

A Comparative Study about Knowledge, Attitude, Practice of Antibiotic Use and Perceptions of the Possible Causes of Resistance between Final Year Undergraduate Students and Postgraduate Pharmacy Students

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Abstract

Background: Antibiotic resistance is a problem leading to difficulty in treating microbial infections that may occur due to many causes. For the important pharmacist role as a reference for the information and the ability to access to medications, they are vital members in lowering the development of antibiotic resistance, and also they support the proper use and control of antibiotics misuse. Our goal is comparing the knowledge, attitude, practice of undergraduate and postgraduate pharmacy students and their perceptions about the causing factors of antibiotic resistance in Iraq.

Method: A cross sectional study was conducted involving the final year bachelor and postgraduate (master and Philosophical doctor) students from different private and public pharmacy universities in Iraq. An adjusted questionnaire was administrated to 233 students electronically and the results obtained were analyzed by using SPSS 20 for Windows Descriptive. A significant difference was found in the knowledge of antibiotic between undergraduate and postgraduate (Master and Philosophical doctor) students (Mean knowledge score 5.32 versus 5.92 respectively, $p < 0.001$). Attitude data also showed a higher positive attitude of postgraduate students according to antibiotic use and resistance when compared to undergraduate students (Mean attitude score: 2.97 versus 2.92 respectively, $p < 0.05$). Significant difference was observed in practices of the comparative students groups regarding to the frequency of self-medication, reason, sources of antibiotic use and in terms of disease condition where they used ($p < 0.05$). Continuous mutation and gene changes of micro-organism taken the higher percentages answered yes for the undergraduate students while the limited restrictions on antibiotic usage taken the higher percentages answered yes for the postgraduate students (89.1% and 98.5% respectively).

Conclusion: We can conclude from data of our study that there is a significant difference in the knowledge, attitude, practice of antibiotic use and perceptions of the possible causes of resistance between postgraduate (master and Philosophical doctor) and undergraduate (fifth year bachelor) pharmacy students when assessing the use of antibiotic and related resistance. This will help to determine the educational requirements for pharmacy students in colleges of Iraq for better understanding and dealing with the antibiotic resistance problem in the future.

Keywords: Knowledge, Attitudes, Practice, Antibiotics, Pharmacy Students.

Introduction

From the important events in the development of the medical field is the discovery of antibiotics which has a great effect on human life over the world. It helped to manage the dangerous disease or do surgeries with a high success rate for saving human life. The death due

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to previous high mortality infections is now under better control⁽¹⁾

High frequently used drugs often associated with irrational use are antibiotics. The most reported risk factor for the development of resistant pathogens is the over antibiotic use⁽²⁾. There is a direct relation between the over usage of antibiotics and related resistance where populations who use less antibiotics develop lower amount of resistance to bacteria⁽³⁾Antimicrobials overuse can change the human's normal flora which may lead to the multiplication of pathogenic bacteria and increase susceptibility to infections⁽⁴⁾. However, unnecessary antibiotic prescribing remains highly common also in developed countries where higher than a 5th of all antibiotic prescriptions for patients are written for upper respiratory tract, bronchial and viral infections⁽⁵⁻⁷⁾

This antibiotic resistance is a big problem leading to difficulty in treating bacterial infections. This resistance caused by multiple reasons which include self-antimicrobial treatments without prescription, over-the-counter selling of antibiotics, low regulation of antibiotic prescriptions, expensive medical consultations, the knowledge and attitudes of patients towards antibiotic use, self-treatment, the knowledge and experiences of doctor and patient preference interaction. ⁽⁵⁻⁷⁾

As a result multidrug-resistant (MDR) bacteria is accompanied with longer hospital stays, lower quality of life (QoL), additional fees for the healthcare department, and increased deaths⁽⁸⁻¹⁰⁾. There is an increasing need to push the scientific understanding of the factors associated with antibiotics use requiring efforts for managing the use of antibiotics have been directed toward the physician, protocols, and educational programs⁽¹¹⁾.

Also, data about of health practitioners perceptions towards the use and resistance of antibiotics could be a baseline, such as, for urgent interventions including the development of national and international antibiotics policies and antimicrobial stewardship program⁽¹²⁾. The concept of antimicrobial stewardship including any intervention that required for the optimization of antimicrobial therapies for every single patient and to prevent the overuse and misuse of these medications⁽¹³⁾.

For the vital role of pharmacist in terms of the information and dispensing of medications, they have an essential role in the issue of antibiotic resistance, and to support the rational use and control of antibiotics. Gaps between pharmaceutical education on antibiotics and the

use of them have been identified in previous studies⁽¹⁴⁻¹⁸⁾ with one common factor was the belief that antibiotics are effective in treating the common cold and other viruses. However, most pharmacy students believed a strong knowledge of antibiotics was important for their later careers and required more education in this field⁽¹⁹⁾. In this study, our goals were to assess Iraqis undergraduate and postgraduate pharmacy students' knowledge, attitude, practice of antibiotic use, and their perceptions about the causes of antibiotic resistance.

Method

The current cross-sectional study was carried out between final year undergraduate pharmacy students and postgraduate (master and Phd) pharmacy students who were studying in different private and public pharmacy colleges in Iraq. Electronic copy of the questionnaire was used and posted in the social media for groups of the fifth stage and postgraduate pharmacy students from different Iraqi universities. This study carried out on a period of 4 months from January to April, 2020. Each student required approximately 10 minutes to fill the demographic data and research questionnaire completely.

There were five sections in the questionnaire. The first one was about the demographic characteristics of students (age, gender, place of residence, and governorate).

Section two, comprised of six questions, assessing the knowledge of participants about their use of antibiotics by asking questions regarding the effectiveness, adverse effects, resistance and economical concerns, policy issues and implication of antibiotic use. Every response was scored as: True=1 which represents the correct answer, False=0 and Don't Know=0 which are wrong answer. The highest possible score of knowledge section was 6 and the minimum was 0. A total knowledge section score of ≥ 4 was taken as a good knowledge while score of < 4 as a poor knowledge. The same criteria were also used for scoring the 6th section of this questionnaire in assessing the possible causes of antibiotic resistance.

The third section was about students' attitude towards antibiotic use and resistance. It consisted from five questions which was measured on 4 point likert scale. Scores were given to strongly agree=1, agree=2, disagree=3 and strongly disagree=4. A mean score of ≥ 3 was taken as a positive attitude while score of < 3 as a negative attitude.

The fourth section was assessing the students' practices towards self-medication with antibiotics in 4 terms (frequency, reason, source, and the disease condition were they used).. The fifth part of the questionnaire evaluated the students about possible causes of antibiotic resistance they believe. It consisted from 7 questions answered with either yes or no.

Data were statistically analyzed using SPSS 20 for Windows Descriptive analysis was employed, and the results were expressed in frequency and percentages. Chi-squares test was used to calculate the p-value regarding dependent and independent and a value < 0.05 was considered as a significant difference between them.

Results

A total number of 233 pharmacy students were participated in this study with mean age (\pm SD) of 26.13 (\pm 3.302) years. The number of male students was 35 (15.0%) while that of female students was 198 (85.0%). Students divided into two groups: Group (1): include 101 (43.3%) Final year undergraduate bachelor pharmacy students, Group (2): include 132 (56.7%) postgraduate (Master and Phd) pharmacy students as shown in table 1.

The majority of postgraduate students was apparent to be correctly answered all the knowledge related questions especially on question about taking antibiotics too often are less likely to work in the future (100% correct answer). On the other hand, the least percentage of correct answers for the undergraduate students

answered correctly on the same question (76.2%). The knowledge score mean was higher in postgraduate than undergraduate (5.92 versus 5.32 respectively). The responses of all knowledge questions mentioned in Table- 2.

Table 1: Demographic characteristics of students participated in the study

Parameter	No. (%)	Mean (\pm SD)
Age		26.13 (\pm3.302)
Gender		
Female		
Undergraduate	78 (77.2%)	
Postgraduate	120 (90.9%)	
Total	198 (85.0%)	
Male		
Undergraduate	23 (22.8%)	
Postgraduate	12 (9.1%)	
Total	35 (15.0%)	
Place of residency		
Rural	30 (12.9%)	
Urban	203 (87.1%)	
Stage		
Undergraduate	101 (43.3%)	
Postgraduate	132 (56.7%)	
College		
Private college	125 (53.6%)	
Public college	108 (46.4%)	

SD: Standard deviation

Table 2: Knowledge questions regarding antibiotic use with students' percentages who respond correctly (N=233)

Knowledge Questions**	Correctly Answered (%)		P value*
	Undergraduate (5th stage) pharmacy students	Postgraduate (Master & Phd) students	
Irrational use of antibiotics can lead to ineffective treatment	94(93.1%)	130 (98.5%)	0.034
Irrational use of antibiotics can lead to increase adverse effects	87 (86.1%)	128(97%)	0.002
Inappropriate antibiotics use may increase emergence of bacterial resistance	94(93.1%)	131(99.2%)	0.01
Irrational use of antibiotics can lead to additional medical cost on the patient	87(86.1%)	130(98.5%)	<0.001
Taking antibiotics more frequently can lead to less efficacy in the future	77(76.2%)	132(100%)	<0.001
Antibiotic resistance is a serious problem that facing patients health around the world	96(95%)	131(99.2%)	0.198

*P value calculated by Chi-square test.**Knowledge score mean (\pm SD) for undergraduate students was 5.32(\pm 1.095) and for postgraduate students was 5.92 (\pm 0.318) with significant difference (P<0.001)

Data showed that the positive attitude of postgraduate students was higher than that of undergraduate students [Attitude score mean (\pm SD) was 2.97 (\pm 0.14) versus 2.92 (\pm 0.53) respectively] and it was statistically significant

in all attitude related statements($p<0.05$). The responses of undergraduate and postgraduate students towards attitude questions are summarized in Table 3.

Table 3: Students’ attitude towards antibiotic use (N=233)

Question	Positive Attitude Count (%)		Mean attitude score (SD)	P-value*
	Undergraduate (5 th stage) pharmacy students	Postgraduate (Master & Phd) Pharmacy students		
I take antibiotics when having cold to prevent worsening of the illness	81(80.2%)	127(95.2%)	2.99(0.59)	<0.001
I take antibiotics when having fever to make me better more quickly	78(77.2%)	128(97%)	2.94(0.53)	<0.001
Patient should stop taking antibiotics as soon as he/she feels better	77(76.3%)	129(97.7%)	3.03(0.69)	<0.001
Missing one or two doses will not contribute to microbial resistance to antibiotics	56(55.5%)	125(94.7%)	2.81(0.36)	<0.001
We can commonly use antibiotics since its safe	81(80.2%)	127(97%)	2.97(0.56)	<0.001

*P value calculated by Chi-square test., **Attitude score mean(\pm SD) for undergraduates students was 2.92 (\pm 0.53),and for postgraduates students was 2.97 (\pm 0.14).

Self-antibiotic practices of students is illustrated in table-4. Significant difference was found between the final year bachelor pharmacy students and postgraduate pharmacy students when asked about practices in terms

of frequency of self- administration, reason, sources of medication and disease for which antibiotics were taken ($p<0.05$).

Table 4: Self-Antibiotics practices of students (N=233)

Self-antibiotic use	Category	Undergraduate pharmacy (5 th Stage) Students* (%)	Postgraduate pharmacy (Master & Phd) students* (%)	P value**
How often you take self-medication	Occasionally	46(45.5%)	100 (75.8%)	<0.001
	Weekly	3 (3%)	3 (2.3%)	
	Rarely	49(48.5%)	28(21.2%)	
	Never	3(3%)	1(0.8%)	
Reason	Disease is simple	46 (45.5%)	22 (16.7%)	<0.001
	Higher treatments’ cost in clinics	2 (2%)	3 (2.3%)	
	Previous exposure to same health problem	50 (49.5%)	106 (80.3%)	
	There is no hospitals in the nearby	3 (3%)	1 (0.8%)	
Source	Family, friends or neighbours	9 (8.9%)	3 (2.3%)	<0.001
	Retail pharmacy shops	30 (29.7%)	25 (18.9%)	
	Previous prescription	38 (37.6%)	95 (72%)	
	Others	24 (23.8%)	9 (6.8%)	
Disease conditions	Cough/cold/flu and other respiratory problems	77 (76.2%)	120 (90.9%)	0.013
	Wound infection	7 (6.9%)	6 (4.5%)	
	GIT related problems(such as diarrhea)	8(7.9%)	3 (2.3%)	
	Eye/ear infection	9(8.9%)	3 (2.3%)	

*Students answered in yes,** P value calculated by Chi-square test

In table 5 the participants' response towards the possible causes of resistance is illustrated. Significant difference was observed between the final year bachelor pharmacy students and postgraduate pharmacy students when asked about all the questions of possible cause of antibiotic resistance ($p < 0.05$). Continuous mutation

and gene changes of micro-organism taken the higher percentages answered yes for the undergraduate students while the limited restrictions on antibiotic usage taken the higher percentages answered yes for the postgraduate students (89.1% and 98.5% respectively).

Table 5: Students perception of possible causes of antibiotic resistance

Following are the possible causes of resistance	Respondents answered Yes (%)		p-value*
	Undergraduate (5th stage) pharmacy students	Postgraduate (Master & Phd) students	
Administration of antibiotics for non bacterial infections	75 (74.3%)	118 (89.4%)	<0.001
Unnecessary broader spectrum antibiotics use	76 (75.2%)	120 (90.9%)	<0.001
Shorter period of antibiotics administration than standard duration	80 (79.2%)	115 (87.1%)	<0.001
Poor infection control measures	78 (77.2%)	124 (93.9%)	<0.001
Continuous mutation and gene changes of micro organism	90 (89.1%)	128 (97%)	0.003
Longer period of antibiotics administration than standard duration	63 (62.4%)	120 (90.9%)	<0.001
Limited restrictions for antibiotic prescription and use	73 (72.3%)	130 (98.5%)	<0.001

*P value was calculated by Chi-square test

Discussion

Results of our study showed that postgraduate students (master and Phd) had better knowledge about antibiotic usage in comparison to undergraduate bachelor students. Speaking on the knowledge, undergraduate bachelor students, as opposed to postgraduate students (master and Phd), answered poorly on question about taking antibiotics more frequently can lead to less efficacy in the future. This low knowledge of undergraduate students was consistent with result obtained with other study in Australia and Sri Lanka⁽²⁰⁾. So, there is a need for additional educational courses for undergraduate bachelor students for improving their understanding about the real causes of microbial resistance and improving antimicrobial therapy success⁽²¹⁾. However, both study groups considered to have a good knowledge when compared to a study applied to non-medical students⁽²²⁾.

This study showed a higher positive attitude of postgraduate students when compared to undergraduate bachelor students believing that antibiotic treatment course should be standard and not stopped when patient feels better (97.7% versus 76.3% respectively), and also

the antibiotics are not safe and can not be commonly used (97% versus 80.2% respectively). The biggest difference about the positive attitude between the postgraduate and undergraduate pharmacy students was in the question (Missing one or two doses will not contribute to microbial resistance to antibiotics) with percentages of 94.7% and 55.5% respectively. This gap in percentages give an indication that postgraduate students have more awareness about antibiotic resistance in contrast to undergraduate students who may misuse antibiotic treatment.

Lower self-antibiotic medication was found among undergraduate and postgraduate pharmacy students in this study when compared to results obtained from non-medical colleges. Non-medical colleges believed that antibiotics could be prescribed for even viral infections⁽²³⁾. When comparing between the students groups in our study the results showed higher practice of antibiotic self-medication with postgraduate students than undergraduate students. The highest percentage was (occasional self-medication with antibiotics) for postgraduate students (75.8%) while (rare self-medication with antibiotics) for undergraduate students

(48.5%). These results are consistent with previous study on Nigerian and Sudanese undergraduate students about self-medication with both antibiotics and analgesic also^(24,25). However, in this study, these high results were associated with more experience with the previous disease and depending on past doctor prescription for the same medical condition as illustrated in table-4.

Antibiotic were found to be used frequently among medical students all over the world which has health and economic adverse event as showed in previous studies⁽²⁶⁻²⁸⁾. Although this considered to be lower than nonmedical students since pharmacy and medical students received some educational courses during their study. These educational courses reflect the appropriate usage of such medications by them but still we cannot deny the high amount of antibiotic prescribing⁽²⁹⁾.

In our study, when students asked about their perception for the possible causes for antibiotic resistance postgraduate students answered better on reasons related to limited restrictions for antibiotic prescribing while undergraduate students the answer was the mutation in micro-organism. Good perception with postgraduate students may be related to the experience that they had by dealing with prescriptions in pharmacies or hospitals where they work. Continuous detection of resistant microbial strain could solve and control the problem of antibiotic resistant to some extent in addition lead to lower costs and hospitalization.

Indirect factors for unnecessary antibiotic use could be due to patients demand, wrong diagnosis and communication skills⁽³⁰⁻³²⁾. Communication skills should be introduced the syllabus of medical colleges in order to teach students how to convince patients for rational antibiotic use and reflect their attitude to reduce patient expectation about antibiotic treatment⁽³³⁾.

Conclusion

The results of this study showed significant difference in the knowledge, attitude, practices of antibiotic use and perceptions of the possible causes of resistance between undergraduate (fifth year bachelor) pharmacy students and postgraduate (master and Phd) when assessing the use of antibiotics and related resistance. These results can be used to determine the aspects for antimicrobial's knowledge requirements for both undergraduate and postgraduate pharmacy students in colleges of Iraq for better understanding the proposed causes of antimicrobial drug resistance. This study can

become the basis for subsequent research for the possible educational courses that can be applied to undergraduate and postgraduate students in pharmacy colleges.

Ethical Clearance: All the students included in this study were older than 18 years, and they reveal voluntary permission to participation. There were no personal identifiers during the administration and collection of the questionnaire to rule out any personal identification.

Source of Funding: Self

Conflict of Interest: There is no conflict of interest

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