

Research Article

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Knowledge, Attitudes, and Practices Towards Antibiotic Use and Antimicrobial Resistance Among Pharmacy Students in Niger Delta University

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Abstract

The study to investigate the knowledge, attitudes, and practices (KAP) regarding Antibiotic use and antimicrobial resistance among pharmacy students in Niger Delta University aimed to investigate the common negative behavior regarding Antibiotic use and antimicrobial resistance among pharmacy students in Niger Delta University, and also, to ascertain the reasons accountable for the engagement of Antibiotic use and antimicrobial resistance among these students. A cross-sectional study was used and an online questionnaire was developed and distributed to pharmacy students in Niger Delta University. Knowledge, Attitude, and Practices (KAP) scores were calculated, with students categorized into low and high levels based on each score mean. The data obtained were presented using tables. Data were analyzed and interpreted based on frequency and percentage. From the Study, out of the 196 total respondents, 57.7 % (n=113) were female. Most respondents were between 21 and 25 years old (n=117, 59.7%). Based on the overall mean scores, it was found that most of the pharmacy students had good knowledge, and positive attitudes but suboptimal practices about antibiotic use (AMU) and antimicrobial resistance (AMR). From the results of the findings, it was concluded that undergraduate pharmacy students in Niger Delta University had good knowledge and a positive attitude, but suboptimal practices towards AMU and AMR. A low-average practice score is of great concern and requires urgent attention. There is a need to improve the details of the undergraduate pharmacy curriculum regarding antibiotic use (AMU), antimicrobial resistance (AMR), and antimicrobial stewardship programs.

Keywords: antibiotics; antibiotic use; antimicrobial resistance; antimicrobial stewardship; attitude; knowledge; pharmacy students; practices

Introduction

Antibiotics are the mainstay to management used variety of infections due to rise in preventing pathogenic microorganisms (Martin *et al.*, 2020). Antibiotic resistance (ABR) has emerged due to irrational use among patients (Carvalho, 2021). The global rise in healthcare costs has implication with high prevalence of ABR, (Founou *et al.*, 2017; Carvalho, 2021). In the United States (US), nearly 2 million people reported ABR per year, resulting to loss of 55 billion dollars (Hayat *et al.*, 2021). ABR is considered to be a type of drug resistance where some or all populations of a bacterial species survive after exposure to antibiotics (CDC, 2013). Also, inappropriate prescribing of antibiotics over the years results to ABR. This study is aimed to investigate the knowledge, attitudes, and practices (KAP) regarding Antibiotic use and antimicrobial resistance among pharmacy students in Niger Delta University.

Method

Research Design

A descriptive cross-sectional study was conducted among undergraduate pharmacy students at Niger Delta University (NDU) offering a degree program in pharmacy.

Study Area

The area of study is the Niger Delta University, Wilberforce Island, Amassoma, and Bayelsa State. Niger Delta University is located on an Island in Bayelsa state. It was founded in 2000.

Sample Size

The sample size was calculated using Yamane's formula (Yamane, 2017). The total population of undergraduate pharmacy students at NDU during the period of the study is 382.

Sample Technique

A simple random sampling method was used to select participants based on their class registers. Simple random sampling means every member of the population has an equal probability of being chosen (Stratton, 2021). Regarding the year of study, the survey enrolled 59 second-year, 50 third-year, 42 fourth-year, and 45-fifth-year students.

Instruments of Data Collection

Data was collected using a structured self-administered questionnaire adapted from a similar study (Mitwali, 2017). The questionnaire had four sections that were used to collect data on participants' socio-demographic characteristics, knowledge, attitude, and practices (KAP) towards AMU and AMR. The participants' responses on knowledge, attitude, and practice (KAP) questions were measured using a 5-point Likert-scale as follows; 5= 'strongly agree', 4= 'agree', 3= 'neutral', 2= 'disagree', and 1= 'strongly disagree'.

Determination of Likert scale total scores

Total scores in the Likert Scale were first calculated by multiplying the frequency of each response option by its corresponding Likert scale score.

Total scores = $\Sigma (f_i \times \text{Likert scale Score})$

Table 2: Analysis of Demographic Variables

Variable	Category	Frequency	Percentage (%)
Sex	Male	83	42.3%
	Female	113	57.7%
Age	15-20 years	62	31.6%
	21-25 years	117	59.7%
	26-30 years	16	8.2%
	31-40 years	2	1%
	>40	0	0%
Year of Study	Second	59	30.1%
	Third	50	25.5%
	Fourth	42	45%
	Fifth	45	23%
Marital Status	Single	191	97.5%
	Married	5	2.6%
Residence	Hostel	63	32.1%
	Off-campus	133	67.9%
Religion	Christianity	194	99%
	Islam	1	0.5%
	Others	1	0.5%

Table 2 above shows the analysis of Demographic Variables.

From Table 2 above, a total of 196 students participated in this study of which 113(57.7%) were

Where: f_i = frequency of each Likert scale score (number of respondents); i = Likert Scale Scores, namely SD (1), D (2), Neutral (3), A (4), SA (5); Determination of Likert scale mean scores; The mean score is calculated by dividing the total scores by the total number of respondents; Mean Score = $\Sigma (f_i \times \text{Likert Item Score}) \div \text{Number of Respondents}$.

Method of Analysis

The data here was analyzed using SPSS and the results were presented in the form of frequencies and percentages in tables

Results

This chapter deals with the presentation analysis and interpretation of data. The first part deals with the analysis of the research questions while the other aspect deals with the discussion of findings from the study.

Table 1: Questionnaire Distribution

Number of Questionnaires	Distributed
Frequency	196
Percentage %	100

From table 1 above it is shown that 196(100%) of the total questionnaire distributed were retrieved.

female. Descriptive analysis of the socio-demographic data (Table 1) showed that 62(31.6%) of the

respondents were between the ages of 15 - 20 years old, with the majority of the respondents comprising of 117(59.7%) were within the ages of 21-25, while 16(8.2%) were within the ages of 26 - 30 years old, 2(1%) of the respondents were within the ages of 31-40 and 0(0%) of none of the respondents were found to be within the age range of 40 years and above.

Furthermore, marital status data shows that 191(97.5%) out of the 198 respondents are single,

while the remaining 5(2.6) were married. In addition, 63(32.1%) of the respondents were residing in the hostel on campus, while the remaining 133(67.9%) were residing in houses off campus. Finally, religious affiliation leans heavily towards Christianity with 194(99%) of the respondents identifying as Christians, while a small percentage represents other religious affiliations.

Table 3: Shows the assessment of knowledge towards Antibiotic use and antimicrobial resistance (AMR) among pharmacy students in Niger Delta University.

Questions	Agree	Disagree	Neutral	Strongly Agree	Strongly Disagree	Total Score	Mean Score	Knowledge
Antibiotics are used to treat infections caused by bacteria.	156(79.6%)	-	-	40(20.4%)	-	824	4.20	Good
Antibiotics are effective against urinary tract infections.	152(77.6%)	4(2%)	7(3.6%)	33(16.8%)	-	802	4.09	Good
Antibiotics should be stopped after completion of the prescribed course.	166(59.2%)	1(0.5%)	5(2.6%)	74(37.8%)	-	851	4.34	Good
Antimicrobial resistance (AMR) occurs when bacteria stop responding to Antibiotic treatment.	139(70.9%)	1(0.5%)	2(1%)	54(27.6%)	1(0.5%)	835	4.26	Good
Infections caused by Antibiotic-resistant bacteria are impossible or difficult to treat.	140(71.4%)	26(13.3%)	13(6.6%)	11(5.6%)	8(4.1)	714	3.64	Good
Overall mean score							4.11	Good

Five questions were utilized to evaluate knowledge related to antibiotic use and antimicrobial resistance. Likert scale mean scoring: The range of interpreting the Likert scale mean score was given as follows: 1.0-2.4 (Poor knowledge), 2.5-3.4 (Neutral Knowledge), and 3.5-5.0 (Good knowledge).

The mean knowledge score was 4.11. This goes on to show that most of the respondents have a good knowledge of antibiotic use and antimicrobial resistance. From Table 4.3 above, 56(79.6%) strongly agreed with the statement that antibiotics are used to treat infections caused by bacteria, 152(77.6%) of the

total respondents agreed that antibiotics are effective against urinary tract infections, More than half of the respondents, 116(59.2%) reported that antibiotics should be stopped after completion of the prescribed course, More than half of the respondents, 139(70.9%) reported that antimicrobial resistance occurs when bacteria stop responding to antibiotic treatment,

Furthermore, 140(71.4%) of the total respondents reported that infections caused by antibiotic-resistant bacteria are difficult to treat.

Table 4: Shows the assessment of their attitudes regarding Antibiotic use and antimicrobial resistance among pharmacy students in Niger Delta University.

Questions	Agree	Disagree	Neutral	Strongly Agree	Strongly Disagree	Total score	Mean score	Attitude
AMR is a global public health problem.	143(73%)	2(1.0%)	8(4.1%)	43(21.9%)	-	815	4.16	Positive
Antibiotic resistance increases with increasing consumption of antibiotics.	141(71.9%)	5(2.6%)	9(4.6%)	39(19.9%)	3(1.5%)	799	4.08	Positive
The development of new antibiotics will solve the problem of AMR.	129(65.8%)	21(10.7%)	35(17.9%)	12(6.1%)	1(0.5%)	724	3.69	Positive
The inappropriate use of antibiotics in animal medicine may lead to antimicrobial resistance (AMR).	151(77%)	3(1.5%)	20(10.2%)	21(10.7%)	1(0.5%)	776	3.96	Positive
Patients must be advised to adhere to antibiotic treatment.	97(45.5%)	2(1%)	4(2%)	96(49%)	-	884	4.51	Positive
Overall mean score							4.08	Positive

1.0-2.4 (Negative attitude), 2.5-3.4(Neutral attitude), and 3.5-5.0(Positive attitude)

From Table 4 above, a significant majority of the respondents, 143(73%) agreed and 43(21.9%) strongly reported that antimicrobial resistance is a global public health problem. More than half 141(71.9%) of the participants agreed that antibiotic resistance increases with increasing consumption of

antibiotics, Furthermore, about 129(65.8%) of the total respondents agreed that the development of new antibiotics will solve the problem of antimicrobial resistance, about half 97(49.5%) of the respondents revealed that patients must be advised to adhere to antibiotic treatment.

Table 5: Shows the assessment of their practices towards Antibiotic use and antimicrobial resistance among pharmacy students in Niger Delta University.

Questions	Agree	Disagree	Neutral	Strongly Agree	Strongly Disagree	Total Score	Mean Score	Practice
I self-prescribe antibiotics whenever I feel sick	33(16.8%)	103(52.6%)	13(6.6%)	3(1.5%)	44(22.4%)	436	2.22	Poor
I take antibiotics when I have a cold or a fever.	15(7.7%)	126(64.3%)	12(6.1%)	3(1.5%)	41(20.9%)	404	2.06	Poor
I educate the public on Antibiotic use and antimicrobial resistance (AMR).	73(37.2%)	88(44.9%)	31(15.8%)	5(2.6%)	1(0.5%)	587	2.99	Neutral
I take part in Antibiotic awareness campaign.	51(26%)	93(47.4%)	41(20.9%)	8(4.1%)	3(1.5%)	556	2.84	Neutral
I discarded leftover antibiotics after recovering.	50(25.5%)	118(60.2%)	17(8.7%)	4(2%)	9(4.6%)	516	2.63	Neutral
Overall mean score							2.55	Neutral

1.0-2.4(Poor practice), 2.5-3.4(Neutral practice), and 3.5-5.0(Good practice).

Table 5 above shows the analysis of the response of the respondents on their Practice regarding Antibiotic use and antimicrobial resistance among pharmacy students at Niger Delta University.

More than half 103(52.6%) of the respondents disagreed that they self-prescribe antibiotics whenever they feel sick, 126(64.3%) of the respondents disagreed that they take antibiotics when they have a

cold or fever. Whereas, 88(44.9%) of the respondents disagreed that they educate the public on antibiotic use and antimicrobial resistance, while, 93(47.4%) if respondents disagreed that they take part in the antibiotic awareness campaign, and 118(60.2%) disagreed that they discarded leftover antibiotics after recovering.

Discussion

This study was conducted to evaluate the knowledge, attitude, and practices of undergraduate pharmacy students on antibiotic use and antimicrobial resistance in Niger Delta University. The study found that the students had good knowledge, positive attitudes, and suboptimal practices towards antibiotic use and antimicrobial resistance. Objective one: Common negative behavior regarding antibiotic use and antimicrobial resistance among pharmacy students in Niger Delta University.

This current study found that the overall practice of pharmacy students in Niger Delta University towards antibiotic use (AMU) and antimicrobial resistance (AMR) was suboptimal because of the mixed responses obtained when compared to their overall obtained knowledge and attitude scores. This shows that some students had poor practices regarding antibiotic use and antimicrobial resistance. In Nigeria, similar findings were reported in which students had good knowledge of AMU and AMR but suboptimal practices (Okedo-Alex *et al.*, 2019). Only 18.3% of the respondents reported that they used self-medication with antibiotics (SMA) when they felt sick while 74. % of the respondents reported that they don't self-prescribe antibiotics whenever they feel unwell. A few of the respondents (9.2%) take antibiotics when they experienced a cold or cough as this has been shown a common negative practice among a few pharmacy students in Niger Delta University. However, most of the respondents (85.2%) reported that they don't take antibiotics whenever they have a cold or a fever. These findings are in line with other studies similar studies among students (Fentensa *et al.*, 2021). Unfortunately, Self-medication with antibiotics (SMA) is a wrong practice and is among the major causes of AMR and has been reported in other studies (Owusu-ofori *et al.* 2017). More than half of the respondents (64.8%) in this study reported that they did not discard leftover antibiotics after completion of the antibiotic course. Extant literature has shown that keeping leftover antibiotics at home increases the chances of SMA among students (Wang *et al.*, 2018).

Having leftover antibiotics may imply that either the quantity purchased or the doses prescribed were more than the required dose. It could also be that the regimen was stopped without completing the prescribed doses. The act of keeping remaining antibiotics for future use is not safe and hence, should be discouraged. This is because the availability of the

leftover antibiotics will encourage the use of leftover antibiotics without consulting a doctor as has been seen in other studies (Scaioli *et al.*2015). Sharing of antibiotics with others who have similar symptoms of ill-health may also arise thus further promoting self-medication. A similar study done in Pakistan reported that about 88% of respondents kept leftover pills for future use. High rates of having leftover antibiotics at home have also been reported in other studies among medical students (Sawir *et al.*, 2009). There is, therefore, a need for pharmacists to dispense the exact quantity of drugs in a single course of antibiotics treatment rather than the whole drug pack. They should also counsel patients on the risks associated with an incomplete course of antibiotic therapy.

Some students never participated in antibiotic awareness week and never educated the public about AMU and AMR which shows a common negative practice among Pharmacy students in Niger Delta University as 89(45.4%) of the respondents reported to have never educated the public on antibiotic use and antimicrobial resistance.

Therefore, the self-medication with antibiotics reported in this study among a few Pharmacy students in Niger Delta University could be due to a lack of student participation in antimicrobial resistance awareness campaigns as almost half of the respondents 96(48.9%) reported to have never taken part in Antibiotic awareness campaigns as these activities are critical in raising awareness among students and the public (Wu *et al.*, 2021). Therefore, increasing antimicrobial stewardship (AMS) activities across the student population can improve their practices regarding antibiotic use and antimicrobial resistance (Akande-Chalabi *et al.*, 2021).

Objective two: Major reasons accountable for engagement of antibiotic use and antimicrobial resistance among pharmacy students in Niger Delta University. There was further evidence of good knowledge since most participants knew that antibiotics are used to treat infections caused by bacteria which is an accountable reason for engagement of antibiotic use among pharmacy students in Niger Delta University and this has similarly been demonstrated in students from other studies that answered this question correctly (Shah *et al.*, 2019). Furthermore, similar to other studies (Shahpawee *et al.*, 2019). The majority of the students knew that antibiotics are effective against urinary tract infections (UTIs) which implies another reason for the use of antibiotics among pharmacy students at

Niger Delta University as the majority of the respondents (94.4%) reported that antibiotics are effective against urinary tract infections.

Objective three: Level of knowledge related to antibiotic use and antimicrobial resistance among pharmacy students in Niger Delta University.

The findings of the current study indicated a good level of knowledge of antibiotic use and antimicrobial resistance among undergraduate pharmacy students in Niger Delta University (NDU) as majority of the respondents 156(79.6%) agreed and 40(20.4%) strongly agreed that antibiotics are used to treat infections caused by bacteria. These findings corroborate with the results of similar studies in Zambia, Trinidad and Tobago, and at 3 universities in East Africa where the students had good knowledge of antibiotics and AMR (Lubwama *et al.*, 2021). This could be because students are more exposed to these topics in their undergraduate courses such as pharmacology and microbiology. In fact, in another survey among university students about antibiotic resistance, it was revealed that university instructors were a source of information regarding antibiotic resistance (Ortega-parades *et al.*, 2022). The recently instituted World Antibiotic Awareness Week could also contribute to the good knowledge levels observed among the respondents (Wu *et al.*, 2021).

Additionally, the majority of the respondents (98.5%) were aware that antimicrobial resistance occurs when bacteria stop responding to antibiotic treatment. 78.5% of the respondents correctly answered the statement; those infections caused by antibiotic-resistant bacteria are impossible or difficult to treat which indicates a good level of knowledge related to antibiotic use and antimicrobial resistance. This awareness is similar to what was observed in undergraduate students in Ecuador and Brunei (Ortega-parades *et al.*, 2022). Evidence has shown that infections caused by antimicrobial-resistant pathogens are difficult or impossible to treat (Frier *et al.*, 2017). Therefore, pharmacy students being future pharmacists should join the promotion of rational use of antimicrobials. This study also found that most participants had positive attitudes towards antibiotic use and AMR. A large proportion (94.9%) of respondents in this current study knew that AMR is a global public health problem that has been worsened by increased consumption while the majority of the respondents (90.8%) were aware that antibiotic resistance increases with increasing consumption. 87.7% of the respondents knew that inappropriate

use of antibiotics in animals and humans may lead to antimicrobial resistance (Pokharel *et al.*, 2020). The study is consistent with what was found in a previous study among healthcare students in Rwanda who were aware of this global threat (Disable *et al.* 2020). An analysis of the global burden of AMR by Goossens and Lipsitch reported that the problem of AMR is high in countries with high consumption rates (Goossens *et al.*, 2022). Additionally, majority of the respondents (98.5%) reported that patients should be advised to follow antibiotic treatment. This attitude is good to have as the next dispensers, and pharmacotherapists will give the best practice advice to patients.

Also, the majority of the respondents (87.7%) demonstrated a good level of knowledge by answering the statement that antibiotics should only be stopped after completion of the prescribed course, similar to what was reported in another study (Chardavoyne *et al.*, 2020).

Conversely, most of the respondents (71.9%) felt that the development of new antibiotics might help to curb AMR. A study in Lebanon among university students had similar findings, with more healthcare students agreeing to this compared to non-healthcare students (Sakr *et al.*, 2020). Evidence has also shown that AMR has been worsened by a lack of development of new antibiotics, hence, a need for improved drug development to address this issue (Miethke *et al.*, 2021).

Conclusion

This study revealed that undergraduate pharmacy students had good knowledge, a positive attitude, and suboptimal practices regarding antibiotic use and resistance. Despite this, there were some inconsistencies in practices across students, which require improvement in the undergraduate pharmacy curriculum to focus on student practices regarding antimicrobial use (AMU), Antimicrobial resistance (AMR), and antimicrobial stewardship (AMS) programs.

Recommendations

- Given the prevalence of self-medication as reported, healthcare professionals and policy maker should discourage self-medication with antibiotics. Education about the danger of antibiotic and antimicrobial resistance should be encouraged. Training among pharmacists should be encouraged.

- Antibiotic guidelines should be issued by all healthcare professionals and policymakers.
- **Contribution to literature:** This study's findings have contributed to an existing body of knowledge on ways of improving knowledge, attitudes, and practices towards antibiotic use and antimicrobial resistance among Pharmacy students in Niger Delta University, as well as improving healthcare system efficiency in the study area.

Declarations

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Conflict of Interest

The researchers declare that there was no conflict of interest.

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