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ASSESSMENT OF ATTITUDE AND PERCEPTION OF BACHELOR IN PHARMACY STUDENTS TOWARDS THE RATIONAL USE OF ANTIBIOTICS

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ABSTRACT

Background: Antimicrobial agents are irreplaceable therapeutic assets; nevertheless, their wrong use promotes the development of antimicrobial resistance (AMR). Pharmacy students are seen as the future custodians of the pharmaceutical care form a critical aspect in the antimicrobial stewardship programs. This study determined the attitudes and perceptions of Bachelor of Pharmacy students at the College of Medicine and Allied Health Sciences (COMAHS), University of Sierra Leone, regarding the rational use of antibiotics. **Methods:** In April-October 2022, a descriptive cross-sectional was conducted, and the whole set of 152 undergraduate pharmacy students in all five academic years were included. The respondents were asked to complete a structured and self-administered questionnaire that assessed demographic variables, attitudes (13 items) and perceptions (15 items). Answers were measured and classified as either good, average or poor. The analysis of data was done with SPSS version 21. **Results:** The response rate was 100 percent. Most of them (67.8 % male and 46.1 % female) were of the 15 to 24 year age group (42.8 % of the sample), and first year students represented 42.8 % of the sample. Sixty-eight point four percent of the respondents indicated positive attitudes with 10.5 percent and 21.1 percent reporting average and poor attitudes respectively. Regarding perceptions, 75.7 percent proved to have good

understanding and 24.3 percent had poor perception. Whereas the level of AMR awareness was high (90.8%), a significant percentage (97.4% of participants) reported antibiotic misuse and a substantial (40.8 percent) number of participants thought that a sub-therapeutic dose can be beneficial. **Conclusion:** Students in pharmacy tended to demonstrate positive attitudes and perceptions towards rational use of antibiotics, although still some misconceptions were obvious. It is suggested that structured antimicrobial stewardship education should be incorporated in the undergraduate curriculum to support the future efforts of combating AMR.

KEYWORDS: Antimicrobial resistance, antibiotics; rational use; pharmacy students; Sierra Leone.

INTRODUCTION

Selman Waksman, a researcher at Rutgers University, is credited with inventing the term "antibiotic" and defining antibiotics as chemical compounds created by bacteria that can inhibit the development of other microorganisms and cause their eradication in diluted solution.[1] Antimicrobial resistance (AMR) is a complex global public health problem that affects both humans and animals, and it develops due to overuse, underuse, and abuse of antibiotics.[2] AMR has been responsible for 700,000 fatalities per year worldwide so far, with that number anticipated to rise to 10 million by 2050.[3] To keep antibiotics effective and continue to reap their health advantages, a balance must be struck between careful usage and increased access. The World Health Organization launched the global action plan (GAP) on antimicrobial resistance in 2014 with the goal of optimizing the use of antimicrobials, particularly antibiotics.[4] WHO has classified antibiotics into three categories: Access, Watch, and Reserve (AWaRe). Access category drugs should be available in all health care settings, while Watch category drugs have a higher risk of developing resistance, so their usage as first- and second-line treatments should be limited. Reserve category covers "last resort" antibiotics that should only be used in exceptional circumstances, such as multidrug-resistant bacterial infections that have failed to respond to other therapies.[3]

Increased knowledge of antibiotics and antibiotic stewardship programs are among the major efforts made by health sectors to tackling AMR. Pharmacists play key roles in tackling and minimizing AMR, and education and sufficient training might change how physicians, nurses, and customers behave. If pharmacists in developing nations lack the required knowledge and training, their professional practices might degrade, leading to the provision

and recommendation of antibiotics in the wrong situations. Microbes are becoming resistant to available antimicrobial agents, making it one of the major global public health issues.[4] Pharmacy students play a crucial role in combating AMR, and understanding their attitudes and perceptions about antibiotics is essential for future drug experts. This study was carried out among bachelor of pharmacy students at the COMAHS-USL teaching facility to fill a vacuum in Sierra Leone's current understanding of the rational use of antibiotics. The World Health Organization emphasizes the necessity for undergraduate medical students to have adequate training and background knowledge on emerging resistance and rational use of antibiotics[5] as it greatly impacts their views and behaviors once they are qualified practitioners. In Sierra Leone, there are limited data on the level of knowledge and rational use of antibiotics among medical students and the general population. This study aims to assess the attitude and perception of pharmacy students towards the rational use of antibiotics and identify factors influencing their use.

Antimicrobial resistance (AMR) is a growing concern, particularly in developing nations like Sierra Leone, due to the excessive overuse of antibiotics.[6] Despite a decrease in poverty rates from 66.4% in 2003 to 52.9% in 2011, the majority of the population still lives in poverty, which has been identified as a key factor influencing the growth of AMR[7,8] Multidrug-resistant organisms are evolving in poorer nations due to issues like poor access to effective medications, unregulated manufacture and administration of antibiotics, and shortened antimicrobial therapies due to cost.[9] Antibiotic use is increasing in both low-income and middle-income countries due to rising incomes, declining antibiotic costs, lack of restrictions on hospital use, and increased over-the-counter sales of medications.[10]

Rational use of antibiotics is essential to prevent AMR, as it raises healthcare expenses, hospital stay times, morbidity, and mortality rates in both developed and poor nations. The World Health Organization[11] has established guidelines and regulations to control antibiotic misuse and abuse, emphasizing the role of clinical pharmacists in antibiotic stewardship. However, most studies have only considered rational medication therapy, educational initiatives, and tight antibiotic policies.

Inappropriate use of antibiotics can lead to antibiotic resistance, causing pathogens to develop resistance against the antibiotics. Factors contributing to the rational use of antibiotics in developing countries like Sierra Leone include increased medication bills without improvement, increased poverty, deterioration of lives, and long hospital stays. To encourage

sensible use of antibiotics, the International Society of Chemotherapy formed the Antimicrobial Stewardship Working Group in 2009, and antimicrobial stewardship has become increasingly common in recent years.[12]

Antimicrobial resistance (AMR) is a global health concern, with approximately 2 million cases of resistant bacterial infections recorded annually in the US, costing $20 billion in direct healthcare expenses. MDR infections are responsible for 25,000 annual deaths and have an economic impact of €1.5 billion.[13] Around 700,000 people died globally in 2014 due to antimicrobial resistant bacteria, but it is estimated that the number of deaths could rise to 10,000,000 by 2050, resulting in a global loss of between 60 and 100 trillion US dollars.[14]

Preventive strategies for AMR include formal protocols and guidelines, hospital formulary restrictions, use of narrow-spectrum antibiotics, antimicrobial decolonization strategies, combination antibiotic therapy, shorter courses of antibiotic treatment, antibiotic cycling and scheduled antibiotic changes, and quantitative cultures and assessment of infection risk[15] Education a key role in preventing AMR through stewardship programs.

Education plays a key role in preventing AMR through stewardship programs. Antimicrobial practice guidelines or protocols can prevent unnecessary administration of antibiotics and increase their effectiveness. Understanding how AMR develops and circulates among people is essential for prevention.[15] The 2011 WHO topic focused on fighting AMR, emphasizing the need for coordinated efforts to address the issue on a global scale.[13]

Irrational use of antibiotics has led to the persistent expansion of resistant microorganisms, resulting in a loss of efficacy of these drugs. The ability of bacteria, parasites, viruses, and fungi to multiply and spread in the presence of antimicrobial drugs is known as antimicrobial resistance (AMR).[17]

According to a 2017 World Bank report, the vast majority (26.2 million) of the additional 28.3 million people who would experience extreme poverty in 2050 under the high-impact AMR scenario would reside in low-income countries. AMR can also result in a significant increase in extreme poverty and health care costs. Since less than 3% of people worldwide live in severe poverty, the world is now on track to eradicate it by 2030 (at $1.90 per day). However, AMR might make this goal unattainable.[18] Given that Sierra Leone is one of the low-income countries, this is concerning.

Numerous research have revealed that college students, both medical and non-medical, self-medicate, abuse antibiotics, and lack sufficient understanding of antibacterial medications[19] According to a survey of 79 students in Sri Lanka, 92% of them said that antibiotic misuse still happens today and is the main cause of AMR. Additionally, 95% of them said that ABR was a severe health problem in Sri Lanka that may affect them and their families. 95% of the students favored the establishment of university-level courses promoting the responsible use of antibiotics, and 96% of them thought that it was essential to learn more about them. Lastly, 77% of respondents concurred that education on the use of antibiotics was necessary for Sri Lankans.[20]

In addition to being informed about current and upcoming health issues, pharmacy students should be trained to administer antibiotics sensibly as future medical professionals.[21] According to a Zambian survey, 76.9% of the students said that teaching people how to use antibiotics sensibly is essential. This is consistent with a study done in South Africa, where most medical students expressed that they would appreciate further training on how to handle antibiotics appropriately.[21]

Pharmacy students agree that antibiotics are overused and that antibiotic resistance is a national issue, but fewer students believed this to be the case at the hospitals where they completed clinical rotations, according to a U.S. research. It was nearly universally acknowledged that better use of antimicrobials will reduce resistance, whereas poor use can cause resistance and harm to individuals (Justo et al., 2014).[22]

METHODS

This study aimed to assess the attitudes and perceptions of pharmacy students towards the rational use of antibiotics using a descriptive cross-sectional approach. The study was conducted between April 2022 and October 2022 at Kossoh town campus and 17 Wallace Johnson Street, where all Bachelor in pharmacy students at College of Medicine and Allied Health Sciences (COMAHS) were included. The sample size was calculated using Slovin's formula, and a proportional formula was used to calculate the number of questionnaires distributed per class.

Table 1: Proportion of Questionaires distributed.

CLASS	NUMBER OF QUESTIONNAIRES THAT WAS DISTRIBUTED
FIRST-YEAR PHARMACY	65
SECOND YEAR PHARMACY	29
THIRD YEAR PHARMACY	23
FOURTH YEAR PHARMACY	16
FIFTH YEAR PHARMACY	19
TOTAL	152

A total of 152 questionnaires were distributed for data collection.

The participants were Bachelor in pharmacy students from the first year to the fith(final) year, with the majority being first-year students. The Faculty of Pharmaceutical Sciences approved the study, and participants' confidentiality was maintained throughout. A self-administered questionnaire was developed using tools from various sources, and the data was analyzed using SPSS software version 21.

The attitude section had 13 questions, with nine scored, and the total was calculated as good, average, or negative attitudes. The perception section had 15 questions, with thirteen scored, and responses were classified as positive or negative attitudes. The data was summarized in tabular form as frequencies and percentages.

A pilot test was done initial and was excluded from the data analysed.

RESULTS

The demographic analysis revealed that 152 students participated, with a response rate of 100%. The majority of respondents were male (67.8%) and female (32%). The majority of respondents were aged 15-24 years, with a majority of them working for 3-12 months, 1-4 years, or more than 10 years. Most students had no working experience, which is attributed to their admission into the college directly after secondary school.

The majority of students were single, with 82.2% being single, 16.4% married, and 1.3% divorced. The majority were Muslims (52.7%) and Christian (42.8%). The study highlights the importance of maintaining confidentiality and ensuring the well-being of pharmacy students in Sierra Leone.

Table 2: socio-demographic characteristics of pharmacy students.

Socio-demographic characteristics		Frequency	Percentage
Gender	Female	49	**32.2**
	Male	103	**67.8**
Age group	15-24years	70	**46.1**
	26--34years	67	**44.1**
	35-44years	15	**9.9**
Work experience	less than 3moths	12	**7.9**
	3-12months	14	**9.2**
	1-4years	15	**9.9**
	4-10years	8	**5.3**
	greater than 10years	6	**3.9**
	None	97	**63.8**
Marital status	Single	125	**82.2**
	Married	25	**16.4**
	Divorce	2	**1.3**
Religion	Muslim	80	**52.6**
	Christian	65	**42.8**
	Other	7	**4.6**
Class	first year	65	**42.8**
	second year	29	**19.1**
	third year	23	**15.1**
	fourth year	16	**10.5**
	fifth year	19	**12.5**

The study reveals that 68.4% of bachelor in pharmacy students have a good attitude towards the rational use of antibiotics, while 21.1 % have a poor attitude. Almost all participants believe there is an existing misuse of antibiotics and that antibiotics resistance is a major problem among students. Overuse of antibiotics is believed to account for most antibiotic resistance, but only 53.3% of participants know if they or their relatives have been affected. Interestingly, 40.8% of participants believe taking less antibiotics than prescribed is beneficial, which is partially attributed to 21.7% of poor attitude towards the rational use of antibiotics. However, 41.4% of participants strongly disagree with this claim. Lastly, 71.7% of participants prefer prescription antibiotics for chest infections. Most participants agree that it is necessary to know the rational use of antibiotics and believe in medical follow-up after taking antibiotics. Most participants agree that antibiotics resistance is a problem in Sierra Leone, and 79.6% believe that administering the correct dose and dosage form is a means of preventing resistance.

Table 3: Attitude of pharmacy students toward the rational use of antibiotics.

Variables	Variable options	Frequency	Percentage
Do you think there exists misuse of antibiotics?	Yes No	148 4	**97.4** **2.6**
Is antibiotic resistance a problem among students?	Yes No	132 20	**86.8** **13.2**
Is the overuse of antibiotics result in antibiotic resistance?	Yes No	135 17	**88.8** **11.2**
Does antibiotic resistance affect you or your family's health?	Yes No not really	57 14 81	**37.5** **9.2** **53.3**
Would you prefer a prescription containing antibiotics during chest infection?	Yes No not really	109 34 9	**71.7** **22.4** **5.9**
Do you think that taking less antibiotics than prescribed is more beneficial?	Yes No not really	62 63 27	**40.8** **41.4** **17.8**
Is it necessary to know " the rational use of antibiotics"?	Yes No not really	145 5 2	**95.4** **3.3** **1.3**
Would you visit for a follow-up after taking antibiotics?	Yes no not really	99 31 22	**65.1** **20.4** **14.5**
Is broad-spectrum antibiotics the right choice for any bacterial infections?	Yes No	52 100	**34.2** **65.8**
Is antibiotic resistance a problem in Sierra Leone?	Yes no not really	138 12 2	**90.8** **7.9** **1.3**
Do you agree with the inappropriate use of antibiotics as a cause of resistance?	Yes no not really	136 14 2	**89.5** **9.2** **1.3**
Administration of correct doses and dosage of antibiotics are means of preventing resistance.	Yes no not really	121 7 24	**79.6** **4.6** **15.8**
What are your preferred classes of antibiotics?	Penicillin cephalosporin Fluoroquinolones amino glycosides macrolides Chloramphenicol	74 26 21 9 5 17	**48.7** **17.1** **13.8** **5.9** **3.3** **11.2**

A study of bachelor in pharmacy students revealed that a majority of them (71.1%) believe strong knowledge of antibiotic agents is crucial for their careers, and that inappropriate use of antibiotics can harm patients. They also believe that inappropriate use of antibiotics is unethical and that more education on appropriate antibiotic use is needed. The majority (60.5%) believe that Antibiotic-Resistance (ABR) is a significant problem nationally, and

that better antibiotic use can reduce AMR problems. However, poor hygiene and excessive attention to advertisements can also contribute to ABR. The majority (78.3%) agree that too long antibiotic treatment duration and too low doses can result in ABR. Additionally, the majority (46.1%) agree that prescribing too many broad-spectrum antibiotics can increase ABR. The study also found that poor infection-control practices by healthcare professionals can cause the spread of antibiotic resistance. Only 37.5% of the respondents strongly believe that new antibiotics will be developed in the future to counter ABR problems.

Table 4: Scoring of attitude and perception of pharmacy students towards the rational use of antibiotics.

	Variable		Count	%
1	Attitude level	Poor attitude	32	**21.1%**
		Average attitude	16	**10.5%**
		Good attitude	104	**68.4%**
		Total	152	**100.0%**
2	Perception Level	Poor perception	37	**24.3%**
		Good perception	115	**75.7%**
		Total	152	**100.0%**

DISCUSSION

This research examined the student attitudes and perceptions of Bachelor of Pharmacy students at COMAHS-University of Sierra Leone with regards to the rational use of antibiotics. The results showed a good attitude towards the antibiotic use was found in 68.4% of the respondents and poor attitude in 21.1%. On the same note, good perceptions were exhibited by 75.7 percent of the participants implying that most students are aware of the dangers of using antibiotics irrationally. These findings are consistent with those of Zambia in which more than 76 percent of students expressed good attitudes towards antibiotic use even though good attitudes in Zambia were greater (96.6%) in comparison to our study.[21]

In the vast majority of this study, antibiotic misuse was perceived as a cause of resistance with 89.5% students agreeing that improper use is one of the causes of antimicrobial resistance (AMR). Similar results were obtained in China, where over 83 percent of medical students admitted that misuse is a significant source of resistance.[23] There was also a high perception of antibiotic resistance as a national issue (90.8%), which is also consistent with the results of similar surveys in Sri Lanka and South Africa that showed concern about antibiotic use and its impact on the health of the population.[20,21]

Although these positive findings were made, some alarming gaps were detected. About 40.8 percent of participants had an opinion that it may be helpful to take less antibiotics than prescribed. This myth demonstrates a cumulative concept of misinterpretations that may jeopardize proper clinical practice unless it is averted during training. Equally, more than 34 percent of students believed that broad-spectrum antibiotics were suitable in any bacterial infection, which is opposite to antimicrobial stewardship that provides that narrow-spectrum antibiotics be used where feasible.

Relative to other findings on international students, Sierra Leonean students of pharmacy had moderate perceptions of the significance of using rational antibiotics but with a weak perception in comparison with Zambia and China. The reduced scores can be related to the inability of local training, the lack of the organization of antimicrobial stewardship curricula, and the lack of clinical practice exposure.

These gaps are of special concern due to the high level of infectious diseases in Sierra Leone, poor antibiotic control, and access challenges based on poverty [7, 9]. Pharmacy students will become prescribers and drug custodians in the future and their training has a direct consequence on AMR control. Strategic measures need to be taken in order to incorporate structured antimicrobial stewardship modules into the undergraduate program, enhance experiential training and harmonize teaching with the AWaRe scheme of WHO. Moreover, inter professional education and awareness campaigns may also enhance the attitudes and perceptions of the students, which will eventually lead to contributions to national and global AMR containment.

CONCLUSION

Almost all of the students had a positive attitude toward the sensible use of antibiotics, although the majority of them believed that it is still important to understand them. However, there is a gap in students` attitudes towards the rational use of antibiotics when compared to other studies done in Africa. Students' attitude level towards the rational use of antibiotics is greater than the one found in this study. The majority of respondents, almost all of whom agreed that antibiotic resistance among students is a concern, and they are also aware that antibiotic resistance can arise through improper use of antibiotics, which is promising.

Even though this survey showed that pharmacy students have good attitudes and good perception towards the prudent use of antibiotics, yet nearly all of the respondents adamantly

demanded a strong understanding of antibiotic agents, which they felt was crucial for their job. Moreover, this study demonstrates pharmacy students' interests in furthering their knowledge of antibiotic use and resistance, as well as their general approval of antimicrobial stewardship programs. The study also reported a high score in perception than attitude toward the rational use of antibiotics.

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