



# Risk Factors of Antibiotics Self-medication Practices among University Students in Cairo, Egypt

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## Abstract

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**BACKGROUND:** Self-medication is a practice with major global implications, especially with antibiotics intake. Self-medication among future health-care professionals could affect their way in prescribing medication in the future.

**AIM:** This study was conducted to estimate the magnitude and the determinants of antibiotics self-medication practices and to describe the pattern of antibiotics abuse among undergraduate university students.

**METHODS:** A cross-section study was conducted among 563 medical students from public and private universities in Cairo, Egypt, using a questionnaire.

**RESULTS:** About 77.7% of the students used antibiotics without prescriptions with no statistical differences by age, sex, residence, or type of universities. More than half of the students (51.7%) do not know the effect of antibiotics abuse on microbial resistance. Most self-treated antibiotics were used to manage gastroenteritis symptoms (70%), respiratory symptoms (63%), and dental infections (36%), other causes such as headache or prophylactic reasons (21%). About 91.7% of the self-medicated students reported access to antibiotics from the pharmacy without a prescription and 71% of them mentioned discontinuation of a course of antibiotics at least once during the last year. About 81% of the students who do not know the effect of antibiotic abuse are self-medicated versus 75% of their counterpart who know and this difference is statistically significant. The multivariate analysis identified the residence as an independent predictor of their knowledge (area of residence = 1.6, 95% confidence interval [1.1–2.3]).

**CONCLUSION:** The prevalence of self-medication with antibiotics among university students in Cairo is high. Our findings highlight the urgent need for tailored interventions to control this practice.

## Introduction

Self-medication is the use of drugs to treat self-diagnosed disorders or symptoms, or the intermittent or continued use of a prescribed drug for chronic or recurrent diseases or symptoms [1]. This includes acquiring medicines without a prescription, sharing medicines or using leftover medicines stored at home [2]. Self-medication causes many problems: Incorrect self-diagnosis, inadequate treatment of diseases, and waste of public expenditure [3]. Self-medication is a practice with serious global implications especially with antibiotics intake [4]. About 57% of the 3.5 billion health problems treated annually in the US were treated with a nonprescription drug. Up to 60–80% of the health problems in developing countries are self-medicated [3].

In a study of the knowledge, attitude, and practice of the university students toward self-medication in Egypt, the prevalence of self-medication was 55%. Of which 87.2%, 58.8%, and 54.4%

took analgesics, antibiotics, and vitamins without physician prescription [4]. Purchase of antibiotics without prescription for self-medication is a significant public health problem in developing countries [5]. Self-medication with antibiotics may lead to masking symptoms, treatment failure, and development of drug resistance by bacteria [6], [7].

There is evidence showing that antibiotics use varies according to patient characteristics, geographic location, medical education, availability of drug, law, and characteristics of the market (socioeconomic and cultural determinants) [5], [8].

Self-medication habit is related to the level of education. People who have higher levels of education tend to practice self-medication more [7].

Medical students and health-care professionals are usually facing difficulty when seeking health care [9], [10], [11]. Prevalence of self-medication among medical students range from 12% to 99% [9], [10], [11]. Knowledge about drugs and diseases has shown to influence self-medication practice [12]. Self-medication

among future health-care professionals could affect the way they could prescribe medication in the future. Health-care professionals have an essential impact on the efficiency and effectiveness of the health system [13].

There is a growing consensus that antibiotics abuse is a serious problem that needs new strategies for prevention. The study of the prevalence and factors associated with self-medication of antibiotics is necessary to help with the planning of tailored interventions to reduce this practice among Egyptians. Compliance of researches to national priorities generates knowledge that promotes health and prevents health problems in Egypt [14]. Despite the risk of this problem, few studies regarding students' self-medication practices have been conducted in Egypt [4], [15], [16]. Hence, this study was conducted to estimate the magnitude and the determinants of antibiotics self-medication practices and to describe the pattern of antibiotics abuse among undergraduate university students in Cairo.

## Methods

### Study population

A cross-sectional study was conducted among 4<sup>th</sup>-year students of medical colleges (medicine, dentistry, pharmacy, and physical therapy) from two randomly selected universities (one public: Cairo University and one private: Heliopolis University) in Cairo, Egypt. The study was carried out during the academic year 2018–2019.

### Sampling

The sample size was estimated to determine a prevalence of self-medication among university students of 55% [4], with 4% acceptable margin of error and 95% level of confidence. The estimated sample size is 594 [17], after adjustment for non-response, the sample size was increased to 600 students. A multistage sampling technique was adopted. In the first stage, Cairo's universities were stratified into public and private, and one university was selected randomly from each stratum. The sample size was distributed proportionally between two groups. In the second stage, a college or more was chosen from each university. Finally, from each college, a cluster (section) or more were selected randomly. All the students in the selected clusters were included in the study.

### Data collection

A questionnaire was used to collect the data. The final version of the questionnaire had 12

questions subdivided into two categories. The first part of the questionnaire included background data of the respondents (age, sex, type of university, and place of residence). The second part of the questionnaire included data about self-medication practices covering self-prescribing antibiotics, reasons for self-medication, reported symptoms associated with antibiotics self-medication, knowledge of the side effect of the antibiotic abuse (development of microbial resistance), methods of purchase from pharmacy, types of antibiotics, reading the instructions, and the discontinuation practices. All items in the questionnaire relate to the period of the previous year. The questionnaire was modeled after that used in a previous study [9].

### Ethical consideration

The Ethical Committee of the Public Health Department, Faculty of Medicine, Cairo University reviewed and approved the study. All participants voluntarily participated in the survey after being briefed about the study objectives. An informed verbal consent of study subjects with a full right to withdraw was obtained. The questionnaire was anonymous and all obtained data were kept as confidential.

### Data analysis

All collected data were revised for completeness and logical consistency. Pre-coded data were entered on the computer using a database developed for data entry on Microsoft Office Excel program for windows 10. Data were then transferred to the computer program IBM SPSS (Statistical Package for the Social Science; IBM Corp, Armonk, NY, USA) release 22 for Microsoft Windows for data analysis. Descriptive statistics including frequencies and percentages were displayed to summarize the data, while Chi-square test was used to assess the relationship between categorical variables. The multivariate logistic regression analysis was used to compute adjusted odds ratio (OR) and 95% confidence intervals (95% CI) to assess the independent associations of these variables with knowledge of risk of antibiotics self-medication on development of bacterial resistance.  $p \leq 0.05$  was considered statistically significant.

## Results

The questionnaires were returned in by 563 (94%) respondents of a total of 600 students, as follows: 243 (43%) were from a public university (Cairo) and 320 (57%) from a private university (Heliopolis).

About 64% of them were female and 62.2% of them were living in a rural area. Four hundred and thirty-eight (77.7%) students used antibiotics without prescriptions with no statistical differences by age, sex, or residence. About 80% and three quarter of the students from the public and the private universities, respectively, reported taking antibiotics without prescription with no statistical difference as well. The knowledge of the effect of antibiotics abuse on the development of antimicrobial resistance was a determinant of self-medication among medical students: About three-quarters of the students who know the effect of antibiotic abuse are self-medicated versus 81% of their counterpart who do not know and this difference is statistically significant,  $p=0.05$  (Table 1).

**Table 1: Demographic characteristics of the respondents and their self-medication history**

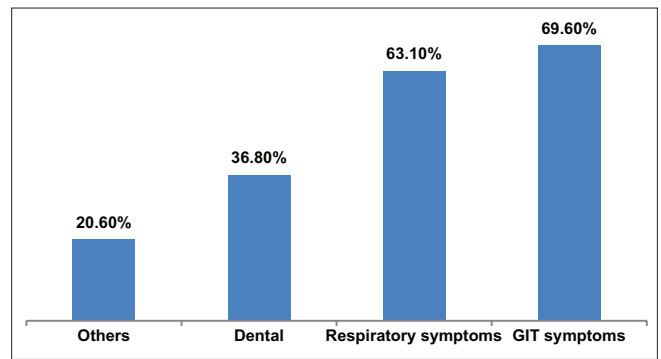
Sociodemographic characteristics	Self-medication (Yes)		Self-medication (No)		Total n	X <sup>2</sup>	p value
	n (n=438)	%	n (n=125)	%			
Age							
18	259	78.5	71	21.5	330	100	0.2
20	179	76.8	54	23.2	233	100	
Sex							
Male	160	79.6	41	20.4	201	100	0.6
Female	278	76.8	84	23.2	362	100	0.3
University							
Public	195	80.2	48	19.8	243	100	1.5
Private	243	75.9	77	24.1	320	100	0.1
Residence							
Urban	161	75.6	52	24.4	213	100	0.9
Rural	277	79.1	73	20.9	350	100	0.2
Know effects of antibiotics abuse							
Yes	203	74.6	69	25.4	272	100	3.1
No	235	80.8	56	19.2	291	100	0.05

Eight in every ten self-medicated students use unprescribed antibiotics due to their past experience with similar symptoms. One-quarter of them hate to visit a doctor. A relative offers advice on the type of antibiotics to 16% of the respondents. The majority of the students who are self-medicated reported ease access to antibiotics without a prescription in pharmacies and two in every ten students did not read the antibiotics instructions. More than 70% of them reported antibiotics discontinuation during the last year (Table 2).

**Table 2: Pattern of antibiotics use among self-medicated students**

Pattern	Frequency	Percent
Reason for antibiotics self-medication		
Experience with similar symptoms	364	83.1
Do not want to visit doctor	110	25.1
Advice from a relative	69	15.8
All	26	5.9
Purchase in pharmacy without a prescription		
Yes	402	91.7
No	36	7.3
Read the Ab instructions		
Yes	365	83.3
No	73	16.7
Ever discontinue the Ab course		
Yes	311	71
No	127	29
Total	438	100

Most self-treated antibiotics were used to manage gastroenteritis symptoms (70%), respiratory symptoms (63%), and dental infections (36%), other causes such as headache or prophylactic reasons (21%), as shown in Figure 1. The most common antibiotics used are Augmentin followed by penicillin and amoxicillin. However, about half the respondents were unable to recall the drug used (Table 3).



**Figure 1: Reported symptoms associated with antibiotics self-treatment**

<sup>†</sup>Others: Headache or for prophylactic reasons.

Table 4 provides the crude and the adjusted ORs with 95% CI that quantify the association between the characteristics of the students and the knowledge of the long-term effect of antibiotics abuse on the increase in the antimicrobial resistance using Chi-square test and multiple logistic regression models, respectively.

**Table 3: Types of self-prescribed antibiotics**

Types	Frequency	Percent
Augmentin	125	28.5
Penicillin	49	11.2
Amoxicillin	36	8.2
Azithromycin	6	1.4
Vancomycin	9	2.1
Do not remember	213	48.6
Total	438	100

More than half of the students do not know the effect of antibiotics abuse. Knowledge of the consequences of the antibiotics abuse was shown to be significantly associated with the residence. About 48.3% of the students know the results of antibiotics abuse on the development of antimicrobial resistance development secondary to the antibiotic abuse. The bivariate analysis shows that the likelihood of their knowledge is higher in respondents living in urban areas and attends a private university than those living in rural areas and from a public university (crude odds ratios [COR] = 1.8, 95% CI [1.1–1.5]) and (COR = 1.9, 95% CI [1.4–2.7]), respectively. The multivariate analysis identified the residence as an independent predictor of knowledge (area of residence = 1.6, 95% CI [1.1–2.3]) [Table 4].

**Table 4: Predictors of knowledge of the microbial resistance risk of the antibiotics abuse**

Predictors	Knowledge		Crude OR [95% CI] <sup>†</sup>	Adjusted OR [95% CI] <sup>*</sup>
	Yes n (%)	No n (%)		
Age				
18	151 (45.8)	179 (54.2)	1.3 [0.9–1.8]	0.7 [0.5–1.0]
20	121 (51.9)	112 (48.1)		
p value	0.09			
Sex				
Male	97 (48.3)	104 (51.7)	1.0 [0.7–1.4]	0.9 [0.6–1.3]
Female	175 (48.3)	187 (51.7)		
p value	0.5			
University				
Private	178 (55.6)	142 (44.4)	1.9 [1.4–2.7]	0.5 [0.4–0.7]
Public	94 (38.7)	149 (61.3)		
p value	≤0.001			
Residence				
Urban	123 (57.7)	90 (42.3)	1.8 [1.1–1.6]	1.6 [1.1–2.3]
Rural	149 (42.6)	201 (57.4)		
p value	≤0.001			
Total	272 (48.3)	291 (51.7)		51.7

<sup>†</sup>Chi-square test, <sup>\*</sup>Binary logistic regression test. OR: Odds ratio, CI: Confidence interval.

## Discussion

Antibiotic misuse is a significant public health problem in Egypt [5]. Prevalence of self-medication is common among university students [4], [15], [18]. The understanding of patients' characteristics associated with the antibiotic misuse is essential to provide social awareness for the effective management of antibiotic use [19]. The study revealed that more than three-quarters of the medical undergraduate university students used antibiotics without prescriptions during the previous year which is fairly high compared to a previous population-based study in Cairo where the usage of unprescribed antibiotics was (29.8%) [5] and to a study in Ain Shams University (55%) [4]. Our finding was in accordance with that of medical university students in Mansoura, Egypt [15] (72.4%) and that of Karachi (76%) [20]. About 79.5% of the undergraduate university students in Khartoum, Sudan, were self-diagnosed and self-medicated for antibiotics/antimalarial [3]. Some studies reported a higher prevalence of self-medication practices: 98% in Palestine [21], 94% in Hong Kong [22], 92.3% in Slovenia [23], and 88% in Croatia [24]. Diving deeper into the root of this problem is important to understand the behavior of subjects toward antibiotic use. The study displayed that gender did not affect the behavior of response toward antibiotic use as 79.6% of males and 76.8% of females were self-medicated with no statistical significance difference. The Cairo study [5] and UAE study [25] ensured this finding while the Lithuanian study [26] revealed that females tended to misuse antibiotics more than males. In contradiction with our results, age and sex were significantly associated with self-medication in city of Mansoura, Egypt and city of Rio Grande, Brazil [15], [27].

The study showed that self-medicated students use antibiotics due to their past experience with similar symptoms (83.1%), or because they do not want to visit a doctor (25.1%), or due to an advice from a relative (15.8%). The majority of students disclosed easy access to antibiotics without a prescription from community pharmacies and more than 70% of them revealed dropping the antibiotic course not less than once during the final year. On the contrary, the previous Cairo study showed that the population use antibiotics without a prescription due to the belief that common diseases do not worth physician's consultation (47.3%), financial issues (33.8%), and medical knowledge (21.6%) [5]. People do not use physicians' consultation due to financial reasons or because it is time consuming [5]. About 59% of university students in Southwestern Nigeria raised the issue of long waiting time at hospitals as one of the reasons for self-medication [28].

Moreover, the study revealed that 70% of gastrointestinal infections and 63% of respiratory infections were managed by those who use antibiotics

(Augmentin followed by penicillin and amoxicillin) without a prescription. Conversely, the Cairo based study showed that 55.7% of respiratory infections were managed by the unprescribed penicillin [6] and that penicillin was the common unprescribed antibiotics used in Greece [29], UAE [25], Jordan [30], Ghana [31], and Nigeria [32]. The most frequent causes in which the undergraduate students in Mansoura, Egypt, self-medicated were cold, headache, sore throat, intestinal colic, and lastly cramps [15].

The analysis displayed that more than half of the students (51.7%) do not know the effect of antibiotics abuse on the development of microbial resistance and this was a predictor of antibiotics self-medication. In Brazil, poor medication knowledge was significantly associated with less self-medication [27]. The previous Cairo based analysis showed that 70.8% of the population are aware of the antibiotic side effects [5]. However, other influences such as age, education, and residence; financial issues had an impact on the behavior response of the population toward antibiotic use. Age and sex were not associated significantly with self-medication practices among students in our study and in Karachi study [20]. The logistic regression analysis showed that being from urban area and going to a private university were independent predictors of students' knowledge. Moreover, residence was the independent predictor of the knowledge of the students as described by the multivariate analysis.

The study is one of the few studies that illustrate the scale of antibiotics abuse among undergraduate students in Egypt. The study is the first step in the planning of tailored interventions to control the problem. However, the study had some limitations. It was conducted among medical students with no control group from nonmedical students. Although self-reported tool is common sources of information about drug exposure, the structure of a questionnaire may have contributed to the difference in the recall of pharmacological treatments. For proper interpretation of data, it is essential to consider the impact of data collection instrument on the validity of estimates [33].

## Conclusion

The antibiotics misuse and nonadherence practices are high among undergraduate university students in Cairo. Our findings highlight the urgent need for tailored interventions to control these practices. This could be achieved through discussing the prudent use of antibiotics and the consequences of misuse in health education campaigns in the universities and in the undergraduate compulsory courses.

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