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Behavioural Risk Factors For Non-Communicable Diseases Among In-School and Out-of-School Adolescents In Jos North Local Government Area, Plateau State

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Abstract

Background: Adolescents engage in risky behaviors that serve as enabling factors for non-communicable diseases later in life. This study compared behavioral risk factors for non-communicable disorders among in-school and out-of-school adolescents in Jos North Local Government Area, Plateau State.

Method: A comparative cross-sectional study was conducted in Jos North Local Government Area in August-November 2020. Three hundred and seventy-seven in-school and out-of-school adolescents each were selected using a two-stage and multi-stage sampling technique, respectively. An interviewer-administered questionnaire was used to collect information. Chi-square, independent t-test, and Mann-Whitney U test were used for comparisons at a 5 % significance level. Statistical analysis used Statistical Product and Service Solutions (SPSS) version 23.0.

Results: Prevalence of behavioral risk factors was high among in-school (96.8 %) and out-of-school adolescents (97.3 %); $P = 0.665$. The prevalence of current smoking was 14 (3.7 %) among in-school and 43 (11.4 %) among out-of-school adolescents ($P < 0.001$). Current alcohol consumption was 38 (10.1 %) among in-school and 58 (15.4 %) among out-of-school adolescents ($P = 0.029$). The Majority of both in-school, 332 (88.1 %) and out-of-school adolescents, 365 (96.8 %), had unhealthy diets ($P < 0.001$). A higher proportion of in-school adolescents were physically inactive, 261 (69.2 %), compared to their out-of-school counterparts, 186 (49.3 %); ($P < 0.001$). The Majority of both in-school, 345 (91.5 %) and out-of-school adolescents, 365 (96.8 %), reported having a sedentary lifestyle ($P = 0.001$).

Conclusion: A high proportion of behavioral risk factors was found among both groups of adolescents, highlighting a potential risk of adolescents developing non-communicable diseases later in life.

Keywords: Non-communicable disease Risk factors, Adolescent, Plateau

Key Messages: Most in-school and out-of-school adolescents had at least one behavioral risk factor.

Introduction

Non-communicable diseases (NCDs) kill 41 million people yearly, equivalent to 74 % of deaths globally. Annually, 17 million people between the ages of 30 and 69 years die from NCDs, and 86 % of these "premature" deaths occur in low-and middle-income countries (LMICs). **[1]** Most NCDs are linked to behavioral risk factors such as tobacco use, alcohol consumption, physical inactivity, a sedentary lifestyle, and an unhealthy diet. **[1,2]**

Approximately 1.2 billion people are adolescents or 1 in 6 of the world's population. In sub-Saharan Africa SSA, adolescents comprise 23 % of the region's population, and in Nigeria, more than 1 in 4 are adolescents. **[3,4]** These figures highlight that adolescents make up a substantial part of the population. **[3]** Globally, over 150 million adolescents smoke; 81% do not participate in sufficient physical activity; 11.7 % partake in heavy episodic drinking, and over 60 % are overweight. **[5,6]** All this contributes to an estimated 7 million annual deaths from tobacco use, 3 million deaths from harmful use of alcohol, and nearly 4 million deaths linked to obesity and overweight. **[7]** A high prevalence of NCD behavioral risk factors has been identified among in-school and out-of-school adolescents. **[8–13]**.

The focus for NCDs has long been on adults, excluding adolescents who are often wrongly presumed healthy, which is far from being confirmed as they engage in risky behaviors that serve as the basis for NCDs later in life. **[14,15]** This exclusion affects out-of-school adolescents disproportionately more than their school-going

counterparts, as available documentation on NCD risk factors is often skewed to in-school adolescents. **[16]** This study therefore aimed to assess and compare behavioral risk factors for NCDs among in-school and out-of-school adolescents. Findings from this study will be used to advocate for targeted interventions.

Material and Methods

Study setting, design, and sample size:

This comparative cross-sectional study was conducted between August 2020 and November 2020 among in-school and out-of-school adolescents in Jos North Local Government Area (LGA), Plateau State. This LGA has 22 government secondary schools (1 boarding and 21 days) and 51 registered private secondary schools (3 boardings and 48 days). **[17]** There are 8 recognized and duly registered markets. **[18]** The minimum sample size for each group was 377, calculated using the formula for a comparative study of two independent samples. **[19]** A 95 % confidence level was used for the research, and a $P \leq 0.05$ was considered statistically significant. The proportion of 8.3 % and 3.3 % of in-school and out-of-school adolescents who smoked were obtained from previous studies. **[20,21]**

Study population and sampling technique

The study population comprised all consenting in-school and out-of-school adolescents aged 10 to 19. Eligible in-school adolescents were those who attended co-educational day secondary schools. Eligible out-of-school adolescents were those who had dropped out of school without completing their senior secondary school, those who never attended school or those who participated in non-formal school programs. These out-of-school adolescents had to be found in the marketplace during regular school hours. In-school adolescents were sampled from three government co-educational day secondary schools via a two-stage sampling technique. First, 3 schools were selected using a simple random sampling technique by balloting from the list of the 21 registered government co-educational day secondary schools obtained from the Plateau State Ministry of Education, which served as the sampling frame. The number of students selected from each of the 3 schools and the six arms in each school was done by proportionate allocation. Students were selected by simple random sampling by balloting (without replacement) using a class list containing students' names across the various classes, which served as the sampling frame. If a student sampled did not meet the inclusion criteria/declined consent/assent, the individual personal identifier number was kept aside, and another number was picked from those left by simple random sampling. This procedure was carried out in all 3 schools till the minimum sample size was met.

Out-of-school adolescents were sampled from three markets using a multi-stage sampling technique. In stage one, three markets were selected from the eight registered markets using a simple random sampling technique by balloting. Next, the number of registered shops to be chosen was done by proportionate allocation. Based on the assumption that at least one adolescent would be found per shop, a sampling interval for each market was calculated by dividing the total number of registered shops by the selected number of registered shops in stage three. The first shop established was obtained using simple random sampling by balloting among the shops within the sampling interval. One eligible out-of-school adolescent was selected per shop, and the questionnaire was administered. If there was more than one eligible adolescent in a shop, a simple random sampling technique by balloting was carried out to choose only one eligible adolescent. The following contiguous shop was visited if no eligible adolescent was found in a selected shop or the respondent did not consent to participate in the study. This was done until the minimum sample size was met. Research assistants were trained for 2 days for 3 hours each day by the principal researcher on obtaining informed consent/assent, good ethical conduct, content, and method of questionnaire administration.

Study instrument and data collection

Data were collected using an interviewer-administered questionnaire adapted from the Global School-Based Health Surveys and Global Youth Tobacco Survey questionnaires. **[22,23]** The questionnaire was pre-tested separately among 10 % of in-school adolescents in Government Secondary School Township and out-of-school adolescents in the Tudun Wada market in Jos North LGA. Information was collected on socio-demographics and behavioral risk factors for NCDs.

Measurement of variables

The independent variables were socio-demographic characteristics, while the dependent variables were the presence or absence of behavioral risk factors for NCDs computed as a composite variable. A score of "1" was assigned to each behavioral risk factor present, i.e., current smoking, current alcohol consumption, inadequate servings of fruits and vegetables, physical inactivity, and sedentary lifestyle, and "0" for any of the behavioral risk factors absent. Individual scores were summed up, and a total score of 1 to 5 was assigned "Present" for the presence of behavioral risk factors, and a total score of 0 was assigned "Absent" for the absence of behavioral risk factors.

The operational definitions for behavioral risk factors, tobacco use, alcohol consumption, physical inactivity, unhealthy diet, and sedentary behavior were as follows:

- Behavioral risk factors were a composite variable comprising at least one of the five risks above factors.
- Tobacco use: Smoking any number of cigarettes in the last 30 days was considered current smoking; one who had not smoked at all was considered non-smoking. **[22,24]** Alcohol consumption:

Consumption of any form of alcoholic drink in the last 30 days was considered as current alcohol consumption; one who had not consumed any alcoholic drink at all was considered as non-alcohol consumption. A drink was defined as a bottle, one glass of wine, or a shot of any spirits, e.g., gin or red wine. **[22,24]**

- Physical Inactivity: Defined as engaging less than five days a week with at least 60 minutes of moderate to vigorous physical activity daily. **[22,24]**
- Unhealthy diet: Defined as consuming less than 5 servings of fruits and vegetables daily. One serving of fruit was considered one medium-sized apple, banana, or orange, and one cup of freshly squeezed fruit juice; for chopped fruits, one serving was equal to one 250ml cup. One serving of vegetables was one cup (250ml) of green leafy vegetables or vegetable salad. **[22,24]**
- Sedentary behavior: Assessed by total screen time (sum of daily television, computer, and video game time) on weekdays and the weekend. Adolescents with more than two hours per day in front of the screen were considered to have this risky behavior. **[25,26]**

Data Analysis

Data analysis was done using the IBM Statistical Product and Service Solutions (SPSS) version 23.0. A $P < 0.05$ was considered statistically significant for all statistical tests. Adolescents were grouped based on the WHO classification: early (10-14 years), middle (15-17 years), and late (18-19 years). **[27]** Frequencies and percentages were used to assess the proportion of behavioral risk factors for NCDs. Mean and median were used to calculate the average number of days engaged in behavioural risk factors. Chi-square, independent t-test, and Mann-Whitney U test were used to compare behavioral risk factors among in-school and out-of-school adolescents.

Ethical consideration

Ethical clearance for the study was obtained from the Jos University Teaching Hospital Human and Research Ethics Committee (HREC). Permission was obtained from the Plateau State Ministry of Education. Advocacy visits were paid to the school principals and market heads to solicit their support for the research. Each in-school adolescent selected for the study was given a letter of permission to be filled out by their parents or guardians. Informed verbal (thumbprint) or written consent was obtained from adults in charge of out-of-school adolescents. Assent (written or oral) was also obtained from the 10 to 17-year-old adolescents, and informed consent was obtained from 18 to 19-year-olds before the commencement of the study. Parents/guardians and participants were assured that their information would be anonymous and confidential. Participants could opt out of the study at any time without loss of any benefits of the study.

Results

Adolescents aged 15 - 17 years made up the highest proportion of adolescents in both groups; 188 (49.9 %) in-school adolescents and 166 (44.0 %) out-of-school adolescents ($P = 0.241$). Over half of the respondents were females, 202 (53.6 %) in the in-school group, while 193 (51.2 %) were males in the out-of-school group ($P = 0.190$). A higher proportion of in-school adolescents lived with their parents, 297 (78.8 %), compared to their out-of-school counterparts; 192 (50.9 %), while more out-of-school adolescents lived with guardians; 174 (46.2 %), compared to that in-school; 80 (21.2 %), ($P < 0.001$). **[Table 1]**.

Table 1: Sociodemographic characteristics of in-school and out-of-school adolescents

Characteristic	**In-school (n=377) Freq. (%)**	**Out-of-school (n=377) Freq. (%)**	χ^2	**df**	**p-value**
Age group (years)					
10-14	137 (36.3)	148 (39.3)	2.844	2	0.241
15-17	188 (49.9)	166 (44.0)			
18-19	52 (13.8)	63 (16.7)			
Median Age	Median (IQR)15 (3)	Median (IQR)15 (4)	Md0		p-value 0.682$^{\$}$
Sex					
Female	202 (53.6)	184 (48.8)	1.720	1	0.190
Male	175 (46.4)	193 (51.2)			
Religion					
Christianity	366 (97.1)	239 (63.4)	15.912	1	< **0.001**
Islam	11 (2.9)	138 (36.6)			
Tribe					
Plateau indigenous	276 (73.2)	358 (95.0)	66.639	1	< **0.001**
Non-Plateau	101 (26.8)	19 (5.0)			

indigenous					
Lives with					
Parents	297 (78.8)	192 (50.9)	68.333	2	**< 0.001**
Guardian	80 (21.2)	174 (46.2)			
Alone	0 (0)	11 (2.9)			

Early adolescents: 10-14 years; Middle adolescents: 15-17 years; Late adolescents: 18-19 years; IQR: Interquartile range; Md:median difference; $=Mann Whitney U test, χ^2: Chi square test; df: degree of freedom

The prevalence of current smoking was 14 (3.7 %) among in-school adolescents and 43 (11.4 %) among out-of-school adolescents (P < 0.001). Most current alcohol consumption was 38 (10.1 %) among in-school adolescents and 58 (15.4 %) among out-of-school adolescents. (P = 0.029). The Majority of both in-school, 332 (88.1 %) and out-of-school adolescents, 365 (96.8 %), did not consume the recommended 5 or more servings of fruits and vegetables in the last 7 days (P < 0.001). A higher proportion of in-school adolescents were physically inactive, 261 (69.2 %), compared to their out-of-school counterparts, 186 (49.3 %). This was statistically significant (P < 0.001). Majority of both in-school; 345 (91.5 %) and out-of-school adolescents; 365 (96.8 %) reported having a sedentary lifestyle (P = 0.001) **[Table 2]** Majority of both groups of adolescents (in-school; 365 (96.8 %) and out-of-school; 367 (97.3 %) had at least one behavioral risk factor (P = 0.665). **[Table 3]**. No age group nor sex was excluded from engaging in any of the behavioral risk factors. However, none of the associations were statistically significant. **[Table 4]**.

Table 2: Behavioural risk factors for NCDs among in-school and out-of-school adolescents

Behavioural risk factors	**In-school (n=377) Freq. (%)**	**Out-of-school (n=377) Freq. (%)**	χ^2	**df**	**p-value**
Smoked in the past 30 days.					
Yes	14 (3.7)	43 (11.4)	15.961	1	**< 0.001**
No	363 (96.3)	334 (88.6)			
Median number	**Median (IQR)**	**Median (IQR)**	**Md**		**p-value**
of days smoked in 30 days	1 (13)	29 (20)	-28		< 0.001$
Consumed alcohol in the past 30 days.					
Yes	38 (10.1)	58 (15.4)	4.775	1	**0.029**
No	339 (89.9)	319 (84.6)			
Median number	**Median (IQR)**	**Median (IQR)**	**Md**		**p-value**
of days consumed alcohol in 30 days	2 (3)	10 (7)	-8		< 0.001$
Fruit consumption in the last 7 days					
Yes	346 (91.8)	358 (95.0)	3.085	1	0.079
No	31 (8.2)		19 (5.0)		
Vegetable consumption in the last 7 days					
Yes	368 (97.6)	376 (99.7)	6.486	1	**0.011**
No	9 (2.4)		1 (0.3)		
Servings of fruits and vegetables per day					
<5	332 (88.1)	365 (96.8)	20.668	1	**<0.001**
≥5	45 (11.9)	12 (3.2)			
Physical inactivity					
Yes	261 (69.2)	186 (49.3)	30.906	1	**< 0.001**
No	116 (30.8)	191 (50.7)			
Number of days physically active for at least 60 minutes/week					
<3	191 (50.7)	108 (28.6)	41.795	1	**< 0.001**
3-4	70 (18.6)	78 (20.7)			
Sedentary lifestyle					

Yes	345 (91.5)	365 (96.8)	12.004	1	**0.001**
No	32 (8.5)		12 (3.2)		
Hours spent sedentary (total screen time)/day.					
01-Feb	32 (72.7)	12 (27.3)	36.075	1	**0.001**
03-Jul	195 (58.9)	136 (41.1)			
08-Dec	150 (39.6)	229 (60.4)			
Median total screen time	**Median (IQR)**	**Median (IQR)**	**Md**		**p-value**
/day (hours)	7 (4)	8 (4)	-1		< 0.001$

$ = Mann Whitney U test, Md: Median difference; χ^2: Chi square test; df: degree of freedom; Smoked in the past 30 days = current smoking, Consumed alcohol in the past 30 days = current alcohol consumption

Table 3: Overall prevalence of behavioural risk factors for NCDs among in-school and out-of-school adolescents

	In-school (n=377)	**Out-of-school (n=377)**			
Variables	**Frequency (%)**	**Frequency (%)**	**χ2**	**df**	**p-value**
Behavioural risk factors					
Present	365 (96.8)	367 (97.3)	0.187	1	0.665
Absent	12 (3.2)	10 (2.7)			

χ^2: Chi square test; df: degree of freedom

Present: the presence of at least 1 behavioural risk factor i.e., smoking, alcohol use, inadequate servings of fruits and vegetables, physical inactivity, sedentary lifestyle

Absent: absence of any risk factor

Table 4: Relationship between socio-demographic characteristics and behavioural risk factors for NCDs among in-school and out-of-school adolescents

	In-school				**Out-of-school**			
	Behavioural risk factors				**Behavioural risk factors**			
Characteristics	**Present**	**Absent**			**Present**	**Absent**		
	(n=365)	**(n=12)**			**(n=367)**	**(n=10)**		
	Freq. (%)	**Freq. (%)**	**χ^2**	**p-value**	**Freq. (%)**	**Freq. (%)**	**χ^2**	**p- value**
Age group (years)								
10-14	134 (97.8)	3 (2.2)	1.087	0.601#	145 (98.0)	3 (2.0)	2.892	0.212#
15-17	180 (95.7)	8 (4.3)			159 (95.8)	7 (4.2)		
18-19	51 (98.1)	1 (1.9)			63 (100.0)	0 (0)		
Sex								
Male	167 (95.4)	8 (4.6)	2.043	0.153	187 (96.9)	6 (3.1)	0.318	0.573
Female	198 (98.0)	4 (2.0)			180 (97.8)	4 (2.2)		
Religion								
Christianity	354 (96.7)	12 (3.3)	0.372	0.542	331 (97.6)	8 (2.4)	1.112	0.297
Islam	11 (100.0)	0 (0)			36 (94.7)	2 (5.3)		
Tribe								
Plateau	267 (96.7)	9 (3.3)	0.020	0.887	349 (97.5)	9 (2.5)	0.527	0.468
indigenous								
Non-Plateau	98 (96.8)	3 (3.0)			18 (94.7)	1 (5.3)		
indigenous								
Lives with								
Parents	287 (96.6)	10 (3.4)	0.153	0.695	186 (96.9)	6 (3.1)	0.330	0.817#
Guardian	78 (97.5)	2 (2.5)			170 (97.7)	4 (2.3)		
Alone	0 (0)	0 (0)			11 (100.0)	0 (0.0)		

= Fisher's exact; χ^2: Chi square test

Discussion

The proportion of current smokers was higher among out-of-school adolescents than in-school adolescents in this study. This was similar to findings from studies in South Africa but at variance with results from studies in Benin and Madagascar. **[16,28–30]** The higher proportion of current smoking among out-of-school adolescents in this study could be attributed to their higher earning power as an individual or through pooling financial resources together as a group of friends to purchase tobacco, undue influence of peer pressure, boredom, not getting along with their parents, feeling neglected and having to cope with household issues such as the stress of contributing towards household income. **[31]** Variations in findings with this study and others could be due to the age range of respondents, sample size, and location of the studies.

The prevalence of current alcohol consumption among in-school adolescents was a little higher than among out-of-school adolescents. This was, however, lower than findings from other studies. **[9,32–34]** The variation in results could be attributed to respondents' location and age range. The slightly higher proportion of out-of-school adolescents who currently consumed alcohol in this study could be attributed to stress. Working adolescents may experience factors in the work environment that create stress. A study in the USA showed that adolescents with work stress were more likely to use alcohol. **[35]**

Most adolescents in this study, both in and out of school, did not consume the recommended five or more servings of fruits and vegetables. This high prevalence agreed with findings from studies among in-school adolescents in Benin and Burkina Faso. **[29,36]** This high prevalence of inadequate servings of fruits and vegetables in this study could be attributed to insufficient food at home, the high cost of fruits, the non-availability of fruits, and not liking fruits. **[37–39]**

A higher proportion of in-school adolescents were physically inactive compared to out-of-school adolescents. This finding was higher than the findings in Ekiti, Ghana, and Benin. **[29,40,41]** The variation in results could be due to the age and sex of respondents, the questions used in assessing physical inactivity, and scoring. The higher proportion of physical inactivity among in-school adolescents in this study could be due to the academic workload on the students, leaving time for minimal physical activity. Pursuing academic achievement has had the unintended consequence of reducing opportunities for children to be physically active during school and afterward. **[42,43]** It could also be that even though time is allotted for physical activity, it might differ from what the adolescent is interested in participating in. **[44]**

The Majority of both in-school and out-of-school adolescents reported having a sedentary lifestyle. This was higher than the study among in-school adolescents in Ghana, where over half engaged in a sedentary lifestyle. **[41]** The variation in findings could be attributed to the different cut-offs and parameters used for a sedentary lifestyle **[26,27,44]**. Evidence suggests that the more time spent in sedentary behavior, especially recreational screen time, the poorer adolescent health outcomes. For instance, a higher duration of screen time is associated with lower fitness, poorer cardio-metabolic health, shorter sleep duration, unfavourable measures of adiposity, poor mental health, and imbibing negative health behaviours as portrayed on screens. **[44]** In other studies, a sedentary lifestyle has also been associated with low consumption of fruits and vegetables. **[45,46]** This study found that many adolescents were more passive than physically inactive. This variation could be because a sedentary lifestyle was assessed using total screen time, while physical inactivity was estimated via the duration of time spent engaging in the activity of moderate intensity.

Conclusion

Most in-school and out-of-school adolescents had at least one behavioral risk factor. However, there was no statistically significant difference in behavioral risk factors among both groups of adolescents. Public health physicians, Ministries of Health, Education, Youth and Sports, and Women Affairs must design targeted interventions to dissuade adolescents from engaging in NCD risk factors. These interventions should focus on the socio-ecologic model and the role of behavior modification based on constructs such as motivation, self-control, reinforcement, and self-efficacy. This is because several factors outside the control of the adolescent have been found to influence the adoption of risky behaviours which are detrimental to their health.

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Conflicts of Interest: Nil

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