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# Misuse of Antibiotic Therapy among University Community in South Jordan

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## Abstract

Misuse of antibiotic is a common problem worldwide; of the common features of this problem were failure to complete the course of treatment, skipping doses, reusing leftover antibiotics, or self-treatment with antibiotics. This indeed can have a negative impact on individuals and community on both economic and health levels. It was established that misusing antibiotics might be a major determinant in the development of bacterial resistance, which became a major global public health problem. In Jordan, antibiotic misuse was highly extended with high prevalence of self-medication and inappropriate use of antibiotics. For understanding the growing resistance to antibiotics and the health problems associated with their inappropriate use.

This study aimed to estimate the prevalence and the risk factors associated with antibiotic misuse among Al-Hussein Bin Talal University Community. Survey study recruited 500 university students and staff using stratified randomization technique in a 4-week period and used a questionnaire asking about demographic data and the use of antibiotics. Participants in this study reported obtaining information on antibiotic use from sources, like physicians (33.7%), enclosed leaflets (20%), and pharmacist (18%). Reasons for re-using antibiotics without a prescription in this study related to positive previous experience with the antibiotic and the difficulty reaching a physician, and half the participants used the antibiotic for three days or less depending mainly on the symptoms. The controlled use of antibiotics is cornerstone to reduce antibiotic resistance; therefore, it is crucial to limit the use of antibiotics to the prescribed ones by a physician who received proper training, and thus minimizing the improper administration of antibiotics. Increase community awareness on the proper use of antibiotics.

**Keywords:** Misuse; Antibiotic; University community; Jordan

microbial resistance after using non-prescribed antibiotics against numerous infectious diseases [2]. Although some would argue that antibiotic resistance may increase as long as antibiotic was in use, until recently clinical significance of this resistance was not clearly reported in the literature [3]. The emergence of antibiotic-resisting microbial organisms, such as the superbugs and VRSA, rendered many antibiotic therapies to become less useful [4]. As both the prevalence and overuse of antibiotics became prevailing now a days, the resistance to antibiotic has become a serious global public health problem [5].

Misuse of antibiotic therapy refers to failure to complete therapy, skipping of doses, re-use of leftover, or self-medication with antibiotics [6,7]. In addition to antibiotic resistance, this behavior may also lead to economic loss, increased incidence of treatment failure, and returned visits to the physician [7,8]. Factor associated with antibiotic therapy misuse included consumer's knowledge and attitudes toward antibiotic consumption, expectations from the therapy, physician's knowledge and experience, and pharmaceutical marketing [2,9,10]. In a study in the Northeast of the United States, medical students emphasized the need for both education and feedback on antimicrobial prescribing in order to control overuse or misuse which was high among the population in general [11]. In addition, it was reported that University students misuse antibiotic [12,13]. Furthermore, in China the widespread prescribing of unnecessary antibiotics, especially antibiotics administered parentally [12].

In Jordan, the prevalence of taking antibiotics without a prescription and the inappropriateness use of this therapy were found to be alarmingly high [6,14]. With the growing number of antibiotic misuses in Jordan, health problems associated with the inappropriate use of antibiotics were also expected to increase. Given the paucity in knowledge concerning this behavior in Jordan, this study examined antibiotic misuse among university students and workers in the south of Jordan. This aim was going to be achieved through three specific objectives:

- To estimate the prevalence of antibiotic misuse among university community.
- To identify risk factors associated with antibiotic misuse.
- To examine individual characteristics linked to antibiotic misuse.

## Introduction

Worldwide, antibiotic misuse was considered as one of the challenges to many health care systems [1]. In the last two decades, the world witnessed an increased incidence of

## Materials and Methods

### Study design

This study adopted a cross sectional survey questionnaire design to explore the use of antibiotics among university staff and student in Al-Hussein Bin Talal University. Data was collected over a period of three months between July and September 2011.

### Study questionnaire

A questionnaire was developed based on reported factors influencing individual choice of using/misusing antibiotic therapy. The questionnaire written in Arabic language and included two parts; demographic information and use/misuse of antibiotic therapy. A pilot study was conducted to assure questionnaire's clarity, comprehensibility, and research ability involving 15 university students and workers. This study indicated that the questionnaire items were clear, easy to read and covering all study concepts. The results from the pilot study were not included in data analysis of the main study.

### Ethical considerations

Ethical approval was granted by the university IRB, and consenting was implied as the participants agreed to fill in the questionnaire. The study plan was delivered to the participants using advertisements on the college journal, webpage of the university and visits to students and workers in each college. There were no information required in the questionnaire that would indicate participants' identities and all data provided was treated for scientific research only, which would generate recommendations for those involved in the topic.

### Sample

The study was conducted at the vicinity of Al-Hussein Bin Talal University, Ma'an City, Jordan. All university staff and students were recruited during a 4-week period using a stratified random sample from the following areas:

- Scientific Faculties, which included Nursing, General Sciences, Engineering, and Information Technology.
- Humanitarian Faculties including Art, Economy, Education, Tourist, and Hospitality.
- Administrative units and departments.
- Data were collected through random distribution of the study questionnaire on the university staff and students. The sample represented 10% of the total number of enrolled students and staff employed in the university.

### Data Analysis

The quantitative data were analyzed using SPSS\* V21 software. Descriptive statistics were used to measure the characteristics of the participants as well as the mean scores, standard deviation and standard errors for the responses on

the study questionnaire. In addition, chi-square was used to find out the relationship between the variables.

### Sample

The study sample represented students and employees at the Al Hussein Bin Talal University. Students were from different areas of study and represented all academic years (Table 1). The majority of participants in this study were students (86.6%, N=324), followed by administrative employees (7.8%, N=29). In addition, the majority were females (61.2%, N=229), single (86.6%, N=324) and were aged between.

**Table 1** Participants' characteristics (N=374).

Factor	Category		
Students	324 (86.6%)	First Year	109 (29.1%)
		Second Year	78 (20.9%)
		Third Year	85 (22.7%)
		Fourth Year	44 (11.8%)
		Fifth Year	8 (2.1%)
Faculty Staff	18 (4.8%)		
Administrative officer	29 (7.8%)		
Employee Services	3 (0.8%)		
Sex	Male	145 (38.8%)	
	Female	229 (61.2%)	
Age	18-20	200 (53.5%)	
	21-30	140 (37.4%)	
	31-40	22 (6%)	
	41-50	9 (2.4%)	
	>50	3 (0.7%)	
Marital Status	Single	324 (86.6%)	
	Married	47 (12.6%)	
	Widowed	2 (0.5%)	
	Divorced	1 (0.3%)	
Faculty	Education	20 (5.3%)	
	General Sciences	28 (7.5%)	
	Information Technology	23 (6.1%)	
	Art	110 (29.4%)	
	Engineering	36 (9.6%)	
	Tourism	21 (5.6%)	
	Business Management	34 (9.1%)	
	Nursing	54 (14.4%)	

## Results

There were 72.5% (N=271) responded positively when asked about their use of antibiotic during the last six months. While 47.6% (N=178) said that they would use antibiotics when they have one or more of the following symptoms; diarrhea, rhinorrhea, flu, toothache, sore throat, chest tightness, urinary tract infection, tonsillitis, otorrhea, 55.9% (N=209) reported that they would use antibiotics without a prescription when having any of these symptoms.

Although 47.9% (N=179) said that they use prescribed antibiotic, the remaining participants use antibiotic without prescriptions from sources such as pharmacy (20.9%, N=78) and from antibiotics that have remained from previous treatments of a house member at home (20.3%, N=76) (Tables 2 and 3).

**Table 2** Sources of obtaining antibiotics for treatment.

Source	Category				Total
	Student	Faculty	Administrative Personnel	Service Worker	
Prescribed by Physician	143	11	23	2	179
	44.10%	61.10%	79.30%	66.70%	47.90%
Pharmacy	73	3	2	0	78
	22.50%	16.70%	6.90%	0.00%	20.90%
Previous experience	73	1	2	0	76
	22.50%	5.60%	6.90%	0.00%	20.30%
Friends	24	3	0	1	28
	7.40%	16.70%	0.00%	33.30%	7.50%
Others	11	0	2	0	13
	3.40%	0.00%	6.90%	0.00%	3.50%

**Table 3** Reasons for obtaining antibiotic without a prescription.

Factor	N (%)
Previous positive experience with the antibiotic	113 (30.2%)
Difficulty reaching a physician	56 (15%)
Low income	22 (5.9%)
Others (availability, easiness, speed, left-over, multi-step insurance procedure)	59 (15.8%)

As approximately one-third of the participants (33.2%, n=124) reported that they would not visit a physician to obtain a prescribed antibiotic. When they were asked for reasons why they would obtain antibiotic without a prescription, approximately 30.2%, (n=113) reported that previous experience with the successful use of antibiotic encourages

them to reuse it again. Other reasons include difficulty reaching a physician, and the low income (Table 4). As illustrated in table QQ, the participants indicated that they knew how to use the antibiotic from different sources, such as physician (33.7%, n=126), and leaflet inside antibiotic pack (20.1%, n=75). Other reasons included the availability of the drug without a prescription through visiting the pharmacy, easiness, speed, leftover from previous uses, and the structured multi-step insurance procedure required to obtain the antibiotic, which in this case referred to the list of approved medications by the insurance company that might exclude some of these drugs.

**Table 4** Sources of information about using the antibiotic.

Source	N (%)
Physician	126 (33.7%)
Leaflet inside antibiotic pack	75 (20.1%)
Pharmacy	68 (18.2%)
Previous experience	57 (15.2%)
Friends	39 (10.4%)
Others	9 (2.4%)

The second issue was concerned with the physician choice of treatment. The majority of participants (67.7%, n=253) said that physician first choice was antibiotic. However, just below half (42%, n=157) reported that they would take the antibiotic for only 3 days or less (Table 5), in fact 241 (64.4%) of them do not follow physician's instruction when prescribing the antibiotic. Only 132 (35.3%) reported that they follow physician's instructions when using the antibiotic, and the remaining did not follow these instructions for different reasons, including feeling better (44.1, n=165), side effects (8.8%, n=33), study and work reasons (5.9%, n=22), and others (5.9%, n=22). They also reported that even when following physician instructions, 211 (56.4%) do not take their antibiotic on time, and reasons for this behavior could be related to forgetting the time of the next dose (29.1%, n=109), work or study conditions (13.1%, n=49), appearance of side effects (9.4%, n=35), or other reasons (5.9%, n=22); a total of 159 (42.5%) reported having doses on time. Interestingly, 237 (63.4%) of the participants said that buy another package and continue on the same antibiotic if symptoms remain present. Participants also said that they knew that some might be sensitive to antibiotics (71.1%, n=268), and 192 (48.7%) said that they would ask their physician to prescribe antibiotic as a treatment (Table 6).

Chi square was used in this study to identify the relationship between participant category and sources of information about using the antibiotic. Students consumed non-prescribed antibiotic more often compared with the academic and employees at the university (P<0.05). Interestingly, participants from the scientific colleges, including nursing, and the higher academic year students reported using antibiotics without prescriptions more frequently compared with the other groups (P<0.05). There were no significant difference

between both sexes, and the age groups of participant on the use of antibiotic without prescription ( $P>0.05$ ).

**Table 5** Period of taking the antibiotic.

Period of using antibiotic	Student	Faculty	Administrative Personnel	Service Worker	Total
1-3 days	142	4	10	1	157
	43.80 %	22.20 %	34.50 %	33.30 %	42.00 %
4-7 days	62	10	10	0	82
	19.10 %	55.60 %	34.50 %	0.00 %	21.90 %
> 7 days	28	1	1	0	30
	8.60 %	5.60 %	3.40 %	0.00 %	8.00 %
Until symptoms disappear	92	3	8	2	105
	28.40 %	16.70 %	27.60 %	66.70 %	28.10 %
Total	324	18	29	3	374
	100 %	100 %	100 %	100 %	100 %

**Table 6** Antibiotic using behaviors among the participants.

Item	Yes N (%)	No N (%)
Antibiotic is physician's first choice of treatment	253 (67.7%)	121 (32.3%)
Follow physician's instruction when using antibiotic	132 (35.3%)	242 (64.7%)
Taking antibiotic doses on time	163 (43.6%)	211 (56.4%)
Continue the same antibiotic when still having symptoms	237 (63.4%)	137 (36.6%)

In addition, participant's sex, age group and type of college did not influence the period of using antibiotic. However, the academic year was found to influence the period of taking antibiotic where first and second year students reported using antibiotics longer periods compared with the other academic years ( $P<0.05$ ).

## Discussion

This study aimed to identify antibiotic-related behaviors among a university community in South Jordan. As an accessible and relatively easy to identify and educate, university community represents an exemplary population whose knowledge and practice on the proper use of antibiotics can improve. To our knowledge, in Jordan, there is a scarcity in studies investigating this topic amongst the general population, and the university community in specific. The majority of the participants in this study were students representing all years of study, then faculty, and there were limited number of administrative personnel and service personnel. The five dimensions this study investigated were

sources of obtaining antibiotics for treatment, reasons for obtaining antibiotic without a prescription, sources of information about using the antibiotic, period of taking the antibiotic, and antibiotic using behaviors among the participants.

Findings focusing on the use of prescribed antibiotics indicated that nearly half of the participants used prescribed antibiotics by a physician including approximately two-third of the faculty and just below half of the students. In Jordan, it was reported that 35% of participants from the general population used unprescribed antibiotics [15]. Although numbers are variable, the reported rates are still high and require further attention [16]. Similarly, it was found that 44% of university Romanian students used antibiotics with no prescription during the last six months of data collection. Supporting this evidence, it was reported that nearly 23% of university students in Pakistan used antibiotics without a prescription [17]. Comparable numbers were also recorded in different studies among the general populations in Europe where rates ranged between 10% and 45% in countries like Britain, Greece, Italy, and Macedonia [18-21].

In this study, pharmacy and previous experience rated high among the sources of obtaining knowledge to the use of antibiotics, despite that legislations do not give the pharmacist the right to prescribe antibiotics [22]. It is the case of Jordan as Pavyde et al. reported that pharmacists were responsible for the use of more than 70% of antibiotics without prescriptions in Lithuania [23]. Similarly, Ghaieth et al. from Libya also reported that 74% of university students, including medical students, had positive experience and purchased their antibiotics based on pharmacist advice [24]. Previous positive experience with the antibiotic rated high in this study (20.3%). In another study more than 27% of university students would repeat the use of the same antibiotic, as they believed it would always be effective in treating similar infections in the future [17].

Reasons for re-using antibiotics without a prescription in this study related to positive previous experience with the antibiotic and the difficulty reaching a physician. Although no access to a physician's consultation should not justify the increased prevalence of self-medication as a physician is available at the university clinic, but a number of studies reported this as a main challenge in the case of university students and employees [24,17].

## Sources of information about the antibiotics

Participants in this study reported obtaining information on antibiotic use from sources, like physicians (33.7%), enclosed leaflets (20%), and pharmacist (18%). This was also clear in Pavyde et al. who found that health care professionals were the main source of antibiotic information, where physicians and pharmacists play an important role in contributing to knowledge about antibiotics [23]. Further, Ghaieth et al. reported that just more than half the students purchased antibiotics based on physician prescription, while nearly one-third the students had pharmacy consultation before purchasing the antibiotic, and nearly 10% depended on

information from a relative or a friend, who was not related to health care [24].

### Period of taking antibiotics

Approximately half the participants in this study reported having antibiotic for three days or less depending mainly on the symptoms, and nearly 8% took antibiotics for more than 7 days. This was comparable with what was reported by Suaifan et al. who said that more than 60% of university students in Jordan reported that they did not complete the last course of antibiotics [25]. Moreover, it was indicated that most individuals usually do not complete the course of antibiotics for a particular infection, which leads to increased prevalence of drug resistance [17]. Furthermore, Ghaieth et al. found that more than half the students took the antibiotics for more than 7 days. Based on findings in this study, students reported that antibiotics were used to treat symptoms among more than 28% of participants; thus, the interruption of the course of treatment is justified by the absence of those symptoms [24]. Similar findings were found medical students interrupted the course of treatment once symptoms subsided [9,26]. This might indicate that knowledge might not a factor in some situations or settings as Huang et al. reported that although medical curricula included knowledge on antibiotics and its resistance, excessive use of antibiotics among the more senior medical students is still practiced [27,28].

Interestingly, the majority of students in the present study reported that regardless of the suspected cause of symptoms (bacterial or viral), the main choice for physician is always antibiotic which was also found in Ghaieth et al. [24]. This percentage is converted when asking about following physician instructions as only one-third the students reported following those instructions, indicating perhaps lack of knowledge about the serious consequences of drug resistance and delayed full recovery due to incompleteness of the course of treatment. In addition, students also reported continuing on the same antibiotic when symptoms stay longer.

### Clinical implications

The controlled use of antibiotics is cornerstone to reduce antibiotic resistance, amongst the strategies to achieve this issue is the use of only prescribed antibiotics [28]. In addition, some infections require no antibiotic use, including viral infections, which can be similar in symptoms to bacterial infections to many individuals with limited knowledge in this area [23,29]. Issues like type of bacteria of the second infection and bacterial resistance upon subsequent use of the same antibiotic pose a challenge that needs to be addressed when educating those individuals. It is therefore crucial to limit the use of antibiotics to the prescribed ones by a physician who received proper training, and thus minimizing the improper administration of antibiotics. It is also the responsibility of health care professionals, especially physicians, to counsel patients and provide the required information about using antibiotics.

The prescribing practices of health care professionals are not regulated by the laws, which consider prescribing antibiotics as a role of a trained physician [30]. Unfortunately, laws against the prevention of dispensing unprescribed antibiotics are not enforced in community pharmacies in Jordan [31]. In addition, more emphasis is required pertaining to the controlled use of antibiotics, not only the unprescribed, but also the prescribed ones through increasing awareness of physicians on prescribing and re-prescribing antibiotics.

### Conclusion

Antibiotic misuse emerged as a public health challenges, the study indicates that pharmacy and previous experience rated high among the sources of obtaining knowledge to the use of antibiotics, despite that legislations do not give the pharmacist the right to prescribe antibiotics. Therefore, it is crucial to limit the use of antibiotics to the prescribed ones by a physician who received proper training and thus minimizing the improper administration of antibiotics and to reduce antibiotic resistance. It is also the responsibility of health care professionals, especially physicians, to counsel patients and provide the required information about using antibiotics. Also more emphasis is required pertaining to the controlled use of antibiotics, not only the unprescribed, but also the prescribed ones through increasing awareness of physicians on prescribing and re-prescribing antibiotics.

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