

Full Length Research Paper

Use of anabolic-androgenic steroids among university student athletes in a Nigerian community

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Anabolic-Androgenic Steroids (AAS) are synthetic forms of male sex hormone used by athletes as performance enhancement drugs. The study aimed to assess the characteristics of university student athletes that use AAS and other substances they use. It also assessed their knowledge of the health effects of AAS and their attitude towards use of AAS. Cross-sectional study was conducted among 157 student athletes from December, 2019 to January, 2020 at the Obafemi Awolowo University in Nigeria. Purposive sampling technique was used to select participants, while a self-reported questionnaire was used for data collection. Descriptive and inferential (Chi-square test and Logistic regression) statistical analysis were carried out. Findings showed that many users of AAS were males (85%), undergraduates (92%), involved in court sports (69%), and were from the Faculty of Arts (27%). A significant difference was found between types of sports and the use of AAS ($\chi^2 = 11.3$, $p = 0.05$). The logistic regression model showed that females athletes have 56.9% lower odds of using AAS than the male athletes (OR = 0.431; 95% CI = 0.135-1.379) while those in the weightlifting sport will 7 times more likely to use AAS than those in the track and field event sport. Some of the athletes that used AAS also reported they consume Marijuana (35%), alcohol (27%), among other substances. No significant difference existed between the knowledge and attitude of those who used and did not use AAS ($p > 0.05$). The use of AAS among athletes in the Nigerian University is still a common practice and efforts should be intensified to reduce the incidence.

Key words: Athletes, attitude, knowledge, anabolic androgenic steroids, use

INTRODUCTION

Anabolic-Androgenic Steroids (AAS) are synthetic, or human-made variations of the male sex hormone, testosterone that have profound effect on protein

synthesis, thereby improving muscle growth and masculinity (Handelsman, 2021). The AAS have been found to be used by athletes to enhance performance

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and physical appearance (Kanayama et al., 2020). This hormone has become a global concern in the twenty-first century as its use has become prevalent in many parts of the world (Mazzeo, 2018). Although, AAS such as nandrolone, oxandrolone, oxymetholone, stanozolol, and trenbolone acetate have been medically useful in the management of abnormally low production of testosterone, in-born error of metabolism, renal insufficiency and muscle wasting (Havnes et al., 2019), the non-medical use of the steroids is not permitted in many parts of the world. This is because these substances are under the Controlled Substance Act thereby prohibiting their unlawful possession and distribution (Angoorani et al., 2018). However, athletes illicitly use steroids either orally or intramuscularly for esthetics, muscle building and to enhance sport activities (Alharbi et al., 2019; Pereira et al., 2019). The recent reports of van de Ven et al. (2020) showed that the most widely reported routes of AAS administration by athletes are via injections and oral consumption. The intramuscular injection route may predispose the AAS users to needle sharing which has been implicated in HIV infection transmission (Ball et al., 2019).

Other than sport enhancement, contributory factors to the use of AAS among youths comprise maladaptive relationships, psychopathology (e.g. depression), poor self-esteem, poor body image, and deviant behavior (Reardon et al., 2019). Also, Bates et al. (2019) reported that youths in their mid-20s, are motivated to consuming AAS in order to enhance body image for occupational performance, youthful appearance and to increase sex drive and energy. Bates et al. (2019) findings are also true for high school students who are either athletes or non-athletes (Shah et al., 2019). Also, many athletes who use AAS also reported to use supplementary vitamins, energy drinks, and psychoactive substances such as opioids, amphetamines, alcohol and marijuana (Alharbi et al., 2019; Kanayama et al., 2020).

Despite the reported use of AAS for athletes' performance leading to increased strength and muscle mass (Handelsman, 2021), myriads of negative effects have been reported in the literature. AAS is associated with psychological problems such as depression, mood changes and withdrawal symptoms. Menstrual irregularities and clitoris hypertrophy may be common among females, while males may experience testicular atrophy, impotence and gynecomastia (Pereira et al., 2019). In addition, Albano et al. (2021) has documented the unwanted effects of AAS use on all body tissues and organs which also include oxidative stress, apoptosis, and protein synthesis. The cardiovascular system and the reproductive system are the most frequently involved apparatuses as further documented by Albano et al (2021). Ultimately, Torrisi et al. (2020) noted that the risk of sudden death is common among illicit users of AAS. With the many negative effects of AAS reported in the literature, AAS is an illicit drug in many countries which are under prescription policy. However, studies have

found that athletes obtained these drugs from many illegal sources including their coaches (Aldarweesh and Alhajaj, 2020) and friends (Althobiti et al., 2018). Incidentally, poor knowledge of the negative effects of AAS and negative attitude towards AAS use, have been reported across studies in Nigeria (Afolayan, 2012; Ijadunola et al., 2018) and outside Nigeria (Althobiti et al., 2018; Ahmed et al., 2021).

In Nigeria, studies on AAS have been conducted among professional and amateur athletes in some recognized gymnastic outlets as well as tertiary educational institutions. Some of these studies were conducted to assess athletes' knowledge, awareness, perception, attitude and practice (Afolayan, 2012; Akindutire et al., 2012; Ijadunola et al., 2018), behavioural disposition following the use of doping substances (Akindutire et al., 2012) and methods of doping (Ajayi-Vincent and Olanipekun, 2014). However, very few studies are available on the use, knowledge and attitude regarding AAS among the university student athletes despite the moderate involvement of the university students in different forms of sports activities in Nigeria. Assessing the characteristics of university student athletes that use AAS and other substances they use, viz-a-viz their knowledge of AAS health effects and attitude towards its use, is paramount for appropriate prevention intervention. Therefore, this study was designed to analyse the characteristics of university student athletes that use AAS, other substances used by them, their knowledge of health effects of AAS and attitude towards the use of AAS.

METHODOLOGY

Study design and setting

Cross sectional descriptive design was adopted and the study was conducted at the Obafemi Awolowo University, situated in Ile-Ife, Osun State, Nigeria between December, 2019 and January, 2020. The university is one of the public universities owned by the Federal Government of Nigeria and has a student population of approximately 30,000 (Obafemi Awolowo University, 2022). The university has facilities for 15 sports comprising athletics, Badminton, Basketball, Chess, Cricket, Football, Handball, Hockey, Judo, Table Tennis, Taekwondo, Tennis, Squash Rackets, Swimming and Volleyball. Also, there is a gymnasium for weightlifters and students who love to gym (Olorunsola, n.d.). As at the time of conducting this study there was an approximate total of 250 students who were participating in one sport or the other at the Sports Complex of the university.

Study population and sampling

Surveys were conducted among university students who were athletes attending the University Sport Complex. The total number of athletes that regularly attended the University Sports Complex was obtained from the office of the Director of the Complex. Sample size was determined using the Taro Yamane sample size formula for a population of less than 10,000. A sample of 154 was obtained which was rounded off to 160. The 160 athletes were selected from each sport type using proportionate sampling technique. Advocacy

visits were made during each sport activity to establish rapport and discuss the nature and the purpose of the study among the athletes.

Data collection and tools

Data were collected using a pre-tested, structured, and self-administered questionnaire. The questionnaire was developed after a rigorous review of literature on attitude, knowledge and use of AAS in similar settings. The questionnaire consisted of four sections, eliciting information on the demographic characteristics of the respondents, knowledge of health effects of AAS, attitude towards AAS use, sources of AAS and other substances used. The knowledge questions were 14 and they had response options of Yes (2), No (0), and I don't know (0). Attitude towards AAS use was measured by nine (9) questions with five-point Likert scale of Strongly Agree to Strongly Disagree. All individual answers to the questions were computed to obtain the individual total scores. Then a median score was calculated to categorize attitude as positive (attitude that do not support use of AAS) or negative (attitude that supports use of AAS). Negatively worded question items were scored in the reverse order. The fourth section used dichotomous responses of Yes and No to assess the use of anabolic androgenic steroids, its sources and other substances used during athletic activities.

Validity and reliability

Experts in sports, public health and statistical analysis validated the questionnaire as appropriate and a Content Validity Index of 0.84 was obtained. A pilot test was also conducted on 16 student athletes (10% of the sample size) from a private university. Minor revisions were made to the questionnaire based on the findings of the pilot study. Pre-test of the instrument was carried out during the pilot study and the Cronbach's alpha of the instrument was found to be 0.91 for knowledge and 0.77 for attitude, indicating that the instrument has a high level of internal consistency. Analysis of the pilot study showed that the research was feasible.

Ethical consideration

Institutional approval for the study was obtained from the Institute of Public Health, Obafemi Awolowo University with approval number of IPHOAU/12/1489. Permission to conduct the study was obtained from coaches of each sport as well as informed consent from each of the study participants.

Data analysis

Out of the 160 questionnaires distributed, only 157 were properly filled and found suitable for analysis giving a 98% response rate. Descriptive and inferential statistical analyses were carried out using Statistical Package for Social Sciences (SPSS) version 21 (IBM Corp. Released, 2012). The knowledge statements for health effects of AAS were coded as Yes (1) No (0), and I don't know (0). Therefore, the maximum score for knowledge was 14. The median knowledge score was statically determined to categorize the knowledge into good and poor. The attitude was scored on a Likert scale of Strongly agree (1), Agree (2), Undecided (3), Disagree (4) and Strongly disagree (5) for positive statements and the scores were reversed for negative statements. The maximum score for attitude was 43 and the median score was used for categorize it into positive attitude (attitude that do not support the use of AAS) and negative attitude (attitude that support the use of AAS). The

Chi-square test was used for the bivariate analysis and multivariate analysis was performed using binary logistic regression model. Alpha was set at 5%.

RESULTS

The results showed that majority of the respondents (65%) were youths within the age range of 17 and 24 years. The characteristics of the athletes (Table 1) showed that 17% of the athletes used AAS while 83% did not use it. Of the AAS users, 85% were males while 15% were females. A significant difference existed between male and female athletes who used and did not use AAS ($\chi^2 = 4.43$, $p = 0.04$). More youths (17-24 years; 11%) used AAS compared to young adults (25-40 years; 6%). None of the athletes that were married or undergoing Ph.D programme used AAS. Those in the Faculty of Arts (27%) used AAS more than those in other faculties and no student from Faculty of Health Sciences used AAS. A significant difference was found between types of sports and the use of AAS ($\chi^2 = 11.3$, $p = 0.05$) as those in courts sports (69%) and weight lifting (15%) used AAS more than athletes in other types of sports. However, the athletes generally reported that sporting activities were mostly for recreational purposes (Figure 1). No significant difference was found between those who used and did not use AAS according to their reasons for participating in sporting activities ($\chi^2 = 1.03$; $p = 0.79$).

A logistic regression was performed to ascertain if sex, age and types of sports will predict the likelihood that an athlete will use AAS. The logistic regression model was statistically significant, $\chi^2 (1) = 56.7$; $p = 0.0001$. The model explained 15% variation (Nagelkerke R^2) in the use of AAS and it correctly classified 84% of AAS use. Females athletes have 56.9% lower odds of using AAS than the male athletes (OR = 0.431; 95% CI = 0.135-1.379) while those in the weightlifting sport will 7 times more likely to use AAS than those in the track and field event sport (Table 2).

Moreover, majority of the athletes reported obtaining the AAS from friends (46%), fitness stores (53.8%) and online stores (53.8%) (Table 3). Results further showed that, some of the athletes that used AAS also reported they consume marijuana (35%), alcohol (27%), among other substances. It was also discovered that those who used AAS consumed supplementary vitamins (62%) and special diets (85%) more than those who did not use (Table 4). In addition, the mean knowledge of health effects of AAS for the athletes was 8.6 ± 4.4 ; median was 9.0 while the range was 0 to 14. Grouping by the median score, 56% had poor knowledge while 44% had good knowledge. No significant difference existed between the knowledge of those who used and did not use AAS ($\chi^2 = 0.06$; $p = 0.80$). The mean score for attitude was 27.5 ± 5.9 , median of 27.0 and range of 29. Grouping by the median score, 68% had positive attitude while 33% had negative attitude. However, no significant difference

Table 1. Characteristics of athletes according to their use and non-use of AAS.

Characteristics	Used AAS		χ^2 (p)
	No	Yes	
	F (%)	F (%)	
Sex			
Male	83 (63)	22 (85)	4.43 (0.04)
Female	48 (37)	4 (15)	
Age group			
17-24	109 (87)	17(14)	4.35 (0.04)
25-40	22 (71)	9 (29)	
Religion			
Christianity	105 (80)	20(77)	0.14 (0.71)
Islam	26 (20)	6 (23)	
Marital status			
Single	123 (94)	26 (100)	1.67 (0.20)
Married	8 (6)	0 (0)	
Educational level			
Undergraduate	117 (89)	24 (92)	0.82 (0.67)
Master	10 (8)	2 (8)	
PhD	4 (3)	0(0)	
Faculty			
Administration	9 (7)	4 (15)	14.7 (0.10)
Agriculture	12 (9)	1 (4)	
Arts	14 (11)	7 (27)	
Health Sciences	16 (12)	0 (0)	
Environmental design and management	9 (7)	1 (4)	
Education	32 (24)	3 (12)	
Physical Sciences	13 (10)	2 (8)	
Social Sciences	7 (5)	3 (12)	
Law	8 (6)	1 (4)	
Technology	11 (8)	4 (14)	
Types of sports			
Track and field events	18 (14)	2 (8)	11.33 (0.05)
Courts	83 (63)	18 (69)	
Board game	8 (6)	1 (4)	
Wrestling	14 (11)	1 (4)	
Racket	5 (4)	0 (0)	
Weightlifting	3 (2)	4 (15)	

Source: Field work

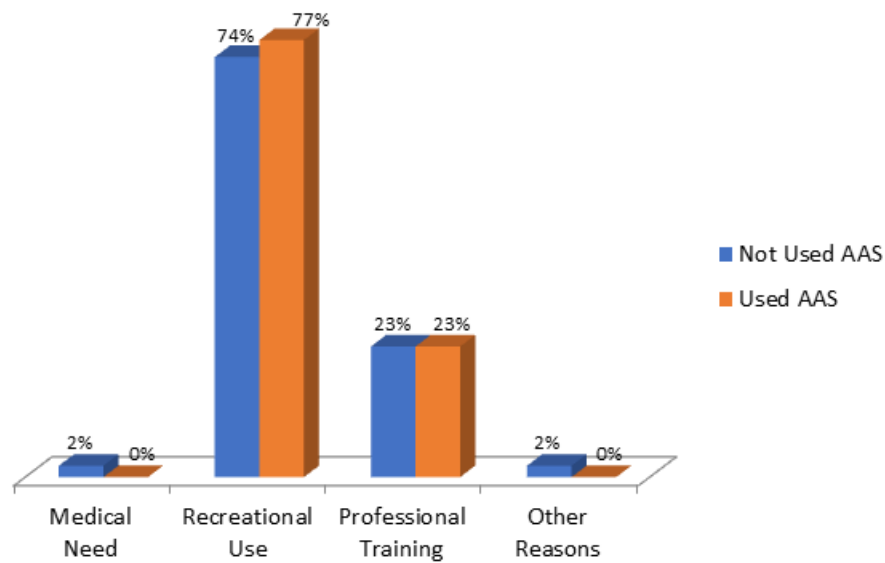


Figure 1. Reasons for participating in sports activities according to their use of AAS
Source: Field work.

Table 2. Binary logistic regression for AAS use.

Parameter	Exp(B)	Sig.	95% C.I. for EXP(B)	
			Lower	Upper
Sex				
Male				
Female	0.431	0.156	0.135	1.379
Sport				
Track and field event				
Courts sport	1.609	0.554	0.333	7.779
Board game	0.845	0.899	0.063	11.388
Wrestling	0.640	0.732	0.050	8.212
Rackets	0.000	0.999	0.000	.
Weightlifting	7.140	0.074	0.825	61.809
Age (years)				
17-24				
25-40	2.157	0.130	0.797	5.838
Constant	0.136	0.009		

Source: Field work

was found between attitude and the use of AAS ($\chi^2 = 0.44$; $p = 0.65$).

DISCUSSION

This study is another confirmation that athletes still use

AAS despite its confirmed negative effects on the human body systems. Previous studies in low- and middle-income countries have reported the use of athletes enhancing drugs such as nandrolone, oxandrolone, oxymetholone, stanozolol, and trenbolone acetate (Tauchen et al., 2021), for improving appearance (Bonnecaze et al., 2020), muscle building (Aldarweesh

Table 3. Source of AAS.

Parameter	Used AAS		χ^2 (P)
	No	Yes	
Coach			
No	131(100)	23 (88.5)	15.4 (0.0001)
Yes	0(0)	3(11.5)	
Health Professionals			
No	131(100)	25(96.2)	5.07 (0.02)
Yes	0(0)	1(3.8)	
Friend			
No	131 (100)	14(53.8)	65.5 (0.0001)
Yes	0(00)	12 (46.2)	
Family			
No	131 (100)	22 (84.6)	20.7 (0001)
Yes	0(0)	4(15.4)	
Fitness store			
No	131 (100)	12 (46.2)	20.7 (0001)
Yes	0(0)	14 (53.8)	
Pharmacy			
No	131 (100)	21 (80.8)	26.0(0.001)
Yes	0(0)	5(19.2)	
Online stores			
No	131 (100)	12 (91.1)	77.4(0.0001)
Yes	0(0)	14 (53.8)	

Source: Field work.

and Alhajjaj, 2020; Halabchi et al., 2021) and weight lifting (Alharbi et al., 2019; Bahri et al., 2017). In the current study, more male athletes reported the use of AAS than females which is in consonance with the findings of Dandoy and Gereige (2012) and (Hearne et al., 2021). Over the years, male athletes have been implicated in the use of AAS and this has continued among adult and adolescent males (Hearne et al., 2021; Pereira et al., 2019). The characteristics of the athletes in this study showed that youths of ages 17-24 years who were mostly undergraduates and single were users of AAS. Although the study of Bahri et al. (2017) showed that those who used AAS were majorly within the age of 30 and 34 years, had higher education, and are body builders. Similarly, ages between 26 and 35 years and are married were reported to use AAS by Aldarweesh and Alhajjaj (2020). Studies have also found high school students as users of AAS both in the Middle East, North America and Nigeria (Afolayan, 2012; Sagoe, 2015). The age difference in the AAS users in this study and that of

the previous studies can be attributed to study setting difference.

Of the study participants, majority of those who used AAS were in courts sports and this was also documented by Denham (2019). Although, it is not clear why most of the athletes in courts sports used AAS, while other studies reported weightlifters (Iraki et al., 2019), and footballers (Halliburton and Fritz, 2018). However, with the few numbers of weightlifters that reported use of AAS in this study, our regression statistics still showed that weightlifters will use it more than any other athletes in other sports. The findings of Alharbi et al. (2019) and Bahri et al. (2017) have also documented that weightlifters use performance enhancing drugs more than other athletes. Although, in the school environment, it is expected that more students will get involved in courts sports compared to other types of sporting activities which might explain why there were few weightlifters in the study.

Furthermore, it was noted in the study that no athlete

Table 4. Other substances used by the athletes.

Substances	Used AAS		χ^2 (p)
	No	Yes	
	f(%)	f(%)	
Morphine			
No	128 (98)	23 (89)	5.05 (0.03)
Yes	3 (2)	3(12)	
Amphetamine			
No	128 (98)	25 (96)	0.21 (0.65)
Yes	3 (2)	1 (4)	
Heroin			
No	130 (99)	24 (92)	5.56 (0.02)
Yes	1 (1)	2 (8)	
Ephedrine			
No	131 (100)	22 (85)	20.7(0.0001)
Yes	00	4 (15)	
Cocaine			
No	129 (99)	26 (100)	0.40 (0.53)
Yes	2 (2)	0 (0)	
Cannabis			
No	131 (100)	24 (92)	10.2(0.001)
Yes	0 (0)	2 (8)	
Codeine			
No	108 (82)	22 (85)	0.07(0.79)
Yes	23 (18)	4 (15)	
Tramadol			
No	126 (96)	25 (96)	0.000(0.99)
Yes	5 (4)	1 (4)	
Pethidine			
No	129 (99)	23 (89)	7.05 (0.008)
Yes	2 (2)	3 (12)	
Methadone			
No	131 (100)	25 (96)	5.07(0.02)
Yes	0 (0)	1 (4)	
Alcohol			
No	111 (85)	19 (73)	2.07(0.15)
Yes	20 (15)	7 (27)	
Tobacco			
No	128 (98)	25 (96)	0.21(0.65)
Yes	3 (2)	1 (4)	
Kolanut			
No	119 (92)	25 (96)	0.65(0.42)
Yes	11 (9)	1 (4)	
Coffee			
No	101 (77)	22 (85)	0.72 (0.40)
Yes	30 (23)	4 (15)	

Table 4. Contd.

Marijuana			
No	119 (91)	17 (65)	12.13 (0.0001)
Yes	12 (9)	9 (35)	
Barbiturate			
No	129 (99)	26 (100)	0.40 (0.53)
Yes	2 (2)	0 (0)	
Cigarette			
No	127 (97)	26 (100)	0.82 (0.37)
Yes	4 (3)	0 (0)	
Fortwin			
No	129 (99)	23 (89)	7.05 (0.008)
Yes	2 (2)	3 (16)	
Supplementary vitamins			
No	89 (68)	10 (39)	8.09 (0.004)
Yes	42 (32)	16 (62)	
Special Diets			
No	101 (77)	4 (15)	37.30 (0.0001)
Yes	30 (23)	22 (85)	

Source: Field work.

from the Faculty of Health Sciences used AAS. This is expected because such students would have understood the health effects of the drugs due to their professional training compared to other students. The poor knowledge of health effects of AAS as reported by majority of the athletes can be linked to students in non-health related programmes, although, many of them had positive attitude towards the use of AAS. Paying attention to students athletes from other non-health related programmes is essential for effective reduction of AAS use in the school environment. Therefore, educational intervention among these groups of students on health implications of AAS is paramount in reducing the incidence of AAS. This educational intervention can be part of orientation programmes for fresh students by health care professionals such as the Public Health Nurse or as a component of specially designed courses for student athletes. In this study setting, attention should also be paid more on male undergraduates when carrying out the intervention and athletes in health related programme can be used as facilitators among their peer athletes.

The use of AAS has been associated with muscle building for professional performance but the findings from this study revealed that 77% of those who used AAS were involved in athletic performances for recreational purposes. It is not clear why non-professional athletes will

decide to use AAS bearing in mind the negative effects of the drugs such as organ damage and other gender and age specific problems (Albano et al., 2021). In addition, AAS is also not a recommended drug for professional athletes. It is therefore essential to intensify awareness programmes among student athletes on the negative implications of ASS use for any reason whatsoever without medical prescription.

In many nations of the world, AAS is a prohibited drug which requires prescription by qualified medical practitioners; hence, they are not drugs that are assessed over the counter. A higher proportion of the athletes in this study obtained the AAS from fitness and online stores, while sizeable number got the drugs from their friends. The study of Aldarweesh and Alhajjaj (2020) discovered that athletes received their AAS through their coaches, online stores, family, friends, unscrupulous Pharmacists and Doctors. However, Althobiti et al. (2018) and Alharbi et al. (2019) reported athletes got the drugs from their friends. A cause for concern is how these drugs get to end-users without prescription, more so that fitness stores are not licensed to sell such drugs. In Nigeria, the government still needs to put strict measures in place to prevent indiscriminate use of AAS by athletes by blocking their sources of purchase or acquisition.

Aside from the use of AAS by the athletes, other injurious substances such as marijuana, alcohol, codeine,

ephedrine, and fortwin were reported to be used by those that either use or do not use AAS. This study has been able to show that those who do not use AAS also use other substances and this was also discovered in the studies of Alharbi et al. (2019) and Bonnecaze et al. (2020) that athletes use performance enhancing drugs, pain killers, stimulants and other drugs to enhance performance. These substances are as dangerous as AAS as they have been found to alter consciousness, cause organ damage, brain damage and even death (Creagh et al., 2018). As a result of the rigorous exercise the athletes are involved in, the consumption of supplementary vitamins and special diets are in line with the nutritional recommendations for athletes. Previous studies have also confirmed the consumption of special diets and vitamins by athletes (Aldarweesh and Alhajjaj, 2020; Aldarweesh and Alhajjaj, 2020; Althobiti et al., 2018). The use of special diets and vitamins is safer compared to the use of AAS and this should be highly encouraged among the athletes. Therefore, prevention programmes on the use of athlete's performance enhancing drugs should lay more emphasis on the importance of diets and vitamins in athletic activities and avoidance of other narcotics as well as AAS.

Conclusion

The use of AAS is common among university student athletes who were mostly males, undergraduates, those in courts sports and in the Faculty of Arts. Athletic activities were mainly for recreational purposes and the sources of AAS were mostly from friends, online and fitness stores. Those who did not use AAS used other athletic enhancing drugs.

Limitation of the study

There was no assessment of the specific AAS drugs used by the students and the study was only conducted in a university in Southwest Nigeria hence, cannot be generalized to the entire student athletes in Nigeria. The self-reported responses in this study may be biased due to the sensitivity of the topic.

Implication for public health professionals

Public Health Professionals have significant responsibilities in reducing the use of AAS and other dangerous substances among athletes in the school environment most especially universities. They can participate in the orientation programme for fresh students or give one-on-one education when in contact with the students at the school health centre. They can also organize special awareness programmes for student athletes on the dangers of AAS and other substances for

athletic performances. They should also pay specific attention to male athletes, undergraduates, those in non-health related programmes and those in court sports activities.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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