PREVALENCE, PERCEPTION, AND PECULIARITIES OF MARIJUANA USE AMONG ADOLESCENTS ATTENDING SECONDARY SCHOOLS IN SAGAMU, SOUTH-WEST NIGERIA

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Article Info

Abstract

Marijuana is one of the most commonly abused substances among adolescents. Its use has led to addiction, poor concentration and poor performance in schools, thefts, organized crime, violence, mental illnesses, injuries, infections, and behavioral disorders. Aim of this study was to determine the prevalence, perception, and peculiarities of marijuana use among adolescents attending secondary schools in Sagamu, South-West Nigeria. A descriptive, cross-sectional design was used. 388 respondents were selected by a multi-stage sampling technique. A validated, semi-structured questionnaire with Cronbach's alpha of 0.72 was used to collect data. Statistical analysis of the prevalence was based on frequency and percentage, expressed in tables and figures. A 4-point Likert scale was used to collect information on the students' perception. Logistic regression analysis of SPSS version 23 was used to assess the correlation between marijuana use and its prevalence. The mean age of respondents was 15.46±1.37years. Over half (56.2%) of the respondents were female, 74.5% were Christians, 84.0% were Yoruba, and 28.4% were in senior class one (grade 10). 4.6% of the respondents had an illiterate dad and 3.9% had an illiterate mum. A majority of the respondents' fathers (70.6%) and mothers (78.1%) were self-employed. Among the respondents, the prevalence of marijuana use was 7.2%. Perception of marijuana use was high as the items in the perception analysis fell within the Likert scale interval of strongly agree and agree. There was no significant association between the students' perception and marijuana use (R=-0.051; p=0.31). With no significant association between high perception and marijuana use, the respondents' marijuana use was not influenced by their perception but by a particular aim - exam success which is very peculiar. Counselors and social workers should be engaged and strengthened in secondary schools to help promote

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abstinence from marijuana use.

1.0 INTRODUCTION

Marijuana is a dried, psychoactive substance prepared from cannabis plant varieties e.g. *Cannabis sativa, Cannabis indica,* and *Cannabis ruderalis* (Gloss, 2015). Marijuana is used interchangeably with cannabis. However, cannabis is the generic term used to denote the several psychoactive preparations of the cannabis plant. The plant contains over 500 bioactive chemicals and over 80 unique phytocannabinoids that have specific and dose-dependent effects in humans. The delta-9-tetrahydrocannabinol ($\Delta-9$-THC) is the principal cannabinoid and psychoactive constituent, and cannabidiol (CBD) is another major constituent of the plant (World Health Organization [WHO], 2024).

Cannabis usage is associated with oxidative stress. Linked to the induction of oxidative stress are major free radicals. Among these major free radicals, superoxide anions, hydroxyl radicals, and hydroperoxyl radicals are of physiological significance. A nonradical of physiological significance is hydrogen peroxide (Ama, 2023; Ekechi, 2023a; Ikwuka, 2023b; Uche, 2023).

Disorders associated with the use of cannabis are a spectrum of medical conditions, defined via physiological, psychological, and social criteria, documenting severe consequences, dependence, and withdrawal symptoms. Harmful and dependence use, including the severity of its health implications, can be assessed (WHO, 2016). However, some cannabinoids have been reported to have potential medical properties e.g. in the management of multiple sclerosis or during cancer chemotherapy (National Center for Complementary and Integrative Health [NCCIH], 2018; WHO, 2016).

The substance use burden increases among adolescents and young adults, with an unequal distribution across age groups, countries, and epidemiological parameters (Global Burden of Disease Collaborative Network, 2015). The adolescents, according to WHO are people aged 10 to 19 years and they make up 20% of the global population (United Nations Children's Emergency Fund [UNICEF], 2022). In developed countries, the age of initiation of marijuana use is between 15 and 16 years (mid-teen) (United Nations Office of Drugs and Crime [UNODC], 2021; WHO, 2016).

Aside from marijuana, alcohol, tobacco, and illicit drugs like cocaine, heroin, and opiates are other substances commonly used with harmful effects on the brain and other vital organs e.g. lungs (Baysah, 2023; Udeh, 2023a; Udeh, 2023b). Cystic fibrosis is a genetic disease affecting mainly the lungs (Ikwuka, 2023a). Other affected organs include the pancreas, liver, kidneys, and intestine. Clinical features of cystic fibrosis include dyspnea, cough with sputum, sinusitis, poor growth, fatty stool, finger and toe clubbing, etc (Ikwuka, 2023a). Cough with sputum can be complicated by blood in the sputum (hemoptysis), which can lead to anemia (Ikwuka, 2023e; Musa, 2023)

Efforts should be made to ensure that adolescents and the public understand the public health problem involved and the addictive properties of these substances, whose initiation begins in adolescence. The usage of these substances among adolescents is expensive and a global public health problem that can be prevented. Nevertheless, some of these substances are from agricultural products, making it easy to procure them for recreational use. In 2019, cannabis was the most commonly used drugamong youths, and in 2021, it became the most commonly cultivated and trafficked drug worldwide (UNODC, 2021).

Marijuana use has been linked to mental health disorders. The links between marijuana use and metabolic disorders are still being investigated by different researchers, although some studies have reported no significant association between marijuana use and metabolic disorders. Among emerging adults, current marijuana users were 54% less likely than never to present with metabolic syndrome. Current (AOR 0.49; 95% CI, 0.25-0.97)

and past (AOR 0.61; 95% CI, 0.40-0.91) middle-aged adult marijuana users were less likely to have metabolic syndrome than never users (Vidot, 2016). Metabolic disorders, e.g. Hypertension, Adiposity, Diabetes mellitus and Dyslipidemia collectively known as Metabolic Syndrome Diseases (MSDs) are diseases related to one another and have very high morbidity and mortality rates (Ikwuka, 2015; Ikwuka, 2017a; Ikwuka, 2017c; Ikwuka, 2023c; Ikwuka, 2023f; Virstyuk, 2016).

Results obtained from different researches have shown that hypertension, diabetes mellitus, adiposity and dyslipidemia, asymptomatic hyperuricemia, systemic immune inflammation activation and fibrogenesis, can lead to kidney damage (Ikwuka, 2017d; Ikwuka, 2017e; Ikwuka, 2018c; Ikwuka, 2018d; Ikwuka, 2019a; Ikwuka, 2019c; Ikwuka, 2022; Ikwuka, 2023d; Virstyuk, 2017a; Virstyuk, 2018a; Virstyuk, 2019; Virstyuk, 2021a; Virstyuk, 2021b).

From 2001 to 2010, some indications exist that the prevalence of marijuana use varies from one region to another, marijuana dependence increased worldwide, and the use is more in developed countries (WHO, 2016). Of the estimated 219 million cannabis users in 2021, the United States of America had 70.46 million users, Asia (61.99 million users), Africa (53.6 million users), Europe (29.47 million users), and Oceania had 3.4 million users (Statista, 2023). Irrespective of age, women in America, West and Central Europe, Australia, and New Zealand were more involved in cannabis consumption as they account for 37.7% of the total users while African and Asian women were the least (10.5%) (Statista, 2023).

In 2022, 15.1% (15.3 million) of the European population between ages of 15 and 34 years, predominantly boys (66.7%) would use marijuana. In the same survey, 18.2% (8.6 million) of youth aged 15-24 years used cannabis. Among the 15.3 million 15-34-year-olds who used cannabis in 2022, 2.1 million used it daily or almost daily, and approximately 75% of them were male (European Monitoring Center for Drugs and Drug Addiction, 2023). The trend of herbal marijuana, driven by its domestic cultivation, is becoming common in many European countries.

In the United States, 30.7% of 12th-grade students reported having used marijuana in the past 12 months, and 6.3% reported using it daily for the past month (Miech, 2023). Marijuana use beginsin the mid-to-late teens, years progressing to heavy usage (daily) in the early 20s, after which it declines in the early 30s. About 10% of users are daily while another 20-30% use marijuana weekly (WHO, 2016).

From the available data sources on substance use in Nigeria, 37.47% of substance victims are found in the North-West, 17.32% in the South-West, 13.5% in the South-East, 11.71% in the North-Central and 8.54% in the North-East (Akannam, 2008). In 2008, a nationwide survey of high school students reported that 65% of the students used drugs to have a good time with their friends (Abudu, 2008). Later in 2015, it was reported that 76% of secondary school students in the Sagamu Local Government Area in Ogun State, South-West Nigeria, used illicit drugs, and 49.3% reported using them for calmness and sleep (Ojieabu, 2017), in the form of self-medication (Oriavwote, 2022).

Nevertheless, there is also a need for new and effective treatment options in patients with Metabolic Syndrome Diseases. Sodium-Glucose Linked Transporter 2 (SGLT-2) inhibitors e.g. Dapagliflozin and Glucagon-like Peptide 1 Receptor Agonists (GLP-1 RAs) e.g. Liraglutide have been found to improve the efficacy of treatment and clinical course of type 2 diabetes mellitus and hypertension in patients with such comorbidities (Ikwuka, 2017b; Ikwuka, 2018a; Ikwuka, 2018b; Ikwuka, 2019b; Ikwuka, 2021; Virstyuk, 2017b; Virstyuk, 2018b; Virstyuk, 2018c). It has also been reported that coconut water has hepatorenal protective functions against alloxan-induced type 1 diabetes mellitus (Ekechi, 2023b).

In some parts of Nigeria, these adolescents obtain marijuana, usually from local drug peddlers or farmers of the produce, at a cost. Easy access and low cost make marijuana available to these users. Following previous studies and as part of the Sustainable Development Goals (SDGs), this research investigated the use of marijuana among secondary school students in Sagamu, South-West Nigeria. The prevalence of marijuana use among the student population in Nigeria will assist in future intervention programs and policy making.

2.0 MATERIALS AND METHODS

2.1 Study Area

The study setting was the Sagamu Local Government Area (LGA) in Ogun State, South-West Nigeria. Its coordinates are $6^050`N3^039`E$. The occupation of the dwellers is mainly kolanut farming. Marijuana has other widespread names across this study area like hemp, ganja, igbo, pot, kaya, wee-wee, oja, gbana, and abana.

2.2 Study Population

Adolescents between ages 11 and 19 years in secondary schools in the study area.

2.3 Sample Size

The Cochran formula for descriptive, cross-sectional, qualitative research was adopted to get the sample size.

Sample size for large population$> 10,000 = n = \frac{Z^2 PQ}{d^2}$

Z = standard normal deviate usually set at 1.96 which corresponds to the 95% confidence level

P = prevalence of drug use in Nigeria = 65% (Abudu, 2008)

Q = complementary proportion equivalent to $= 1 - P = 1 - 0.65 = 0.35$

d = degree of accuracy desired (absolute precision) = 5.0% = 0.05

Therefore:

$$n = \frac{1.96^2 \times 0.65 \times 0.35}{0.05^2} = 359.57 \sim 360$$

The sample size (n) is ~360 students. Adding a 10% non-response rate, 396 was obtained.

2.4 Sample Size Justification

The formula used in determining the sample size is the appropriate for a qualitative, cross-sectional study. A cross-sectional study could be qualitative or quantitative, and there are specific formulas for each, and in situations where the study population is less or greater than 10,000 (Udeh,2023c). Having a study population above 10,000, the appropriate formula was used, thereby justifying the sample size.

2.5 Sampling Technique

Multistage sampling was used in this study. A list of all secondary schools in Sagamu was obtained from the LGA's Ministry of Education. Simple random sampling by balloting was used to select secondary schools from the list. Aproportionate sampling technique was used to derive the number of participants per school, and systematic sampling was used to obtain the number of students needed from the schools.

2.6 Inclusion and Exclusion Criteria

Male and female students in secondary schools in Sagamu LGA, between 11 and 19 years, and who consented voluntarily to partakein the study were included. Students outside the age bracket, those in the age bracket but had conservative opinions about the study or are not students, and students who did not voluntarilyconsent to participate were excluded.

2.7 Instrument for Data Collection

A structured, self-administered questionnaire was administered to the adolescents in the schools selected. The variables were aligned with the research objective. The sections of the instrument included the socio-

demographic characteristics,prevalence of marijuana use among the students, perception of the students toward marijuana use, and peculiarities of marijuana use among the students.

2.8 Validity of the Instrument

The following criteria were carefully used: face validity, item validity, and construct validity. These criteria were reviewed and modified by an expert researcher.

2.9 Reliability of the Instrument

A pilot study was conducted with 10% of the sample size among students outside the study area to determine the reliability, validity, precision, and accuracy of the questionnaires to be used. Reliability of the questionnaire was further confirmed as Cronbach's alpha was 0.72 at 95% confidence interval, and a test-retest was also performed.

2.10 Method of Data Collection

The information obtained from the pilot study was used to re-modify the questionnaires as necessary. Data collection involved one of the researchers and three assistants who were trained on the method of data collection to be used and how the distribution of the questionnaires was to be done. Data collection was conducted in March 2023 during school hours as permitted by the school authorities. The students completed the questionnaires and returned them accordingly.

2.11 Data Analysis

Participants responded to the items on perception using a four-point Likert scale: 1- Strongly Agree, 2- Agree, 3- Disagree, and 4- Strongly Disagree. The Likert scale interval was calculated and the students' perception was deduced. Data was analyzed using Statistical Package for Social Sciences (SPSS) version 23, and an association was drawn at a p-value less than 0.05.

2.12 Ethical Considerations

Permission to conduct this study was obtained from the Babcock University Health Research and Ethical Committee (BUHREC). A letter of introduction from the Department of Public Health was sent to the Sagamu LGA's Ministry of Education, and another letter from the Ministry of Educationwas sentto the schools. Written informed consent from each participant was obtained. The information obtained was kept confidential.

3.0 RESULTS

A 98% response rate was recorded as only eight questionnaires were not filled. The results are presented in tables and figures.

Table1: Socio-demographic characteristics of the respondents ($n=388$)

Socio-demographic characteristics	Respondents in this study ($n=388$)	
	Frequency(n)	Percentage (%)
Age (in years)		
11-13	19	4.9
14-16	295	76.0
17-19	74	19.1
Mean age ($\bar{x}$) = **15.46±1.37**		
Gender		
Male	170	43.8

Female	218	56.2
Religion		
Christianity	289	74.5
Islam	96	24.7
Traditional	3	0.8
Class (Grade)		
SS1 (Grade 10)	110	28.4
SS2 (Grade 11)	138	35.6
SS3 (Grade 12)	140	36.1
Ethnicity		
Yoruba	326	84.0
Igbo	45	11.6
Hausa	7	1.8
Others	10	2.6
Father's educational level		
No formal education	18	4.6
Elementary school	30	7.7
Secondary school	153	39.4
HND/University	129	33.2
Postgraduate	58	14.9
Mother's educational level		
No formal education	15	3.9
Elementary school	34	8.8
Secondary school	176	45.4
HND/University	110	28.4
Postgraduate	53	137

The mean age of the respondents was 15.46±1.37 years. More than half (56.2%) of the respondents were female. Most (74.5%) were Christians, and 36.1% were in senior secondary school three. The majority (84.0%) were Yorubas. Approximately 39.4% of the respondents' fathers had secondary school education and less than half (45.4%) of their mothers had secondary education. A majority of the respondents' fathers (70.6%) and mothers (78.1%) were self-employed.

Table 2:Respondents' level of marijuana use (*n=388*)

Items	Respondents in this study=388	
	Frequency(*n*)	**Percent (%)**
Have you ever used marijuana?		
Yes	28	7.2
No	360	92.8
Have you ever smoked marijuana at least once a month for more than a year?		

Yes	15	3.9
No	13	3.4
Never use	360	92.8
How long have you been using marijuana?		
< 6 months	11	2.8
6-12 months	17	4.4
Never used	360	92.8
How often would you use marijuana?		
Once per month	17	4.4
2-3 times per month	11	2.8
Never used	360	92.8
How much marijuana do you use in a day?		
1 handful	10	2.6
2 handfuls	13	3.4
3-5 handfuls	3	0.8
Never used	362	93.3
How long has it been since you last used marijuana?		
1month	11	2.8
2-6 months	13	3.4
6 months-1 year	1	0.3
1-2 years	3	0.8
Never used	360	92.8
On what occasion do you use marijuana?		
Before exams	14	3.6
Before doing sport	8	2.1
Onthe street	5	1.3
At party	2	0.5
At home	2	0.5
Never used	357	92.0
Why did you start using marijuana?		
Peer pressure	13	3.4
Sibling use	7	1.8
Pleasure	1	0.3
Brain power	4	1.0
Never used	363	93.6

Few (7.2%) respondents had ever used marijuana. Only 3.9% had smoked marijuana once a month for more than one year. Approximately 2.8% of the respondents have been using marijuana for less than six months before the study. 4.4% had been using marijuana for about 6 to 12 months, while 92.8% had never used it. Few (4.4%) of the respondents used marijuana once per month. 2.6% of the respondents use one handful of marijuana a day, 3.4% use two handfuls a day, and 0.8% use three-five handfuls a day. 2.8% of the respondents last used marijuana a month ago, 3.4% last used it 2-6 months ago, 0.3% used it 6-12 months ago, and 0.8%

used it 1-2 years ago. Only3.6% of the respondents used marijuana before their examinations. Regarding why the respondents started using marijuana, 3.4% agreed that peer pressure made them start using marijuana, 1.8% used it because they had a sibling using marijuana, 0.3% used marijuana just for pleasure, and 1.0% used it as brain power. Overall, an average of 28 (7.2%) respondents have used or are currently using marijuana.
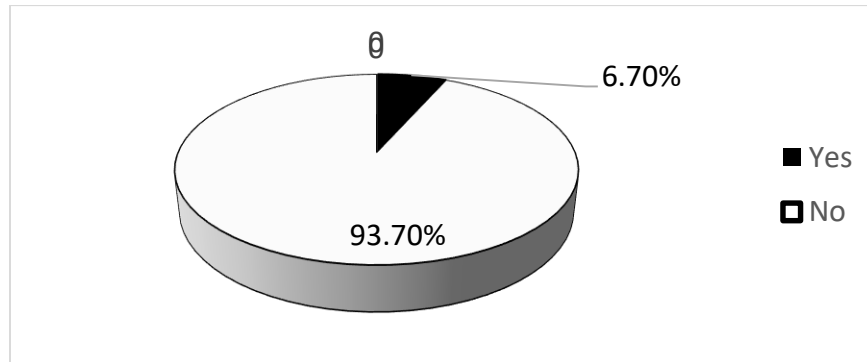
Figure 1 shows that 6.7% of the respondents' family members use marijuana.

Fig. 1: Respondents' family members using marijuana

Figure 2 shows the mode of marijuana use among the respondents. A majority of them (92.8%) never used marijuana. Others who use marijuana either smoke it (5.9%), chew it (0.8%), or sniff it (0.5%).
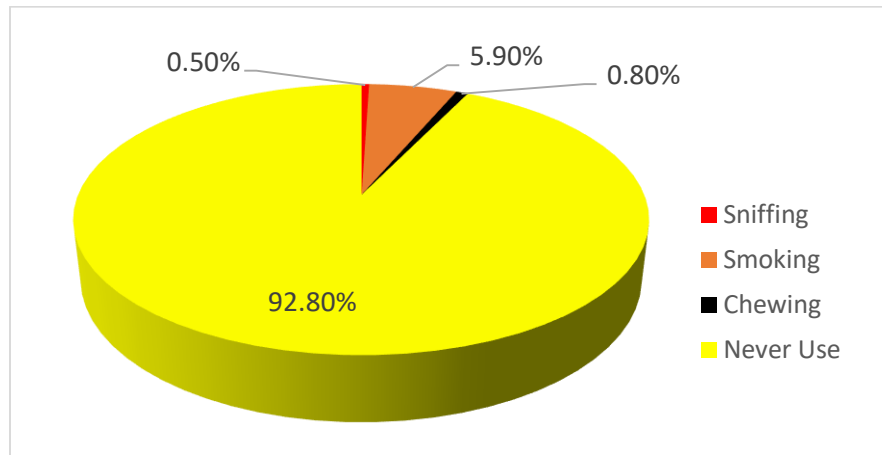

Fig. 2: Mode of marijuana use among respondents

Table 3:Respondents' perception of marijuana use (*n*=388)

S/N	Items	SA *n*(%)	A *n* (%)	D *n* (%)	SD *n* (%)	Inte rval	Decis ion
1	Using marijuana excessively can result in addiction	216 (55.7)	128 (33.0)	11 (2.8)	33 (8.5)	1.64	**SA**
2	Risk-taking behavior is a reason for marijuana use among adolescents	117 (30.2)	186 (47.9)	42 (10.8)	43 (11.1)	2.04	**A**
3	Marijuana use has serious health consequences	200 (51.5)	94 (24.2)	47 (12.1)	47 (12.1)	1.85	**A**
4	Having good role models helps	257	93	19	19	1.28	**SA**

	adolescents avoid marijuana		(66.2)	(24.0)	(4.1)	(4.9)	
5	Abstinence from marijuana use yields good results	187 (48.2)	71 (18.3)	47 (12.1)	83 (21.4)	2.07	A
6	Adolescents' marijuana use may reduce their quality of life	198 (51.0)	106 (27.3)	31 (8.0)	53 (13.7)	1.84	A
7	Marijuana use does not indicate that you are now an adult	277 (71.4)	87 (22.4)	15 (2.3)	9 (2.3)	1.37	SA

Note: SA (Strongly Agree), A(Agree), D(Disagree), SD(Strongly Disagree). Likert scale interval: SA=**1.00-1.75**, A=**1.76-2.50**, D=**2.51-3.25**, and SD=**3.25-4.00**.

In this study, the interval of every item considered under perception wastraced to the Likert scale interval of Strongly Agree, Agree, Disagree, and Strongly Disagree. The respondents strongly agreed that excessive use of marijuana can result in addiction. They agreed that risk-taking behavior is a reason for marijuana use among adolescents and that the use of marijuana has serious health consequences. Also, they strongly agreed that having good role models helps adolescents avoid marijuana and that, abstinence from marijuana use yields good results, and adolescents' marijuana use may reduce their quality of life. The adolescents strongly agreed that marijuana use does not indicate that you are now an adult.

Table 4: Relationship between respondents' perceptions and marijuana use

Variable	Marijuana use (n=388)	
	R	**p-value**
Perception	-0.051	0.31

Table 4 shows that the respondents' perception has no significant relationship (R=-0.051; p=0.31) with their marijuana use.

4.0 DISCUSSION

High levels of marijuana use remain one of the leading adolescent health problems that Nigeria is facing, and its effects on health cannot be over-emphasized. This study focused on the use of marijuana, its perception, and peculiarities among adolescents attendingsecondary schools in Sagamu LGA, Ogun State, South-West Nigeria.

The finding of this study on the age of the respondents was similar to the findings of (Almahdi, 2018), where most respondents were between ages 14 and 16 years, with more female respondents than male. Furthermore, the study indicated that most of the respondents are Christians, and Yorubas while their parents were civil servants (Almahdi, 2018).

In this present study, the prevalence of marijuana use was very low compared to other studies in Nigeria. Only 7.2% of the respondents either used or are currently using marijuana. This result is very low compared to the findings of (Abudu, 2008), who reported a 65% nationwide prevalence rate of substance use among high school students. In Abudu's study, students use substances just to have a good time with their friends (Abudu, 2008).

A 17.4% prevalence rate of substance use among school-going adolescents was reported in Botswana (Gotsang, 2017). A 76% prevalence rate was also reported among secondary school students in Sagamu (Ojieabu, 2017). The very low prevalence rate in the present study may be attributed to the focus only on marijuana use and not

on the use of multiple substances. In the present study, the students that engage in marijuana use, used as much as a handful or more a day. Most of the users agreed to being influenced by peer pressure and having a sibling using it. Also, most marijuana users use it before their exams. This might be due to the perception that marijuana reduces or relieves stress, or enhances assimilation when reading.

The analysis of respondents' perceptions toward marijuana use revealed that they had a high perception as the interval of all the items evaluated to assess the students' perceptions were within the Strongly Agree (1.00-1.75) and Agree (1.76-2.50) intervals. The students strongly agreed that excessive marijuana use can result inaddiction. The students agreed that marijuana use has serious health consequences and may reduce quality of life. These findings are similar to what (Adekeye, 2012) reported in his study among 300 school-going male adolescents. Adekeye reported that the items on perception such as drugs may lead to death; drugs are bad for good health; and drugs ruin lives were all agreed to by the students (Adekeye, 2012).

The respondents moderately perceived that adolescents use marijuana because of risk-taking behavior and abstinence from using marijuana yields good results. They strongly agreed that a good role model helps in avoiding marijuana use and marijuana use does not make you an adult. On further analysis, the present study revealed that there was no significant association between perception and marijuana use among the respondents. This finding agrees with the finding of (Duru, 2017), who reported that predisposing factors do not influence substance use. This reiterates the fact that the students were using marijuana just for exam success, not considering the health implications.

The National Drug Law Enforcement Agency (NDLEA) is a government agency in Nigeria tasked with the responsibility of enforcing laws guiding or prohibiting substance use in Nigeria. The use of marijuana and other illicit drugs is prohibited by the Nigerian Drug Law, thus making the students hide this act from their friends and parents. It is therefore imperative for parents and teachers to closely monitor their children or wards and identify any suspicious movement or attitude for correction.

5.0 CONCLUSION

Marijuana use is low among adolescents attending secondary schools in Sagamu, South-West Nigeria. The students also have a high perception of marijuana use. There is no significant association between the students' perception and marijuana use. Therefore, it is very important to continue to re-emphasize the implications of marijuana use for the students. Parents should be close to their children and monitor their activities, as a neglected child could easily be influenced by friends or relatives.

6.0 ACKNOWLEDGMENT

7.0 AUTHORS' CONTRIBUTIONS

All authors contributed to different aspects of the research.

8.0 CONFLICT OF INTEREST

All authors hereby declare that they do not have any possible conflict of interest.

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10.0 REFERENCES

Abudu, R. V. (2008). Young people and drugs abuse. *Biennial International Conference on Alcohol, Drugs and Society in Africa*, 23rd- 25th July 2008, Abuja, FCT, Nigeria.

Adekeye, O. (2012). Knowledge level and attitude of school-going male adolescents toward drug use and abuse. *Kontagora Journal of Education*, *12*, 122-130.Kotangora, Niger State, Nigeria.

Akannam, T. (2008). North-West rankshighest in drug addiction. *NigerianDrug Statistics by Zone*. Available online:http://www.nairaland.com/203955/nigerian-drug-statistics-zone

Almahdi, H.M., Ali, R.W., Nasir, E.F., & Åstrøm, A. N. (2018). Socio-cognitive correlates of intention to use Toombak: A cross-sectional study among students (13–16 years) in Khartoum State, Sudan. *BMC Public Health, 18*(88), 1-9. DOI: 10.1186/s12889-017-4606-z.

Ama, M. I., Ikwuka, A. O., Udeh, F. C., Ekechi, H. O., & Eteudo, A. N. (2023). Sperm Parameters and Testicular Histology of Male Wistar Rats Treated with *Phoenix dactylifera* After Consumption of Local Mmahi Salt. *American Journal of Bioscience and Bioinformatics*,*2*(1), 41-51. DOI: 10.54536/ajbb. v2i1.2275.

Baysah, P. V., Ikwuka, A. O., Udeh, F. C., Bleh, D. P., & Viloria, T. (2023). Pathophysiological effects of alcohol and tobacco consumption on semen parameters of men attending a fertility clinic in West Africa. *American Journal of Biomedical and Life Sciences, 11*(4), 73-81.DOI: 10.11648/j.ajbls.20231104.13.

Duru, C. B., Oluoha, U. R., Okafor, C. C., Diwe, K. C., Iwu, A. C., Aguocha, C. M., Ohale, I., & Nwaigbo, E. (2017). Socio-demographic determinants of psychoactive substance use among students of tertiary institutions in Imo State, Nigeria. *Journal of Addiction Research& Therapy, 8*(345), 1-9. DOI:10.4172/2155-6105.1000345.

Ekechi, H. O., Ikwuka, A. O., Udeh, F. C., & Abraham, J. C. (2023)a. Effects of Ethanol Extract of *Rauwolfia vomitoria* Leaf on Lipid Profile and Cerebellar Histology in Cisplatin-induced Oxidative Stress. *British Journal of Medical and Health Research*, *10*(5), 16-39. DOI: 10.5281/zenodo.8042521.

Ekechi, H. O., Ikwuka, A. O., Udeh, F. C., Epete, M. A., & Uche, V. U. (2023)b. Hepatorenal Protective Functions of Coconut Water in Alloxan-Induced Type 1 Diabetes Mellitus. *World Journal of Current Medical and Pharmaceutical Research,5*(4), 114-122. DOI: 10.37022/wjcmpr.v5i4.276.

European Monitoring Center for Drugs and Drug Addiction (EMCDDA). (2023). *European drug report 2023: Trends and developments*. Available online: https://www.emcdda.europa.eu/publications/european-drug-report/2023_en

Global Burden of Disease Collaborative Network. (2015). Global burden of disease study 2013 (GBD 2013):incidence, prevalence, and years lived with disability 1990-2013. *Institute for Health Metrics and Evaluation (IHME)*.Available online: https://ghdx.healthdata.org/record/ihme-data/gbd-2013-incidence-prevalence-and-ylds-1990-2013

Gloss, D. (2015). An overview of products and bias in research. *Neurotherapeutics. 12*(4), 731-734.

Gotsang, G., Mashalla, Y., & Seloilwe, E. (2017). Perceptions of school-going adolescents about substance abuse in Ramotswa, Botswana. *Journal of Public Health and Epidemiology, 9*(6), 151-160. DOI: 10.5897/JPHE2017.0930.

Ikwuka, A. O. (2015). Risk factors for the pathogenesis of diabetes mellitus type 2. *Materials of 84th Scientific and Practical Conference of Students and Young Scientists with International Participation "Innovations in medicine"*, p. 19. Available online: http://www.ifnmu.edu.ua/images/snt/files/konferenciya/Tezu_2015.pdf

Ikwuka, A. O. (2017) a. Dyslipidemia risk severity in patients with diabetes mellitus type 2 and essential hypertension. *Journal of the 21st International Medical Congress of Students and Young Scientists*, p. 59.

Ikwuka, A. O. (2017) b. Effectiveness of dapagliflozin in patients with diabetes mellitus type 2 and essential hypertension. *Book of abstracts of the 7th International Students' Scientific Conference of Young Medical Researchers*, p. 102. Available online: http://www.stn.umed.wroc.pl/files/lm/Accepted_papers.16113.pdf

Ikwuka, A. O. (2017) c. Influence of dyslipidemia in patients with diabetes mellitus type 2 and essential hypertension. *The Pharma Innovation Journal*, *6*(3), 101-103. Available online: http://www.thepharmajournal.com/archives/?year=2017&vol=6&issue=3&part=B

Ikwuka, A. O., & Haman, I. O. (2017) d. Features of kidney damage in patients with diabetes mellitus type 2 and essential hypertension. *Journal of 86th Scientific and Practical Conference of Students and Young Scientists with International Participation "Innovations in medicine"*, p. 144. Available online: http://www.ifnmu.edu.ua/images/snt/86-konf-tezi%20(1).pdf

Ikwuka, A. O., Virstyuk, N. G., & Luchko, O. R. (2017) e. Features of the functional state of kidneys in patients with diabetes mellitus type 2 and essential arterial hypertension. *Materials of scientific-practical conference with international participation "Babenkivski reading"*, p. 48.

Ikwuka, A. O. (2018)a. Clinical dynamics in patients with diabetes mellitus type 2 and concomitant essential hypertensive disease treated with dapagliflozin. *Journal of the 22nd International Medical Congress of Students and Young Scientists,* p. 32.

Ikwuka, A. O. (2018)b. Clinical effectiveness of SGLT-2 inhibitors in patients with diabetes mellitus type 2 and essential hypertensive disease. *Endocrine Practice*, *24*(1), 74. DOI: 10.1016/S1530-891X(20)47129-0.

Ikwuka, A. O. (2018)c. Features of kidney damage in patients with arterial hypertension and type 2 diabetes mellitus and optimization of treatment. *Specialized Academic Council IFNMU*, Available online: http://www.ifnmu.edu.ua/images/zagalna_informacia/spec_vcheni_radi/2017-2019/%D0%9420.601.01/Ikvuka/Avtoreferat.pdf

Ikwuka, A. O., & Paliy, Yu. (2018)d. Structural changes of the left ventricular myocardium in patients with essential arterial hypertension and diabetes mellitus type 2. *Abstracts of the 87th Scientific Conference of Students and Young Scientists with International Participation "Innovations in medicine"*, p. 25-26. Available online: https://www.ifnmu.edu.ua/images/snt/zaproshennia_eng.pdf

Ikwuka, A. O. (2019)a. Clinical dynamics of nephropathy in patients with diabetes mellitus type 2 and concomitant essential hypertensive disease. *Clinical Medicine*, *19*(2), s39. DOI: 10.7861/clinmedicine.19-2-s39.

Ikwuka, A. O. (2019)b. Clinical effectiveness of GLP-1 RAs in patients with metabolic syndrome diseases. *Endocrine Practice*, *25*(1), 104-105. DOI: 10.1016/S1530-891X(20)46611-X.

Ikwuka, A. O., & Virstyuk, N. G. (2019)c. Pattern of cardiac remodelling of the left ventricle in patients with essential hypertensive disease and concomitant type 2 diabetes mellitus. *Clinical Medicine*, *19*(3), s92. DOI: 10.7861/clinmedicine.19-3-s92.

Ikwuka, A. O., & Virstyuk, N. G. (2021). Influence of SGLT2 inhibitor and A2RB (AT1) on fibrogenesis and heart failure in patients with essential hypertensive disease combined with diabetes mellitus type 2. *E-Poster No. 143 of the 44th & 45th Annual General and Scientific Meeting of the West African College of Physicians (WACP), 1 - 3 November, 2021*. DOI: 10.13140/RG.2.2.26912.87047.

Ikwuka, A. O., & Virstyuk, N. (2022). Prognostic markers of nephropathy in patients with dual metabolic syndrome diseases (essential hypertensive disease and concomitant type 2 diabetes mellitus). *Endocrine Practice*, *28*(5), S65-S66. DOI: 10.1016/j.eprac.2022.03.164.

Ikwuka, A. O. (2023)a. *Dr. Aloy's Core Essential Series (DACES) Medical Genetics*. 1st Edition. Science and Education Publishing, USA, p. 15. ISBN: 978-1-958293-02-7.

Ikwuka, A. O. (2023)b. *Dr. Aloy's Core Essential Series (DACES) Immunology*. 1st Edition. Science and Education Publishing, USA, p. 30. ISBN: 978-978-795-866-7.

Ikwuka, A. O., & Virstyuk, N. (2023)c. Patterns and Influence of Cardio-Metabolic Insufficiency in Patients with Essential Hypertensive Disease and Concomitant Type 2 Diabetes Mellitus. *Endocrine Practice*, *29*(5), S32-S33. DOI: 10.1016/j.eprac.2023.03.076.

Ikwuka, A. O., Virstyuk, N. G., Luchko, O. R., & Kobitovych, I. (2023)d. Heterogeneity Of Renal Pathogenicity On The Background Of Asymptomatic Hyperuricemia In Patients With Dual Metabolic Syndrome Diseases (Essential Hypertensive Disease and Type 2 Diabetes Mellitus). *British Journal of Medical and Health Research*, *10*(2), 1-9. DOI: 10.5281/zenodo.7690636.

Ikwuka, A. O. (2023)e. *Dr. Aloy's Core Essential Series (DACES) Hematology*. 1st Edition. Science and Education Publishing, USA, p. 84. ISBN: 978-1-958293-09-6.

Ikwuka, A. O., Omoju, D. I., & Mahanera, O. K. (2023)f. Profiling of Clinical Dynamics of Type 2 Diabetes Mellitus in Patients: A Perspective Review. *World Journal of Current Medical and Pharmaceutical Research*, *5*(5), 210-218. DOI: 10.37022/wjcmpr.v5i5.294.

Miech, R. A., Johnston, L. D., Patrick, M. E., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2023). Monitoring the future national survey results on drug use, 1975-2022. *Monitoring the Future Monograph Series.* Ann Arbor: Institute for Social Research, The University of Michigan.

Musa, S., Ikwuka, A. O., Udeh, F. C., Musa, A. A., & Chukwuezie, U. C. (2023). CRISPR-Cas9 Genomic Editing as an Innovation in the Management of Sickle Cell Disease: A Systematic Review. *American Journal of Medical Science and Innovation,2*(2), 36-48. DOI: 10.54536/ajmsi.v2i2.1760.

National Center for Complementary and Integrative Health. (2018). *Marijuana and cannabinoids.* Available online: https://nccih.nih.gov/health/marijuana

Ojieabu, W. A., Eze, U. I. H., Ojieabu, C. I., & Osunkoya, O. K. (2017). Substance abuse in Sagamu Local Government of Ogun State. *Nigerian Journal of Pharmaceutical Research*, *11*(1), 140-146. Available online: www.ajol.info/index.php/njpr/article/view/163016

Oriavwote, P. E., & Ikwuka, A. O. (2022). Patterns and factors influencing self-medication among students of the American International University West Africa (AIUWA), The Gambia. *European Journal of Clinical Medicine*, *3*(2), 33-37. DOI: 10.24018/clinicmed.2022.3.2.181.

Statista. (2023). Estimated number of cannabis users worldwide from 2011 to 2021, by region. *Health, Pharma and Medtech.* John Elflein Publisher.

Uche, V. U., Ikwuka, A. O., Udeh, F. C., Okorocha, A. E., Epete, M. A., Ekechi, H. O., Abraham, J. C., & Igwe, E. C. (2023). Associated Risks and Pathogenic Effects of Consumption of Calcium Carbide-Ripened Banana Before and/or During Pregnancy on Maternal and Neonatal Livers. *American Journal of Food Science and Technology, 2*(2), 54-64. DOI: 10.54536/ajfst.v2i2.2197.

Udeh, F. C., Ikwuka, A. O., Epete, M. A., & Igwe, E. C. (2023)a. Effects of Local Tobacco Snuff Ingestion during Pregnancy on Renal Functions and Histology Architecture of Female Wistar Rats and on the Birth Weight of Their Pups. *American Journal of Medical Sciences and Medicine*, *11*(1), 1-5. DOI: 10.12691/ajmsm-11-1-1.

Udeh, F. C., Ikwuka, A. O., Epete, M. A., & Igwe, E. C. (2023)b. Effects of Oral Consumption of Nicotiana Tabacum During Pregnancy on the Liver and Prolactin Levels of Adult Female Wistar Rats. *European Journal of Veterinary Medicine, 3*(2), 1-5. DOI: 10.24018/ejvetmed.2023.3.2.93.

Udeh, F. C., Ikwuka, A. O., Nwandu, T. C., Ewunonu, E. O., Egwu, O. A., Ezinwa, G. A., & Anaetor, I. S. C. (2023)c. Human Anatomy Education: Knowledge, attitude, perception and challenges encountered by medical and nursing students in two Gambian Universities. *Journal of Tertiary Education and Learning*, *1*(3), 29-38. DOI: 10.54536/jtel.v1i3.2277.

United Nations Children's Emergency Fund. (2022). Investing in a safe, healthy and productive transition from childhood to adulthood is critical. *Adolescent.* Available online: https://data.unicef.org/topic/adolescents/overview/

United Nations Office of Drugs and Crime. (2021). *World Drug Report 2021*. United Nations. Available online: https://www.unodc.org/unodc/data-and-analysis/wdr2021.html

Vidot, D. C., Prado, G., Hlaing, W. M., Florez, H. J., Arheart, K. L., & Messiah, S. E. (2016). Metabolic Syndrome Among Marijuana Users in the United States: An Analysis of National Health and Nutrition Examination Survey Data. *The American Journal of Medicine*, *129*, 173-179.

Virstyuk, N. G., Ikwuka, A. O., Haman, I. O., & Adebomi, M. S. (2016). Diabetes mellitus type 2, arterial hypertension and dyslipidemia. *Materials of 2nd International Scientific and Practical Conference "Therapeutic readings: modern aspects of diagnosis and treatment of diseases of internal organs"*, p. 46-47.

Virstyuk, N. G., & Ikwuka, A. O. (2017)a. Diagnostic and prognostic markers of the diabetes mellitus type 2 course in connection with essential arterial hypertension taking into account the kidney function. *Precarpathian Journal Pulse*, *8*(44), 53-62.

Virstyuk, N. H., Ikwuka, A. O., Losyuk, L. V., Kobrynska, O. Ya., & Markiv, H. D. (2017)b. Dapagliflozin utility in patients with diabetes mellitus type 2 and essential hypertensive disease. *Actual Problems of Modern Medicine*, *4*(60)1, 76-79. Available online: http://www.umsa.edu.ua/journal2stat4_2017_eng.html

Virstyuk, N. G., & Ikwuka, A. O. (2018)a. Features of asymptomatic hyperuricemia in patients with diabetes mellitus type 2 and concomitant essential arterial hypertension. *Clinical and Experimental Pathology*, *1*(63), 22-26. DOI: 10.24061/1727-4338.XVII.1.63.2018.5.

Virstyuk, N. G., Ikwuka, A. O., & Didushko, O. M. (2018)b. Effect of dapagliflozin on the level of uric acid during asymptomatic hyperuricemia in patients with diabetes mellitus type 2 and concomitant arterial hypertension. *Art of Medicine*, *1*(5), 21-26. Available online: https://art-of-medicine.ifnmu.edu.ua/index.php/aom/article/view/179/150

Virstyuk, N. H., & Ikwuka, A. O. (2018)c. Dapagliflozin influence on the clinical course of diabetes mellitus type 2 and essential hypertension in patients. *Recent Advances in Environmental Science from the Euro-Mediterranean and Surrounding Regions*, p. 2007-2008. DOI: 10.1007/978-3-319-70548-4_582.

Virstyuk, N. G., & Ikwuka, A. O. (2019). Nephropathic characteristics in patients with diabetes mellitus type 2 and essential hypertensive disease. *Art of Medicine*, *1*(5), 44-47. DOI: 10.21802/artm.2019.1.9.44.

Virstyuk, N. G., & Ikwuka, A. O. (2021)a. Asymptomatic hyperuricemia and functional state of the kidneys in patients with essential arterial hypertension and concomitant diabetes mellitus type 2. *European Journal of Clinical Medicine*, *2*(3), 100-104. DOI: 10.24018/clinicmed.2021.2.3.65.

Virstyuk, N. H., Ikwuka, A. O., Luchko, O. R., & Kocherzhat, O. I. (2021)b. Peculiarities of renal insufficiency in patients with diabetes mellitus type 2 and arterial hypertension. *Materials of scientific-practical conference with international participation "Achievements and prospects of experimental and clinical endocrinology" Twentieth Danilevsky readings*, p. 86-87.

World Health OrganizationAlcohol, Drugs and Addictive Behaviours Unit. (2016). The health and social effects of non-medical cannabis use. *Cannabis.* Available online: https://www.who.int/substance_abuse/publications/cannabis_report/en/index4.html

World Health Organization Alcohol, Drugs and Addictive Behaviours Unit. (2024). *Cannabis*. Available online: https://www.who.int/teams/mental-health-and-substance-use/alcohol-drugs-and-addictive-behaviours/drugs-psychoactive/cannabis