



## Knowledge, Attitudes, and Practices Regarding Antibiotic Use and Resistance: A Cross-Sectional Study among University Students in Ekiti State, Nigeria

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### Abstract

Antibiotic resistance in clinical and community settings has attained a crisis level with serious implications for individual and public health. More concerning is the use of antibiotics in community or extra-clinical settings, with increasing reports of abuse and indiscriminate use of antibiotics, particularly among adolescents and university students. This carries an attendant risk of toxicity and emergence of antibiotic resistance. The aim of this present study was to assess the level of knowledge about antibiotics and antibiotic resistance (AR), attitude towards antibiotics and antibiotic use practice among students of the Federal University Oye Ekiti, using a self-administered questionnaire.

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The questionnaire was designed, as established in the relevant literature and tested for reliability using the alpha Cronbach test. It was reproduced and subsequently administered to 400 student volunteers selected at random. The age of the sampled respondents ranged from 17 to 29 years, with an average age of 21.3 years. The results obtained showed that the respondents demonstrated fair knowledge about antibiotics and those antibiotics may have side effects. However, the respondents demonstrated poor knowledge and awareness about antibiotic resistance, with 68/400 students claimed that antibiotic resistance is not a global problem and 115/400 students claiming that they are not aware that antibiotic resistance is a problem. The Chi square test revealed no significant difference between the different parameters measured and the different faculties of students within the university. Many of the respondents demonstrated a poor practice of self-medication, which is a major factor in the abuse of

antibiotics. In conclusion, this study calls for proper vigilance in the use of antibiotics and the enhancement of proper antibiotic stewardship programmes in order to forestall this negative development and promote public health.

**Keywords:** KAP; antibiotics; resistance, students; antimicrobial stewardship.

## Introduction

Antibiotics have historically formed the basis for the control of infectious diseases caused by bacteria in community settings (Bebbel *et al.*, 2014, Shatla *et al.*, 2022). They are also the current regimens used to treat and prevent bacterial infections in core clinical settings globally (Lee *et al.*, 2021). The overuse of these antibiotics in core clinical settings has increased the prevalence of bacteria that show resistance to antibiotics, with their attendant complications and implications for public health (Shallcross and Davies, 2014). Antibiotic-resistant bacteria cause diverse infections that show reduced susceptibility to antibiotics; and such infections are difficult to treat, leading to treatment complications, prolonged hospital stays, an increased risk of secondary infections, the use of additional drugs and overall increase in the cost of healthcare (Ventola, 2015; Dadgostar, 2019).

Equally important to note is the use of antibiotics in community or extra-clinical settings (Manyi-Loh *et al.*, 2018). There is documented evidence of the use of antibiotics in community settings without due recourse to standard clinical practices for the prescription of antibiotics. This has increased overall consumption of antibiotics and associated emergence of antibiotic-resistant bacteria (Fair and Tor, 2014). However, there is relatively scanty knowledge regarding the exact contribution of abuse or indiscriminate use of antibiotics in the community setting to the overall increase in antibiotic-resistant bacteria and

infections. The abuse of antibiotics is a matter of serious concern among students and different strata of the population in developing countries (Do *et al.*, 2021). This has been attributed to lower literacy levels and poor regulatory and surveillance systems for tracking and use of antibiotics among the population including adolescents and students of various age grades which have all contributed to the overall problem of antibiotic resistance (Chen *et al.*, 2021; Mallah *et al.*, 2022). The most important risk factor for indiscriminate use of antibiotics is the low level of knowledge about antibiotics and poor attitudes towards antibiotics among different segments of the population, including young adults and students of university age (Mate *et al.*, 2019).

This survey is aimed at presenting a view of the awareness level of students about antibiotic resistance among student volunteers at Federal University, Oye-Ekiti, Ekiti State, Nigeria. This will allow the proper evaluation of the knowledge gaps about antibiotics and AR among selected students, determine the common attitudes students have towards antibiotics and assess the common practices viewed within the framework of antibiotic use among the students of FUYOYE. The specific objectives of this study are to examine the present level of awareness of antibiotics and their indiscriminate use among students in FUYOYE. It also seeks to determine typical practices of antibiotic use among students in FUYOYE, which can indirectly be used to assess the risk of the emergence of antibiotic resistance.

## Methodology

This is a descriptive survey carried out with a self-designed standard questionnaire, strictly for students in FUYOYE, Ekiti State, Nigeria. Data were collected from 400 students who were selected randomly. The following parameters were taken into consideration in the design of the

questionnaire: age, sex, disciplines, prescription and type of antibiotics used. The first part (I) captured the demographic information of the students, which included age, gender and course of study. The questions in the second part (II) assessed the students' knowledge about antibiotics, antibiotic resistance and usage. The students' knowledge was assessed using a set of true and false questions. The third part (III) addressed questions related to more in-depth knowledge of antimicrobials. This was done by using a 5-point Likert scale, ranging from "strongly agree" to "strongly disagree". The fourth part (IV) addressed their self-reported practices regarding antibiotic usage. This was also done using a Likert scale, which ranged from "always" to "never". All participants gave their consent before they were allowed to participate in this study.

### Reliability Test

The reliability test was evaluated using the Cronbach's alpha test. The four-factor structure of questions for Knowledge about Infectious Diseases (KID), Knowledge about Antibiotics and Antibiotic Use (KAAU), Attitude towards Antibiotic Use (ATA) and Assessment of Practice on Antibiotic Use (APAU) was confirmed in their analysis. The researchers found a satisfactory Cronbach's alpha value of at least 0.7 for each of the indicators (knowledge of antibiotics, resistance and usage, as well as the practice of self-medication). Hence, the research instrument is reliable enough for the population of this study (Panagakou *et al.*, 2009; Goni *et al.*, 2020).

### Statistical Analysis

The collected data were subject to two levels of analysis. The first analysis was descriptive, using frequency and percentage distribution. The second level of analysis was inferential statistics

to establish the hypothesis using the chi-square test. IBM-SPSS version 22 was used for data analysis and Microsoft Excel 2016 software was used for the charts and graphs. The hypothesis of an association between the demographic characteristics of the respondents and the effects of indiscriminate use of antibiotics was tested using the chi square test.

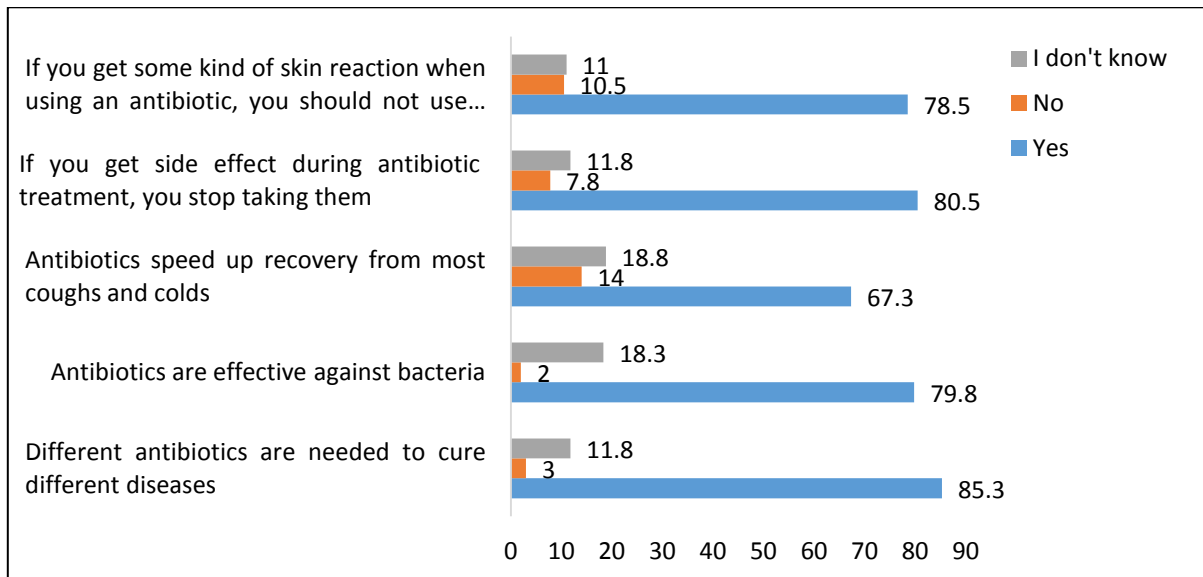
### Results

The demographic distribution of the sampled students showed that 51% were males, while the females took the remaining 49% (Table 1). The majority of the students were old and returning, especially second-year students, who took 43.3% of the sample size. Twenty-seven percent were from social sciences, 22.0% from education and management sciences took 16% of the total sampled students while the least number of students (5.5%) were selected from the faculty of agriculture. The age of the sampled respondents ranged from 17 to 29 years, with an average age of 21.3 years. The demographic features of the students are contained in Table 1.

The results in Figure 1 showed the level of awareness that side effects of antibiotics can emerge during use. More than 85% (341/400) of the students reported being aware that various antibiotics are required to treat various ailments; 79.8% (319/400) of them reported that antibiotics are effective against bacteria; and 67.3% (269/400) disclosed that most coughs and colds heal more quickly with antibiotics. Three hundred and twenty-two respondents (80.5%) claimed that they must stop antibiotic intake the moment side effects emerge during antibiotic treatment. It was found that 78.5% (314/400) of the students were of the opinion that they shouldn't use the same antibiotic again if they get a skin reaction after taking it.

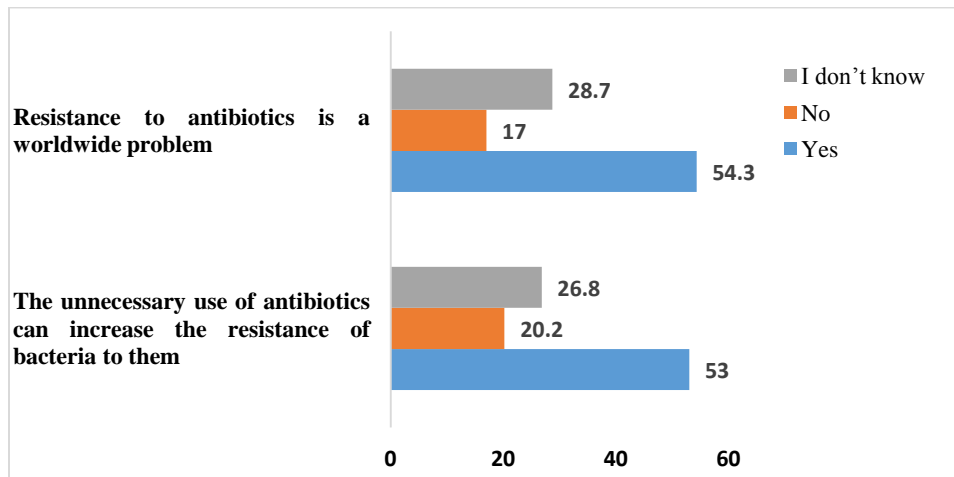
**Table 1:** Background demographic characteristics of sampled students

Background Characteristics	Frequency	Percentage
<b>Gender</b>		
Male	204	51.0
Female	196	49.0
<b>Year of Study</b>		
Year 1	88	22.0
Year 2	173	43.3
Year 3	71	17.8
Year 4	68	17.0
<b>Faculties</b>		
Agriculture	22	5.5
Art	24	6.0
Education	88	22.0
Engineering	63	15.8
Management	30	7.5
Science	64	16.0
Social Science	109	27.3
<b>Total</b>	<b>400</b>	<b>100.0</b>
<b>Age</b>		
N=400	Mean	Standard Deviation
	21.37	2.29

**Figure 1:** Knowledge of students on antibiotics and possible side effects

The other part of the questionnaire was to evaluate the knowledge of the participants about antibiotic resistance. Figure 2 shows that only 53% of the students are aware that unnecessary use and overuse of antibiotics can increase the resistance of bacteria to the antibiotics with 47%

answering with a negative response, while only 54.3% of the respondents believe that antibiotic resistance is a worldwide problem and 17.0% believe that antibiotic resistance is not a global problem.



**Figure 2:** Knowledge of antibiotic resistance

The assessment of practice on antibiotic use (APAU) is shown in Figure 3. About 76.8% of the students indicated that they always finish the course of treatment with antibiotics, even when they feel better. In contrast, 55.3% of the respondents reported they sometimes stop taking their drugs if they feel better after a few days, whereas 32.1% disagreed and 11.8% were neutral. More than 80% of the sample respondents agreed that they preferred to keep antibiotics at home in case they may need them in the future. About 70% of the respondents disagreed with the opinion that it is good to get antibiotics from relatives or friends without consulting a qualified medical doctor. Sixty-three of the respondents agreed that they preferred to buy antibiotics without a prescription at the pharmacy. More than 48% of the sampled respondents reported that if they have a cough for longer than a week, they prefer to use an

antibiotic. Conclusively, most sampled respondents agreed that when they have a sore throat, they prefer to use antibiotics; 44% of them agreed, 30% disagreed and about 25% were undecided.

Figure 4 shows the second part of the assessment of practice on antibiotic use (APAU). It showed that 62% of the sample respondents have had a prescription for any antibiotics within the last one year. It was also found that 44.5% of the total respondents have taken antibiotic within the last one year without a doctor's prescription.

### Statistical analysis

The percentage distribution of selected students' demographic characteristics and indiscriminate use of antibiotics showed that indiscriminate use of drugs is common among female (48%) compared to the proportion of males (41.2%) who have taken antibiotics indiscriminately, with

chi-square test statistics ( $X^2$ ) =11.86,  $p<0.05$ ) (Table 2) .This implies that there is a significant association between the sex of respondents and the indiscriminate use of antibiotics. Furthermore, the result shows that indiscriminate use of drugs is common among older students compared to first-year students. It was found that

more than 52% of 400 level students engaged in indiscriminate use of antibiotic drugs, 47% of sampled 300 level students also practised self-medication compared to the proportion of 100 level students, which were 34.1% who were involved in indiscriminate use, with chi-square test statistics ( $X^2$ ) =6.17,  $p<0.05$ .

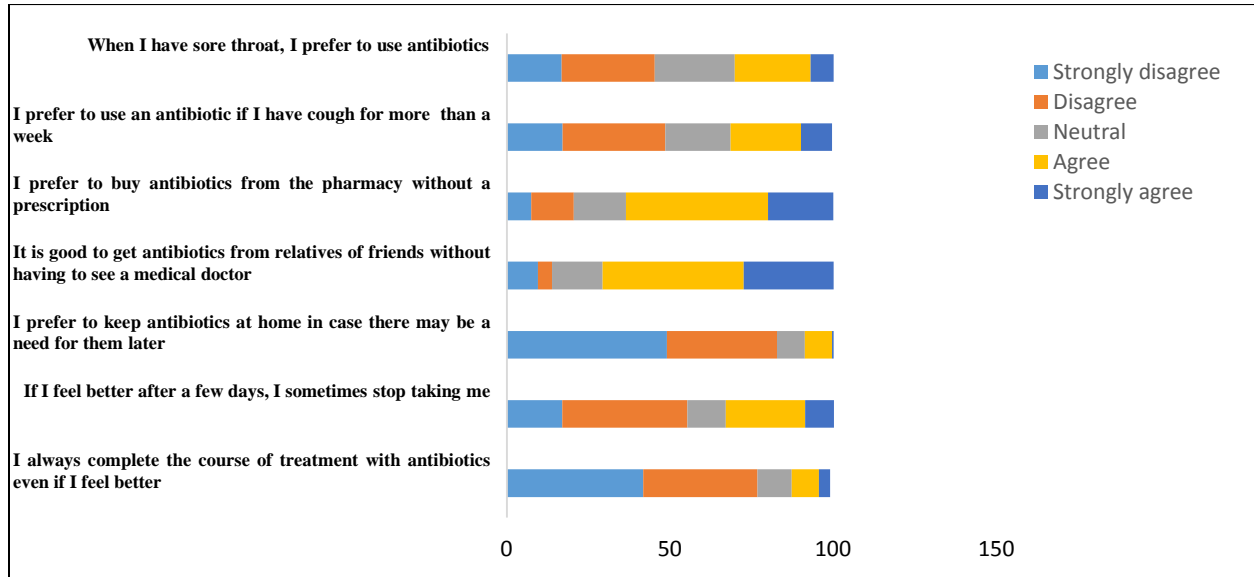


Figure 3: Assessment of Practice on Antibiotic Use (APAU)

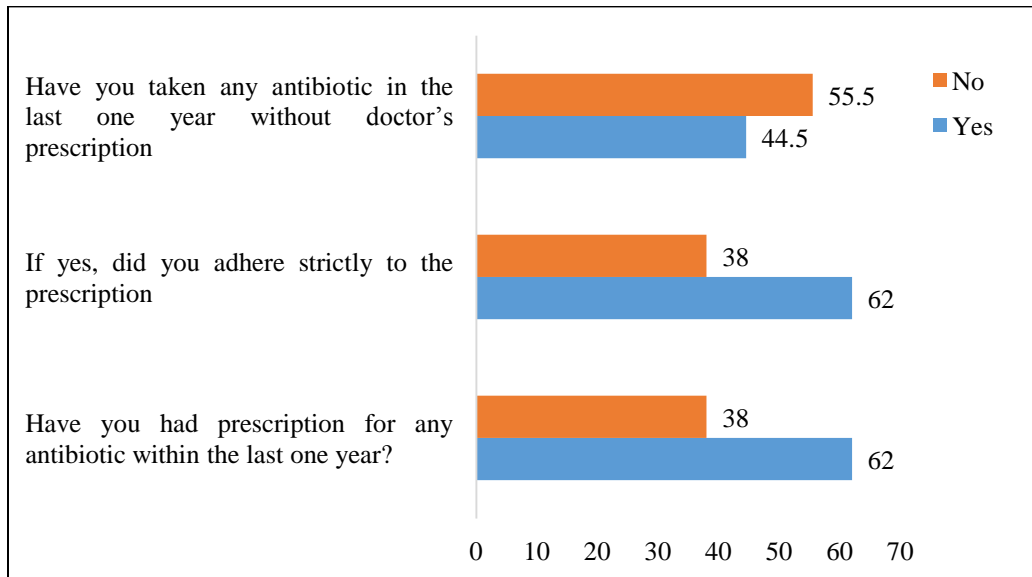


Figure 4: Assessment of Practice on Antibiotic Use (APAU) in % (n=400)

This implies that there is a significant association between the level of students at the university and duration of time spent on campus and the practice of indiscriminate antibiotic use. In the same vein, the faculty of study was associated with indiscriminate antibiotic use, as the majority of those that were involved were from the Faculty of Social Sciences (55%), followed by the Faculty of Agriculture (50%), Faculty of Education (45%), while we had the proportion reduced to 37.5% among the students in the Faculty of Arts and 35.5% among those from the Faculty of Science with chi-square test statistics ( $X^2$ ) =9.46,  $p < 0.05$ . Therefore, there is a statistical reason to reject the null ( $H_0$ ) hypothesis and conclude that the sex of students, the level of faculty and the courses of study are associated with the indiscriminate use of antibiotics. It was also observed that seventy-two of the students prefer to purchase antibiotics from pharmacy shops without a prescription, while 196 students confirmed that they take antibiotics whenever they have bouts of coughs. These findings are an indication of poor use and abuse of antibiotics among the participants. Self-medication is described as the use of medications to address disorders or symptoms that one has independently diagnosed or as the irregular or continuous use of a prescription medication for persistent or recurrent illnesses or symptoms.

### Correlation analysis

Correlation analysis (Table 3) was carried out to show the relationships among the variables in the study for the evaluation of the effect of independent variables on the dependent variable. A positive correlation study demonstrates that raising one variable causes the other to rise as well, and vice versa. The Pearson product-moment correlation coefficient used in this study examined the relationship between the dependent and independent variables at 0.05 levels of

significance. Table 7 below shows the Pearson correlation coefficients between awareness, attitude and practice of indiscriminate use of antibiotics. In contrast with the first hypothesis ( $H_1$ ), the Pearson correlation indicates that there is a weak positive correlation between the attitude of students towards the indiscriminate use of antibiotics and practice of self-medication ( $r = 0.362$ ,  $n = 400$ ,  $p = 0.000$ ). The Pearson correlation coefficient for awareness of the effect of indiscriminate use of antibiotics was found to be negatively correlated to the practice of self-medication ( $r = -0.090$ ,  $n = 400$ ,  $p = 0.036$ ).

### Discussion

This study was carried out to identify the knowledge, attitude and practices of the undergraduates at the FUOYE, Ekiti State, Nigeria, towards antibiotics and antibiotic resistance. Such studies are important to understand the underlying risks of antibiotic resistance and to guide policies for proper management of antibiotics to stop the emergence and spread of germs that are resistant to antibiotics in the general population. The first major observation in this study was that the majority of the students (86%) were aware that antibiotics do have side effects; hence they should not be consumed indiscriminately. A study carried out by Marzan *et al.* (2021) reported that a fair number of university students showed good knowledge about antibiotics and their proper uses. Previous studies have also reported a high proportion of participants with good knowledge or awareness that antibiotics have side effects (Tiong and Chua, 2020). A cross-sectional study carried out among Norwegian pharmacy consumers reported that a high percentage of the consumers are aware of the side effects of antibiotics, including antibiotic resistance (Waaseth *et al.*, 2019).

**Table 2:** Association between indiscriminate uses of antibiotic and demographic characteristics of students in FUOYE

	<b>Have you taken any antibiotic in the last one year without Doctor's prescription</b>		<b>Chi-Square (<math>\chi^2</math>)</b>
	yes	No	
<b>Sex</b>			$X^2=11.86, p=0.017$
Male	84	120	
	41.20%	58.80%	
Female	94	102	
	48.00%	52.00%	
Total	178	222	
	44.50%	55.50%	
<b>Levels in the University</b>			$X^2=6.176, p=0.031$
100	30	58	
	34.10%	65.90%	
200	78	95	
	45.10%	54.90%	
300	34	37	
	47.90%	52.10%	
400	36	32	
	52.90%	47.10%	
Total	178	222	
	44.50%	55.50%	
<b>**Faculties in the University</b>			$X^2=9.46, p=0.014$
<b>Agriculture</b>	11	11	
	50.00%	50.00%	
Art	9	15	
	37.50%	62.50%	
Education	40	48	
	45.50%	54.50%	
Engineering	23	40	
	36.50%	63.50%	
Management	12	18	
	40.00%	60.00%	
Science	23	41	
	35.90%	64.10%	
Social Science	60	49	
	55.00%	45.00%	
	178	222	
	44.50%	55.50%	



**Table 3:** Correlation between awareness, attitude and practice of indiscriminate use of antibiotics

		Practice	Awareness	Attitude
<b>Pearson Correlation</b>	Practice	1.000	-.090	.362
	Awareness	-.090	1.000	.061
	attitude	.362	.061	1.000
<b>Sig. (1-tailed)</b>	Practice		.036	.000
	Awareness	.036		.113
	Attitude	.000	.113	

The results obtained agreed with a similar cross-sectional study carried out in Indonesia, showed that fewer than half of the respondents thought that antibiotics have no side effects (Widayati *et al.*, 2012), which is definitely at variance with what was obtained in this present study. Generally, a broad awareness of antibiotics and their side effects has been attributed to an increased level of education and literacy within a given population.

It was also observed in this study that the students sampled demonstrated an appreciable level of awareness about antibiotics and their uses. A higher percentage of the students claimed that they are aware that antibiotics are needed to cure infections. About 80% claimed to be aware that antibiotics are effective only against bacteria. A closer observation from previous studies showed that there are variations in responses to the different parameters assessed. In a study carried out in India among school students and teachers, there was a low level of awareness about antibiotics (Kotwani *et al.*, 2016). A similar study carried out among university students in Lebanon reported that students in medically related courses showed higher knowledge or awareness of antibiotics in comparison with students who are enrolled in non-medical-related courses (Sakr *et al.*, 2020). It should be noted that the enrollees in this study are mainly from non-medical fields, as there were no medical courses the time this study commenced.

The high percentage of the students who reported that antibiotics can be taken to cure colds and coughs further illustrates possible variations in responses to specific questions asked to assess their knowledge about antibiotics and how they can be used. Coughs and common colds could be regarded as symptoms of other diseases based on expert medical examinations. They can even be attributed to viral aetiologies. Some studies have indicated that many students mistakenly attribute antibiotics with viral diseases (Dopelt *et al.*, 2023). When compared with other studies, 80% of respondents in a study carried out in Iraq claimed that antibiotics can be used to tackle common colds and coughs (Dopelt *et al.*, 2023). Similarly, 75% and 88% of studies carried out in Kuwait and Malaysia made the same claim about antibiotics (Andre *et al.*, 2010; Huang *et al.*, 2013). This gross misconception about antibiotics could increase the chance of indiscriminate use of antibiotics, with attendant risks in the form of antibiotic resistance, increased side effects of antibiotics an overall increase in the cost of healthcare.

Regarding the assessment of practice on antibiotic use (APUA) (Figure 3), only 167 students strongly agreed that they always complete the dosage and duration of their antibiotic treatment even while they feel better, while about 86 students strongly agreed that they stop their antibiotic intake after feeling better. This serves as a prelude to increased use of

antibiotics and prolonged treatment. It can be inferred that the students demonstrated poor practice in antibiotic use. The finding obtained in this present study agrees with previous reports regarding poor practices in how students and general populations use antibiotics. A recent study compared the practice of antibiotic use among medical and non-medical students and revealed that medical students had better practices in antibiotic use compared to non-medical students (Jairoun *et al.*, 2018). According to a similar study carried out in a medical school in Nigeria, only 56% of all the respondents sampled had a positive antibiotic practice among the students (Okedo-Alex, 2020).

In this present study, 82 students stated that they prefer to purchase antibiotics from pharmacy stores without a prescription, while 196 students stated that they always take antibiotics when they have coughs without a prescription. Similar studies have reported that the use of antibiotics without prescriptions is a common unhealthy practice among students and adolescents (Jorgji *et al.*, 2014). In a study carried out among medical students in Sudan, it was confirmed that self-medication with antibiotics was common and is associated with gender and year of study (Elmahi *et al.*, 2022). This conforms to the present finding that indiscriminate use of antibiotics is more prevalent among female students than male students. It was also confirmed that students in the higher year of study take indiscriminate use of antibiotics in comparison with the first-year students. This observed phenomenon portrays poor antimicrobial stewardship among the students, with an increased risk of antibiotic resistance among the students and the population of the students.

Another important observation in this study is that 196 students confirmed that they do keep antibiotics at home for further or future use. Furthermore, 135 students reported that they agreed to keep antibiotics at home. It has been observed that keeping antibiotics at home is one of the most common unhealthy practices regarding use of antibiotics. A study carried out among Chinese students confirmed that keeping of antibiotics at home promotes and contributes to self-medication among university students (Wang *et al.*, 2018). The unhealthy storage of antibiotics is also a big problem among households in rural and poorly developed areas (Khan *et al.*, 2022). Self-medication has been reported as the most dangerous antibiotic use practice. Xu *et al.* (2020) confirmed that parental self-medication contributes significantly to the overuse of antibiotics among children and students.

In conclusion, while the respondents sampled in this study demonstrated fair awareness about antibiotics and antibiotic resistance, the majority of the respondents demonstrated poor practices in the use and consumption of antibiotics. This is evident in the fact that many of the respondents keep antibiotics at home for future use. Many of the students also relax their antibiotic intake when they start feeling better. A sizeable number of the respondents reported that they take antibiotics for mere coughs and some of them have developed the practice of taking antibiotics without a proper prescription, which is a prelude to drug abuse. This poor habit demonstrated by the students towards antibiotics demonstrates a lack of proper antimicrobial stewardship and is inimical to the overall public health of the population. This study also sheds light on possible drug abuse among university students, going by the number of students that take antibiotics without prescription. A deliberate

public enlightenment is necessary to educate the students' population on the risks and dangers inherent in the indiscriminate consumption of antibiotics and related practices.

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