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Evaluation of the Knowledge, Attitude and Perception of Healthcare Students on Antibiotics and Antibiotic Resistance: A Study in Central University, Ghana

Peace Doe[1,2,*], Cynthia Amaning Danquah[1], Kwasi Adomako Ohemeng[3], Gloria Awo Mashood[2], Jorindel Sepenoo[2], Kwame Ohene Buabeng[4], Michael Ofori[1]

[1]Department of Pharmacology, Faculty of Pharmacy and Pharmaceutical Sciences, Kwame Nkrumah University of Science and Technology, Ghana.
[2]Department of Pharmaceutical Sciences, School of Pharmacy, Central University Ghana.
[3]Department of Medicinal Chemistry, School of Pharmacy. Central University Ghana.
[4]Department of Pharmacy Practice, Faculty of Pharmacy and Pharmaceutical Sciences, College of Health Sciences, Kwame Nkrumah University of Science and Technology, Ghana
*Corresponding author: pdoe@central.edu.gh

Abstract

Students undergoing programmes in healthcare will play an important role in the management of antibiotic resistance which is still a global problem. Their knowledge and attitude should be adequately documented. This study is carried out to evaluate the knowledge, attitudes and perceptions of antibiotic use and antibiotic resistance among healthcare students in Central University, Ghana. In this study, 1027 students offering courses in pharmacy, nursing and physician assistantship participated in a survey to evaluate their knowledge, attitudes and perception on antibiotic use and antibiotic resistance. Data obtained was analyzed using STATA statistics DATA analysis software version 12.0. Descriptive statistics and chi-squared test was employed. Students displayed very good knowledge of antibiotic use and antibiotic resistance with students studying physician assistantship and nursing showing greater knowledge. The attitude of the respondents on the use of antibiotics was slightly above average. There was a significant difference ($p = 0.029$) between students' programme of study and how they obtained their last course of antibiotics. Students displayed average knowledge on antibiotic use and antibiotic resistance but there is a need for more education to improve their perception and attitudes in order to contribute towards curbing the global problem of antibiotic resistance.

Keywords: knowledge, attitude, perception, healthcare students, antibiotic resistance

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1 Introduction

Management or treatment of infections with antibiotics is one of the most significant approaches employed by modern medicine. The discovery of antibiotics occurred from the 1930s to 1960s which gave rise to many antibiotics (1), but there has been a decline in antibiotic discovery due to the emergence of pathogens that were resistant to these antibiotics and the inability of researchers to maintain the rate of discovery in the face of this challenge [2, 3].

Presently, the threat of antimicrobial resistance is a global issue to all of humanity due to the growing and continuous spread of multi-drug resistant pathogens [4, 5]. Unregulated purchase and use of antimicrobial agents, poor sanitation and hygiene, release of non-metabolized antibiotics into the environment through waste and the irrational use of antibiotics in humans as well as animals are some of the factors that precipitate antimicrobial resistance [2, 6]. Indiscriminate and improper use of antibiotics by individuals also contributes to the development of antibiotic resistance and effective education and orientation is necessary to curb this development [7]. Healthcare providers are also responsible for antibiotic resistance through inappropriate prescriptions among others and studies have shown a direct association between the misuse of antibiotics and the development of antibiotic resistance [8, 9]. A previous study conducted to assess the knowledge and perception of antibiotic use and antibiotics resistance among healthcare providers in a tertiary teaching hospital in Ghana showed that physicians consider antibiotics resistance as a problem that does not apply to their own departments [10]. Another study carried out among prescribers in both private and public facilities in southern Ghana showed that although knowledge of antimicrobial resistance was high, there is still a need for improvement in their perception and knowledge of antibiotic prescription practices [11]. Other studies have assessed the knowledge, attitude and perception of patients, students and members of the population on antibiotic use and antibiotic resistance. These studies highlight the high prevalence of antibiotic use as well as the inadequate knowledge on antimicrobial resistance [12–18]. It is therefore imperative that healthcare students have adequate understanding of the challenges that constitute the problem of antimicrobial resistance and informed measures are carried out to train them on relevant areas on antibiotic use for their prospective fields [19]. To the best of our knowledge, this is the first study that compares the knowledge, attitude and perception of students studying pharmacy, nursing and physician assistantship on antibiotic resistance in Ghana.

Thus, since healthcare providers are the first point of call for patients, this study is aimed at assessing the knowledge, attitudes and perception of healthcare students on antibiotics

and antibiotic resistance. This is because the healthcare students of today are the healthcare providers of tomorrow and are also prospective target population who will contribute to the prevention of antibiotic resistance.

2 Experimental section

2.1 Study design and participants

A cross-sectional study was carried out at Central University Ghana. This survey was administered to undergraduates from the School of Pharmacy and the Faculty of Applied Sciences. The questionnaire was accessible online via Google forms from 23rd March to 3rd April 2019. Participation was voluntary and without any form of compensation.

2.2 Questionnaire development

The questionnaire for this study was developed using data from previous studies among healthcare students (20–23). It consisted of 25 questions, which included sections on demographics, personal use of antibiotics, knowledge, perception and attitude towards antibiotic use and resistance. A pilot study was carried out with 50 students. The questionnaire employed in this study is included in the supplementary materials section.

2.3 Ethical approval

This study was approved by the Committee for Human Research Ethics and Publications of the Medical School Sciences, KNUST with reference number CHRPE/RC/Oct/2017 as one of several investigations conducted on AMR in Kumasi, Ghana.

2.4 Statistical analysis

STATA statistics/Data Analysis software, version 12.0 was used to analyze the data obtained. Descriptive analysis was carried out on demographic characteristics of students and results reported in frequency and percentages. Chi-square test was applied to evaluate the correlation between dependent and independent variables. Multiple linear regression was also carried out to evaluate the relationship between several response variables and explanatory variables such as age, gender, programme and level of study of students.

3 Results and Discussion

Total sample size was 1027; of these 844 were pharmacy students, 83 were nursing students and 80 were studying physician assistantship (Figure 1). The number of responses for each question varied slightly, this is because not all respondents gave answers to all questions in the questionnaire.

3.1 Personal use of antibiotics

More than half of the students (807/1027) had taken oral antibiotics in the previous 12 months. Most of them (577) acquired these antibiotics from a Doctor's prescription, 301 (31.19%) from a Pharmacist's prescription, 31 (3.21%) from a family member, 32 (3.32%) from a leftover previous use and 24 (2.49%) from drug peddlers.

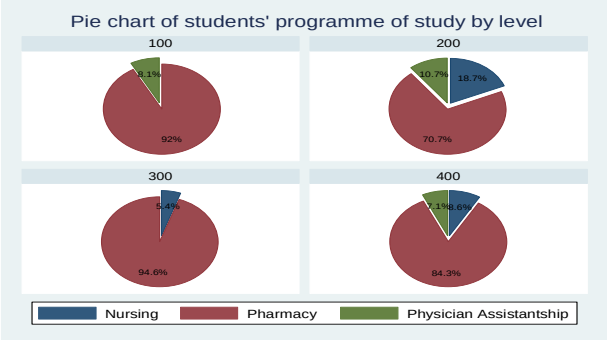

Figure 1. Distribution of students' from different programmes by level of study.

3.2 Knowledge and perceptions about antibiotics and antibiotic resistance

About half of the students (58%) knew that antibiotics kill both good and bad bacteria with 21% of them unsure. Most of them (82%) agreed that overuse of antibiotics makes them ineffective but less than half of the respondents (42%) said antibiotics are effective against cold with only 40% of them disagreeing. Most students (89%) agreed that bacteria can become resistant to antibiotics with 70% of pharmacy students agreeing that humans can

also develop resistance to antibiotics (Table 1). An encouraging number of students (78%) answered correctly that antibiotics refers to drugs that kill bacteria while antimicrobials include drugs that kill viruses, fungi or bacteria; only 15% of them said there is no difference between antibiotics and antimicrobial agents.

Table 1. Healthcare students' awareness of contributory factors to antimicrobial resistance

Statements	Agree with statement (%)		
	Pharmacy students (n = 849)	Nursing students (n = 88)	Physician assistantship students (n = 80)
Antibiotics are effective against cold	41%	65%	23%
Bacteria can become resistant to antibiotics	86%	80%	99%
Humans can become resistant to antibiotics	70%	80%	63%

3.3 Knowledge and awareness on antibiotic resistance

Students across all healthcare courses considered various factors important that contribute to the problem of antibiotic resistance, these include: too many antibiotic prescriptions (76%); too many broad spectrum antibiotics used (79%); poor infection and control practices (86%); too long duration of antibiotic treatment (77%); public awareness of antibiotic resistance (95%). There are no major variations in the responses observed with respect to students' programmes of study (Table 2).

Table 2: Healthcare students' attitudes and perception to potential contributors that are important to antibiotic resistance.

Attitude and perceptions questions (Important %)**	Pharmacy students (n=849)	Nursing students (n=88)	Physician assistantship (n=80)	*P-value
Too many antibiotic prescriptions	74%	84%	76%	0.001
Too many broad spectrum antibiotics used	79%	65%	91%	0.001
Poor infection prevention and control practices	86%	90%	89%	0.021
Public awareness of antibiotic resistance	94.7%	100%	99%	0.001

*P value derived from chi-square test.
**Percentages of Important and Very important are combined

3.4 Students' need for more education

Students studying pharmacy programmes were more likely to want more information on medical conditions for which antibiotics are used while all students across all programmes felt they had enough information on the prescription of antibiotics. Nursing students were evenly distributed among topics while 70% of students studying physician assistantship required more information on antibiotics resistance. More details are reported under table 3.

Table 3: Topics on which healthcare students want more information

Topics	Want more information (%)		
	Pharmacy students (n=850)	Nursing students (n=89)	Physician assistantship (n=80)
How to use antibiotics	59%	33%	25%
Resistance to antibiotics	62%	38%	70%
Medical conditions for which antibiotics are used	78%	46%	56%
Prescription of antibiotics	21%	21%	14%
Links between the health of humans, animals and the environment	20%	26%	1%

3.5 Personal use of antibiotics

Multiple linear regression analysis show that there is a significant difference (p = 0.021) between males and females and how they obtained their last course of antibiotics. There is however, no significant difference between a student's age or level of study and how they obtained their last course of antibiotics. There was also a significant difference (p = 0.029) between students' programme of study and how they obtained their last course of antibiotics. A below average attitude towards antibiotic use was observed by all students in this study (Table 4).

Table 4: Healthcare Students' attitude towards antibiotic medication practice.

Medication practice questions (% Never and Sometimes)	Pharmacy students (n=850)	Nursing students (n=89)	Physician assistantship students (n=80)	*P value
Do you stop taking further treatment if you feel better before completing the prescribed antibiotic course	34%	26%	21%	0.066
Do you save the remaining antibiotic for the next time	49%	44%	39%	0.046
Do you give the leftover antibiotic to your friend?	58%	55%	44%	0.154
Do you complete the full course of treatment?[a]	40%	28%	35%	0.029
Do you consult a doctor before starting an antibiotic?[a]	26%	22%	24%	0.710

[a] Percentages of Always responses.
**P* value derived from Chi-square test

3.6 Perception and attitude on antibiotic use

Nursing students performed better than pharmacy and physician assistantship students on their attitude and perception towards the use of antibiotics for the management of coughs and cold. All nursing students agreed that skipping 1 or 2 antibiotic doses can contribute to the development of resistance. A significantly higher proportion of students agreed that most coughs and cold get better without the use of antibiotics (Table 5).

Table 5: Healthcare Students' attitudes towards antibiotic use and resistance

Attitude questions	Pharmacy students (n=849)	Nursing students (n=88)	Physician assistantship students (80)	*P-value
Bacteria that are resistant to antibiotics spread easily from person to persona	63%	41%	61%	0.001
Most coughs, cold and sore throat get better on their own without the need for antibiotics[a]	64%	83%	69%	0.001
Healthy people can carry antibiotic-resistant bacteria[a]	74%	82%	80%	0.001
When I get fever, antibiotics help me get better quickly[b]	66.2%	44%	73%	0.001
Skipping 1 or 2 antibiotics doses does not contribute to the development of resistance[b]	66%	100%	99%	0.001

**P* value derived from chi-square test;
[a] Percentages of agree and strongly agree are combined.
[b] Percentages of disagree and strongly disagree responses are combined.

This study was carried out to evaluate the knowledge, attitude, perception and practice of healthcare students towards antibiotics and antibiotic resistance. To the best of our knowledge, this is the only study that has been done involving more than a thousand students studying pharmacy, nursing and physician assistantship. The results show that the students had an above average knowledge about antibiotic resistance which is somewhat similar to other studies carried out in India and Portugal [24]. Students were well informed of the overuse of antibiotics on drug efficacy or effectiveness but only 28% of them agree that skipping several doses of antibiotics can contribute to the development of resistance. This is unlike a study carried out in Kuwait, which showed that respondents had better attitudes towards antibiotic use with more than half of them emphasizing the importance of completing the full course of antibiotic treatment [25].

This study also highlighted the misapprehension of the use of antibiotic medication where 42% of students agree that antibiotics are effective against colds which is similar to results obtained among medical students in China [26]. This is quite high compared to a study done by Seid and Hussen in 2018 where only 28% of the study participants agreed to a similar question on the effectiveness of antibiotics for viral infections [27]. In another study carried out in Saudi Arabia, medical students had very good previous knowledge of antibiotic use and bacterial infections with only 18.1% of them admitting that antibiotics could be used for viral infections [28]. This misconception among healthcare students of all levels may contribute to the improper use of antibiotics and this can in turn contribute to the developing problem of antimicrobial resistance. However, almost all students in this study responded correctly when asked if bacteria can become resistant to antibiotics with 99% of students studying for a degree in physician assistantship agreeing with the statement (Table 1).

In this study, only 7% of students agreed that they always took the full course of antibiotics regimen prescribed by a doctor even when they feel better, 46% of students said they sometimes consult a doctor before starting an

antibiotic course or regimen. A somewhat encouraging number (48%) of them said that they never save the remaining leftover medication for next time (Table 4). This is in line with studies carried out among final year pharmacy and medical students in Malaysia where a large majority agreed that it is not standard practice to store leftover antibiotics for subsequent use [29].

With regards to students' attitude, 80% of them viewed antibiotic resistance as a national problem while 73% agreed that antibiotic resistance will be a greater problem for their future individual practice if appropriate measures are not taken which is in agreement with a study carried out among selected schools in the United states that saw a vast majority of pharmacy students affirming that a great deal of knowledge on antimicrobials is crucial for their future careers [30]. Accordingly, 91% of students in this study agreed that prescribing, dispensing or administering inappropriate or unnecessary antibiotic is unethical. This is similar to studies carried out in Trinidad and Tobago where all respondents correctly answered that inappropriate antibiotic prescription will result in ineffective treatment [20]. This result is obvious because students are seeing that antibiotic resistance is an issue that is now as close as possible to them and this awareness will guide them when prescribing and administering these drugs to patients in the nearest future.

In chi-square test, a statistically significant difference in attitude and perception responses was found (Tables 2 and 5) between the programme of study of the respondents and their attitude towards antibiotic use. Nursing and physician assistantship students achieved more correct responses to attitude questions as compared to pharmacy students. This could be as a result of the more experiential exposure of nursing and physician assistantship students to patients as compared to pharmacy students. This experiential training could be included to the programme of pharmacy students from the first year to improve their attitude as well as knowledge of antibiotic use and antibiotic resistance.

4 Conclusions

The level of awareness of healthcare students in this study regarding antibiotics and antibiotic resistance was quite satisfactory, but there is a significant need for improvement in their attitudes, perceptions and practice. There were significant improper behavior such as failing to take a full antibiotic regimen as well as purchasing these antimicrobial agents without appropriate prescription. Therefore, there should be educational interventions such as introducing specific courses on antibiotics prescription, use and antibiotic resistance from first year to final year of student's programme of study.

5 Declarations

5.1 Acknowledgments

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5.2 Author Contributions

Conceptualization, CAD and PD; methodology, CAD, PD, GAM, JS, KOB, MO, NKBB; Data analysis: PD; writing-original draft preparation, PD; writing-reviewing and editing, PD and CAD; supervision, CAD. All authors have read and approved the final manuscript.

5.3 Funding Statement

This research received no external funding.

5.4 Conflicts of Interest

The authors declare no conflict of interest.

5.5 Ethic

This study was approved by the Committee for Human Research Ethics and Publications of the Medical School Sciences, KNUST with reference number CHRPE/RC/Oct/2017.

6 Supplementary Data

Supporting information article can be accessed online.

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