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## KNOWLEDGE, ATTITUDE, AND PRACTICE TOWARDS ANTIBIOTIC USE AMONG LEBANESE HEALTH PROFESSIONS STUDENTS: A MULTICENTRE CROSS-SECTIONAL STUDY

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# KNOWLEDGE, ATTITUDE, AND PRACTICE TOWARDS ANTIBIOTIC USE AMONG LEBANESE HEALTH PROFESSIONS STUDENTS: A MULTICENTRE CROSS-SECTIONAL STUDY

## Abstract

Antibiotic resistance poses a great threat to the public health at a global scale. This resistance has emerged due to the misuse and overuse of antibiotics, especially in countries where antibiotics are dispensed without a prescription. The aim of this study was to evaluate knowledge, behavior and practice towards antibiotics among medical students in universities. The study is a cross sectional survey using questionnaire. Data were collected from a random sample of 226 students of two faculties pharmacy and health sciences. Results showed good knowledge of participants since 87.6% had more than 50% correct answers. 47% of physicians prescribe antibiotics to treat common cold and 46% of physicians prescribe antibiotics over the phone without examining the patient. Awareness campaigns should be launched among the general public as well as healthcare professionals aiming at raising awareness regarding antibiotic misuse and resistance.

## Keywords

Antibiotic, Antibiotic resistance, Lebanon, Knowledge, attitude

## 1. INTRODUCTION

Antibiotic resistance is one of the biggest threats to the future of public health that is occurring everywhere in the world, in developed and developing countries (World Health Day, 2018). This is due to the emergence of resistant microbial strains that are fueled by the excessive use or misuse of antibiotics as well as poor infection prevention and control (Aslam et al., 2018) as shown in Figure 1.

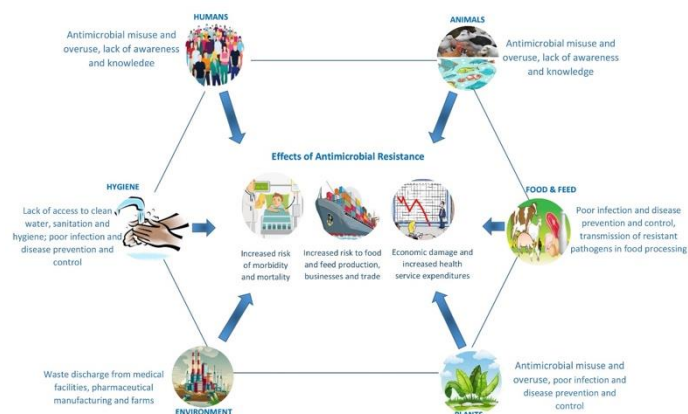


Fig.1: Causes and effects of antibiotic resistance (Adapted from (5))

According to the interagency coordination group (IACG) on antimicrobial resistance, each year antibiotic-resistant infections kill more than 700,000 lives around the world (Review on Antimicrobial Resistance, 2014; Abat et al., 2017; Chan, 2015). If no urgent action is taken, resistant pathogens could claim 10 million deaths annually by 2050 and trigger an economic damage that could be comparable to the shockwaves experienced during the 2008 global financial crisis (Review on Antimicrobial Resistance, 2014; Abat et al., 2017; Chan, 2015). The WHO considered tackling the growing global burden of resistance to antibiotics as a top priority (Farah. et al., 2015). Thus, in 2015, the World Health Assembly endorsed a global action plan on antimicrobial resistance comprised of five strategic objectives (Farah. et al., 2015). The first objective of the plan is to ‘improve awareness and understanding of antimicrobial resistance’; whereas, the fourth objective is to ‘optimize the use of antimicrobial medicines’ (Farah. et al., 2015). To achieve these objectives, WHO adopted a global campaign to increase public awareness towards antibiotic resistance and to encourage best practices of antibiotics among policymakers, health professionals and the general public (Farah. et al., 2015). In line with the global action plan, each country should develop its national roadmap to raise awareness and to promote rational use of antibiotics. In Lebanon, like many other developing countries, antibiotics are popular, inexpensive and of most concern, they can be bought from community pharmacies without a medical prescription despite being stated by law as prescription only drugs (Osman et al., 2019). This is not to mention the fact that self-medication practices with antibiotics is integrated within the local culture (Osman et al., 2019). All this misuse and overuse of antibiotics have promoted the emergence of multidrug-resistant bacterial strains thus increasing the prevalence of antibiotic resistance in Lebanon (Chamoun et al., 2018). A retrospective study conducted by the Lebanese Society of infectious Diseases (LSID) analyzing 20,684 Gram-positive and 55,594 Gram-negative isolates between 2011 and 2013 reported antimicrobial resistance as a serious problem in Lebanon (Sakr et al., 2020). Therefore, it is necessary to develop a national plan to combat the rise in antibiotic use and misuse which is associated with increasingly high rates of antibiotic resistance. To do so, it is necessary to assess the knowledge and attitude of the public and health professionals towards the use of antibiotics in order to find out what awareness and education they may need. Health professions students are particularly important since they will be responsible for dispensing and/or communicating about antibiotic use with the public. Therefore, this study was conducted to provide a snapshot of the current knowledge and attitude of health professions students towards antibiotic use in two universities in Beirut, Lebanon.

## 2. MATERIALS AND METHODS

### 2.1 Study Design And Participants

A university-based cross-sectional study of antibiotic-related knowledge and behaviours of university students was conducted in two universities located in Beirut, Lebanon during the period from March to May 2019. The study was conducted in accordance with the Declaration of Helsinki and national and institutional standards with an ethical approval obtained from the IRB of Beirut Arab University. Data was collected from two medical faculties, the Faculty of Pharmacy and Faculty of Health Sciences. A random sample of students from 1<sup>st</sup> year to final year of their bachelor program as well as Master students were contacted and given an explanation regarding the purpose of the study with data collected anonymously via self-administered questionnaires. Information about anonymity, confidentiality and consent were included in the explanation, and written permission was obtained.

### 2.2 Study Questionnaire

A pre-tested validated questionnaire was adopted and comprised of four sections.. The first section was about the participants' socio-demographic characteristics such as gender, age, marital status, educational level and residency. Section two evaluated participants' knowledge and behavior regarding antibiotics use based on four aspects: Aim of antibiotic use (Bacterial, viral or parasitic infection, common cold, cough and nasal congestion, sore throat or stomachache); effectiveness; causes of antibiotic resistance and antibiotic safety. Another section was designed to assess the utilization practice of antibiotics among students such as the frequency of antibiotic use one year before the study, followed by the reason for use and from where they did access the antibiotics. Finally, a fourth section was included to explore the physician' habits and the patient-physician relationship regarding antibiotics prescriptions.

### 2.3 Statistical Analysis

For statistical analysis, responses were coded and entered into SPSS, version 24 (IBM Corp., Armonk, NY). Descriptive statistics for socio-demographic characteristics of study participants, as well as their knowledge and practice regarding antibiotics use, resistance and safety, are presented as means and proportions for continuous and categorical variables, respectively. The chi-square test or Fisher's exact test was used to calculate the association between two categorical variables. Independent t-tests and Mann-Whitney tests were used to chart comparisons for normal and non-normal continuous variables. Statistical significance was detected by a *P*-value < 0.05.

## 3. RESULTS

### 3.1. Participants' Socio-Demographic Characteristics

A total of 320 questionnaires were distributed, out of which 226 were completed with a response rate of 70.6%. Of the 226 health professions students, the majority of respondents (82.3%) were females, 166 (73.5%) were between 20 and 30 years old and 214 (94.2%) were single. As for their higher degree of education, 85.8% were undergraduate students and 14.2% had master's degree. Over half of the respondents (58.4%) were living in the capital of Lebanon "Beirut" as shown in Table 1.

Table 1: Socio-demographic characteristics of students responding to a survey about antibiotic use (n=226).

Characteristics	Total sample (n= 226)
Gender, n (%)	
Male	40 (17.7)
Female	186 (82.3)
Age, n (%)	
< 20 years	60 (26.5)
20-30 years	166 (73.5)
Marital status, n (%)	
Single	214 (94.7)
Married	12 (5.3)
Educational level, n (%)	

1 <sup>st</sup> year BSc	48 (21.2)
2 <sup>nd</sup> year BSc	29 (12.8)
3 <sup>rd</sup> year BSc	63 (27.9)
4 <sup>th</sup> year BSc	28 (12.4)
5 <sup>th</sup> year BSc	14 (6.2)
MSc	32 (14.2)
Beirut resident, n (%)	
Yes	132 (58.4)
No	94 (41.6)

### 3.2. Knowledge And Behavior Of Participants Towards Antibiotic Use

Knowledge of participants about antibiotics use, effectiveness, resistance and safety was assessed as shown in Table 2. The majority of participants answered correctly the knowledge section, 74.8% and 44.2% believed that antibiotics are effective in bacterial infection and bacterial infection with fever respectively. It is worth mentioning that 10.2% of the respondents believed that antibiotics were used to decrease fever; however, all the respondents agreed that antibiotics do not work as painkillers for stomachache or against common cold, cough and nasal congestion. The study population was also knowledgeable about antibiotic resistance. Over half of participants (59.7 %) agreed that antibiotic resistance is due to using antibiotics without physician prescription. More than 3 out of 4 respondents (82.3%) believed that using antibiotics when not necessary is a causative factor of antibiotic resistance; whereas, 63.3% of respondents agreed with the statement that ‘antibiotic resistance is due to not completing the full course of antibiotic’. Sixty-five percent and seventy-three percent of the study population were aware that antibiotics could be harmful for children’s teeth and might develop allergy leading to death, respectively.

Table 2: Knowledge of students responding to a survey about antibiotic use (n=226).

Characteristic	Total sample (n=226)
<b>A. Aim of antibiotic use, (%)</b>	
Fever	10.2
Viral Infection	5.3
<i>Bacterial Infection</i>	74.8
Parasitic Infection	7.5
Both viral and bacterial Infections	7.5
Bacterial viral parasitic and fever	0
<i>Bacterial Infection with fever</i>	44.2
Common cold cough and nasal congestion	0
Stomachache	0
Treatment of sore throat	4.4
<b>B. An antibiotic will always be effective in the treatment of same infection in the future? (NO), (%)</b>	11.5
<b>C. Antibiotic resistance is due to, (%)</b>	
<i>Using antibiotics when they are not necessary</i>	82.3
<i>Not completing the full course of antibiotic</i>	63.3
<i>Using antibiotics without physician prescription (Self-medication)</i>	59.7
Taking antibiotic before meal	1.8
<i>Using antibiotic in febrile illness</i>	4
Taking antibiotic with another drug (drug-drug interaction)	8.8
Using the same antibiotic with different brand name	6.6
<b>D. Antibiotic Safety, (%)</b>	
<i>Antibiotics could be harmful for children’s teeth? (YES)</i>	65
<i>Antibiotics might develop allergy leading to death? (YES)</i>	73

*Statements in Italics were used in assessing respondents’ knowledge score*

The association between participants' knowledge about antibiotic use and their gender, age, educational level and place of living was presented in table 3. No significant difference was shown between the antibiotic aim of use and participants' gender, age and place of living. However, the level of education significantly affected the participants' knowledge regarding the aim of antibiotic use with  $p = 0$  as shown in table 3. Concerning antibiotics resistance, only significant difference ( $p=0.003$ ) was noted between the educational level and the knowledge that resistance is due to not completing the full course of antibiotics as shown in Table 3. Association of antibiotic safety with respondents' age, gender, educational level and place of living shows no significant difference.

Table 3: Correlation between the knowledge of participants about antibiotics and their educational level

Characteristic	Education level					Total/ 214	P-value	
	BSc		MSc					
<b>A. Aim of antibiotic use, n (%)</b>	1 <sup>st</sup> /48	2 <sup>nd</sup> /29	3 <sup>rd</sup> /63	4 <sup>th</sup> /28	5 <sup>th</sup> /14	/32		
Fever	4	2	10	2	0	1	19	0.240
Viral Infection	4	3	4	0	0	1	12	0.436
Bacterial Infection	34	22	41	26	14	23	160	0.021*
Parasitic Infection	3	4	4	1	1	4	17	0.636
Both viral and bacterial Infections	6	2	5	0	1	1	15	0.397
Bacterial viral parasitic and fever	0	0	0	0	0	0	0	
Bacterial Infection with fever	8	15	33	19	8	14	97	0*
Common cold cough and nasal congestion	0	0	0	0	0	0	0	
Stomachache	0	0	0	0	0	0	0	
Treatment of sore throat	0	1	6	0	0	2	9	0.120
<b>B. An antibiotic will always be effective in the treatment of same infection in the future?</b>	6	2	6	2	2	6	24	0.665
<b>C. Antibiotic resistance is due to:</b>								
Using antibiotics when they are not necessary	35	25	49	26	14	26	175	0.108
Not completing the full course of antibiotic	23	19	36	23	14	20	135	0.003*
Using antibiotics without physician prescription (Self-medication)	25	17	37	18	9	19	125	0.924
Taking antibiotic before meal	0	0	3	0	0	0	3	0.20
Using antibiotic in febrile illness	5	2	2	0	0	0	9	0.129
Taking antibiotic with another drug (drug-drug interaction)	4	2	9	0	2	2	19	0.312
Using the same antibiotic with different brand name	0	3	6	2	0	2	13	0.277
<b>D. Antibiotic Safety</b>								
Antibiotics could be harmful for children's teeth?	31	20	35	21	12	20	139	0.250
Antibiotics might develop allergy leading to death?	33	19	44	22	13	24	155	0.442

A scoring system was used to determine the respondents' knowledge towards antibiotics. The knowledge score was calculated by summing the participants' number of correct responses to 8 statements written in italics as shown in Table 3. One point was given for each correct answer and zero for each wrong response, with a maximum obtainable correct score of 8 for each respondent. The knowledge score was then categorized into three levels indicated by score 1 (0–3), score 2 (4–6), and score 3 (7–8) as shown in Table 4.

Table 4: Knowledge score of participants

Score		n (%)	Total (%)
Score 1	1/8	4 (1.8)	12.4
	2/8	7 (3.1)	
	3/8	17 (7.5)	
Score 2	4/8	30 (13.3)	53.5
	5/8	48 (21.2)	
	6/8	43 (19)	
Score 3	7/8	49 (21.7)	34.1
	8/8	28 (12.4)	

Table 5 shows the association between knowledge score and socio-demographic characteristics among study participants. There were significant differences between participants knowledge score by age and education level ( $p < 0.01$ ). Good level of knowledge (score 3;  $> 75\%$  correct response) was found in participants of age group between 20 and 30 years (38%) as compared to those less than 20 years of age (21.7%). Respondents in their last year of undergraduate studies were found to have better knowledge regarding antibiotics (score 3; 64.3%) than those with lower educational levels. The majority of Master students (62.5%) expressed moderate level of knowledge (score 2). It is worth noting that both the gender and place of residency did not significantly affect the level of knowledge.

Table 5: The knowledge score of respondents with respect to their socio-demographic characteristics

Characteristics	Total	Score 1 < 37.5%	Score 2 37.5-75%	Score 3 > 75%	P-value
<b>Gender, n (%)</b>					
Male	40	6 (15)	21 (52.5)	13 (32.5)	0.858
Female	186	22 (11.8)	101 (54.3)	63 (33.9)	
<b>Age, n (%)</b>					
<20 years	60	1 (1.7)	46 (76.7)	13 (21.7)	0.00
20-30 years	166	27 (16.3)	76 (45.8)	63 (38)	
<b>Educational level, n (%)</b>					
1st year BSc	48	8 (16.7)	33 (68.8)	7 (14.6)	0.005
2nd year BSc	29	4 (13.8)	13 (44.8)	12 (41.4)	
3rd year BSc	63	8 (12.7)	35 (55.6)	20 (31.7)	
4th year BSc	28	1 (3.6)	11 (39.3)	16 (57.1)	
5th year BSc	14	0 (0)	5 (35.7)	9 (64.3)	
MSc	32	5 (15.6)	20 (62.5)	7 (21.9)	
<b>Beirut Resident, n (%)</b>					
Yes	132	16 (12.1)	72 (54.5)	44 (33.3)	0.978
No	94	12 (12.8)	50 (53.2)	32 (34)	

### 3.3 Practice Of Antibiotic Use And Misuse

The majority (66.8%) of the study population had used antibiotics within 12 months prior to the study period. Almost one-fifth (21.2%) of respondents reported using antibiotics twice within the past year, while around ten percent (9.7%) reported using antibiotics more than 3 times. The frequency of antibiotic use by the respondents in the past year is shown in Figure 2a. As for the source of antibiotics, the majority of respondents (44.2%) got their antibiotics from physician after consultation and 12.8% got their antibiotics directly from pharmacy without physician consultation as shown in Figure 2b. Figure 2c summarizes the reason given behind the antibiotic use. About one-third (28.3%) and thirteen percent of respondents who received antibiotics at least once in the past year used it for sore throat treatment and bronchitis, respectively.

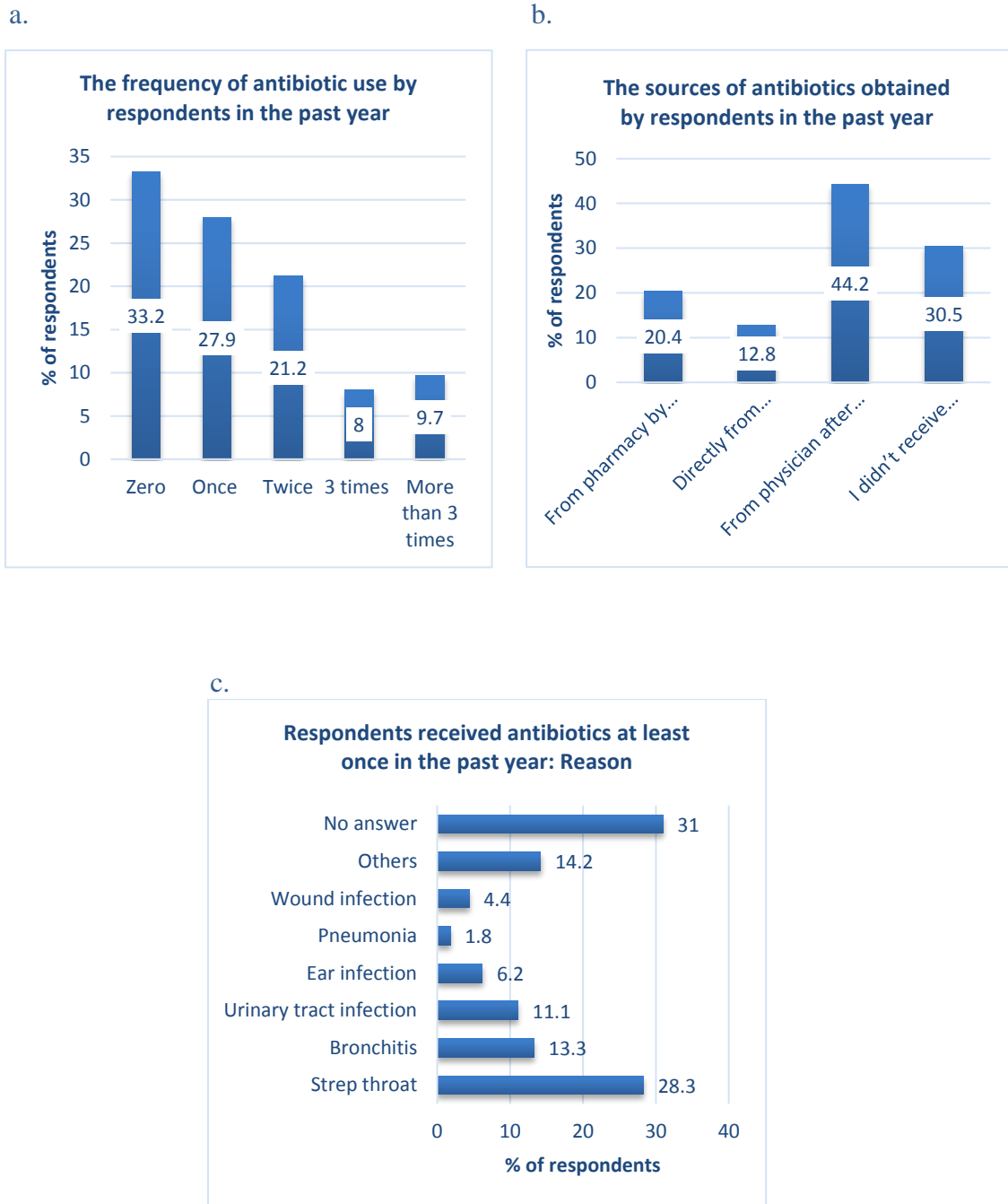


Fig.2: The practice of antibiotic use and misuse (n=226)

### 3.4 Patient-Physician Relationship

Table 6 describes with 4 statements physician's prescription patterns of antibiotics. Less than half of participants (42%; CI 35 – 48) request antibiotic prescriptions from their physician. Only 12% (CI 8 – 16) consult another physician to prescribe antibiotics if the first disagree to do so. Almost half (47% CI 40 – 53) agreed that physicians prescribe antibiotics to treat common cold and 46% (39 – 52) agreed that physicians prescribe antibiotics over the phone without being examined.



Table 6: Patient-physician relationship (n=226)

Parameter	n (%)	
Do you request antibiotic prescriptions from your physician?	Yes	94 (42)
	No	132 (58)
Do you consult another physician to prescribe antibiotic if your physician disagreed to do so?	Yes	27 (12)
	No	199 (88)
Physician routinely prescribed antibiotics to treat common cold symptoms	Yes	106 (47)
	No	120 (53)
Physicians prescribe antibiotics over the phone without examining the patient?	Yes	103 (46)
	No	123 (54)

#### 4. DISCUSSION

In Lebanon, like in other developing countries, antibiotics can be easily purchased even without a prescription. Thus, a major public health problem “antibiotic resistance” would be of great concern and assessing the knowledge of health professions students is of outmost importance. Our findings, in addition to other similar studies performed in Lebanon to assess the knowledge, attitudes and practices of antibiotic usage will assist in designing educational campaigns and informative programs targeting community by providing a quantitative data about the actual situation of antibiotic use, knowledge and attitudes among Lebanese students (Mouheiddine et al., 2015). In the current study, the majority of respondents (74.8%) were aware that antibiotics are used to treat bacterial infection. Another similar study conducted in Jammu, India, reported that 90% of medical students considered that antibiotics are used to cure bacterial infections (Khajuria et al., 2019). Moreover, our study showed that the majority had a moderate level of consumption (1-3 times per year), whereas according to Mouheiddine *et al.* a healthy individual should not consume antibiotics more than one time per year (Mouheiddine et al., 2015).

As for the source of antibiotics, just 44.2% of the respondents got their antibiotics from physician after consultation. This finding is alarming and is low when compared with similar studies from Arab countries such as Kuwait, Syria and Jordan (Barah et al., 2010; Shehade et al., 2012; Jairoun et al., 2019).

About thirteen percent (12.8%) got their antibiotics without prescription, which shed the light on the role of pharmacists in our society. Antibiotic self-medication can be due to many causes mainly lack of knowledge and easy accessibility to antibiotics (Jairoun et al., 2019)

In this study, students were knowledgeable about antibiotic resistance. According to the respondents. Antibiotic resistance was due to using antibiotics without physician prescription, using antibiotics when not necessary or due to not completing the full course of antibiotics which is in alignment with previous studies carried out in Lebanon (Mouheiddine et al., 2015; Khajuria et al., 2019)

This study is not without its limitations. This study was based on a cross sectional design, which cannot be representative to the entire population. A similar study could be conducted on a larger sample size that include doctors and healthcare providers in practice, general population and others to provide adequate predictive power to generalize to the whole population. In such case, the findings would generate an information tool to improve knowledge, attitude and behavior concerning antibiotic issues. Another limitation is that the respondents may have answered about their knowledge and not their real behavior concerning antibiotic use.

## 5. CONCLUSION AND FUTURE DIRECTIONS

Our findings clearly highlight the importance of adopting awareness and educative programs for antibiotic use for students and general population. The ministry of public health in Lebanon should also establish campaigns to increase awareness towards antibiotics, emphasis should be on pharmacists for not dispensing antibiotics without physician examination and prescription, and for presenting good patient counseling for those taking antibiotics to prevent its misuse and resistance.

The ministry of Public health in Lebanon shall implement an appropriate plan to improve the appropriate use of antibiotics and prevent its misuse and resistance. Such measures should include:

- Establishing informative programs for public and healthcare providers regarding prudent use of antibiotics
- Publish guidelines and protocols to be used in healthcare facilities.
- Enforce regulations to reduce over-the-counter sale to reduce antibiotics self-prescription.
- Launch awareness campaigns through social media about the rational use of antibiotics.

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