American Journal of Pharmacological Sciences, 2017, Vol. 5, No. 2, 31-39
Available online at http://pubs.sciepub.com/ajps/5/2/3

DOI:10.12691/ajps-5-2-3

Evaluation of Self-medication Use of Antibiotics within Lebanese Population: A Prospective Pilot Study

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Abstract **Objective:** The aim of this study was to assess the appropriateness of antibiotic used in community based pharmacy setting. **Method:** It is a cross sectional prospective study in a community-based pharmacy setting in Lebanon. It uses a structured random interview to patients visiting a community pharmacy and seeking for antibiotics. Baseline characteristics and reason for self-medication were collected. Completing the questionnaire after 30 days provided information on adherence and usage pattern. Data were analyzed using descriptive statistics and Chi-square test. A multivariate logistic regression was performed to predict factors affecting appropriateness. **Results:** 62.7% of 501 participants bought antibiotics without prescription. Amoxicillin/clavulanic acid was the most used antibiotic as self-medication (33.7%). 62.4% of patients used the right antibiotic and 80.1% used it in correct dosage. The duration of treatment was inappropriate in the majority of cases (68.6%). When all of these three factors were summed together, it turned out that 83.6% of antibiotics were utilized inappropriately. Appropriateness in use was seen in 27.6% and 16.4% of the prescribed and non-prescribed antibiotics respectively. **Conclusion:** Our study shows great misuse of antibiotics and hence there is a need to increase awareness of the health risks related to inappropriate and uncontrolled use of antibiotics.

Keywords: *self-medication, antibiotic, Lebanon, misuse, appropriate use*

Cite This Article: Malak Khalifeh, Nicholas Moore, and Pascale Salameh, "Evaluation of Self-medication Use of Antibiotics within Lebanese Population: A Prospective Pilot Study." *American Journal of Pharmacological Sciences*, vol. 5, no. 2 (2017): 31-39. doi: 10.12691/ajps-5-2-3.

1. Introduction

Antibiotics are considered among the most commonly sold drug classes in the developing countries.[1] Irrational use of antibiotics is a global problem [1] and the rate of this problem and antibiotic resistance is increasing in Middle-East. [2] Resistance rates differ significantly between developing and developed countries. Indeed, data from the Resistance Surveillance and Control in the Mediterranean Region (ARMED) project showed an increase of antimicrobial resistance in countries with high levels of antibiotic consumption such as eastern and southern Mediterranean regions, compared to low resistance rates in northern countries. [3]

This situation could be explained by the unregulated distribution of antimicrobials, and their wide availability without prescription in developing countries which is not the case in most of the developed countries where antibiotics are not available without medical prescription. [4,5] Overuse and the inappropriate use of antibiotics with incorrect dosages for inappropriate period of time increase the rate of selecting resistant strains and their dissemination in the population leading to a higher frequency of treatment failure. [6]

In Lebanon, like most other developing countries, having a valid prescription is not always enforced for receiving prescription-only medicines (POM). Previous researches in Lebanon showed that the prevalence of self-medication with antibiotics is alarmingly high [7] and revealed that the pattern of self-medication practice was inappropriate without further details.

The aim of this study therefore was to describe the community use of antibiotics within the Lebanese population living in Lebanon concerning appropriateness of use, dose and duration of antibiotic consumed and their conformity to IDSA guideline.

2. Method

2.1. Design and Study Population

A cross sectional prospective study was conducted in a community-based pharmacy setting in Lebanon. Data was collected over a 1-year period (September 2015 to September 2016) from 50 community pharmacies (CPs) distributed in the six districts in Lebanon: Beirut, South Lebanon, Nabatiyeh, Mount Lebanon, Bekaa, and North Lebanon.

Eligible participants were recruited randomly from consumers presenting at CPs in Lebanon after they had

purchased antibiotic medication with or without prescription. The patients included were from both genders, aged 16 years and older, coming to purchase antibiotic. The patients were divided into two groups: those buying antibiotic with a prescription versus those buying them without prescription.

The Lebanese University, Faculty of Pharmacy Internal Review Board waived the need for written informed consent. The patients were informed about the objective of the study and were asked to give an oral consent. Only those who gave their voluntary informed oral consent were enrolled.

2.2. Sample Size Calculation

A sample size was calculated assuming a type I error of 5% and a study power of 80% and 95%CI. Based on a previous study, 40% of patients were expected to self-medicate with antibiotics. [7] The minimal sample size necessary to show a twofold increase in the risk of exposure to non-prescribed antibiotics consists of 442 subjects: 186 patients for those buying antibiotic with prescription and 256 without prescription.

2.3. Procedure and Data Collection

Data on antibiotic use was collected using a structured random interview conducted by pharmacists or interviewers who had been briefed about the study's aims and methods. Consecutive customers arriving at CPs seeking antibiotic were interviewed. Data was collected from the participants twice, first at purchase for data about drug used and the condition for which it was to be used, then by calling the patient 30 days after starting the medication, for usage patterns.

The questionnaire included many sections that were chosen following an extensive review of literature. The questionnaire was translated into Arabic and subjected to a process of forward and backward translation into English. It was pretested and validated first on 20 patients visiting 4 different pharmacies before starting the survey.

The questionnaire consisted of dichotomous and close-ended questions. It consisted of the following sections: socio-demographic data (age, sex, occupation, educational and marital status, monthly income, medical insurance, and the presence of a care provider at home), lifestyle data (smoking status, alcohol status, and involvement in sport activities), complaint for which the antibiotic is taken, the medication details (name, dose, duration and mode of administration as recommended to be taken), presence of comorbidities (defined as long-term diseases diagnosed by physicians) and background medications, as well as reasons and sources of self-medication.

Thirty days after starting the medication, patients were assessed about adherence and duration of antibiotic consumed, direction of use, and reasons for misuse.

2.4. Data Analysis

Appropriate antibiotic use was described by the choice of antibiotics dispensed, duration of antibiotic used, and prescribed daily doses (PDD) of antibiotic consumed by each patient in the follow up. The suitability of the dispensed antibiotic for the customer's complaint and duration were decided using IDSA guideline. Because of the absence of Lebanese guidelines, the IDSA guidelines are generally taught during medical education in Lebanon and are deemed to be the most important guidelines on an international level. The PDD was assessed in comparison to recommended daily dose (RDD) of treatment based on the French national drug formulary (VIDAL® dictionary) (https://www.vidal.fr/).

One point was awarded for each correct use and 0 point will be awarded for misuse, wrong choice of medication, wrong duration (underuse or overuse), or wrong PDD. Later on, the dispensed antibiotic was assessed by summing up the scores given for each item. The total score obtained was 3, which refers to 'appropriate treatment' whereas the lower scores were defined as 'inappropriate treatment'.

Statistical analysis was performed using SPSS for Windows version 19. Frequencies and percentages of patient's characteristics, treated complaints, classes of antibacterial drugs dispensed and their appropriateness were calculated and presented. Chi-2 test was used to determine the associations between qualitative variables and other outcome measures. Stepwise multivariate logistic regression was then used to control for potential confounding variables and to calculate the odds ratios for potential independent variables for appropriateness. A p-value of 0.05 or less was considered to be statistically significant.

3. Results

3.1. Baseline Characteristics

Of a total of one thousand questionnaire distributed to CPs data from a total of 501 patients were recorded in the study. Among participants, 314 (62.7%) have requested for antibiotic without prescription while 187 (37.3 %) had a medical prescription for their antibiotic. Both groups were homogenous regarding gender (p=0.154), age (p=0.532), education (p=0.285), income (p=0.051), and presence of comorbidities (p=0.548). The majority were females (69.5%) and between 16 and 50 years of age (87.8%). About half of the patients had a university degree (55.7%) (Table 1).

A total of 392 patients (78.2%) had no associated medical conditions, while 109 (21.8%) suffered from chronic diseases, among which 21.8% had hypertension, 3.2% had asthma or COPD, 5.8% had dyslipidemia, and 3.8% for diabetes, 2.4% had gastric diseases, and 3.6% had osteoarthritis. 3 participants were pregnant and one had an allergy to penicillin.

Our results indicated that amoxicillin–clavulanic acid (coamoxiclav) combination was the most purchased antibiotic (33.7 %) followed by cephalosporins (21.2%). 33.9% of participants were using antibiotic once per year. Coamoxiclav was the most frequently dispensed antibiotic without prescription (37.3%) followed by cephalosporins (21%), penicillins (17.2%), macrolides (6.1%) and fluoroquinolones (3.8%) respectively. The antibiotics that were dispensed with a prescription, in the following descending order: coamoxiclav (27.8%), cephalosporins (21.4%), fluoroquinolones (17.6%), macrolides (14.4%) and penicillins (5.3%). (Table 2).

Table 1. Characteristics of the study population

	Total participants N=501	Participants with medical prescription N= 187	Participants without medical prescription N= 314	p-value
Gender				
Male	153 (30.5%)	50 (26.7%)	103 (32.8%)	0.154
Female	348 (69.5%)	137 (73.3%)	211 (67.2%)	
Age group				
16-25	244 (48.7%)	85 (45.5%)	159 (50.6%)	0.532
25-50	196 (39.1%)	78 (41.7%)	118 (37.6%)	
>50	61 (12.2%)	24 (12.8%)	37 (11.8%)	
Educational level				
Primary and less	153 (30.5%)	65 (34.8%)	88 (28%)	0.285
Secondary	69 (13.8%)	24 (12.8%)	45 (14.3%)	
University	279 (55.7%)	98 (52.4%)	181 (57.6%)	
Marital status				
Single	259 (51.7%)	90 (48.1%)	169 (53.8%)	0.217
Married	242 (48.3%)	97 (51.9%)	145 (46.2%)	
Currently working				
Yes	173(34.5%)	134 (71.7%)	194 (61.8%)	0.025
No	328 (65.5%)	53 (28.3%)	120 (38.2%)	
Family income (LL)				
<2000000	134 (74.4%)	38 (20.3%)	95 (30.3%)	.051
>2000000	46 (9.2%)	18 (9.6%)	27 (8.6%)	
No answer	323 (64.5%)	131 (70.1%)	192 (61.1%)	
Presence of comorbidities				
Yes	109 (21.8%)	38 (20.3%)	71 (22.6%)	0.548
No	392 (78.2%)	149 (79.7%)	243 (77.4%)	
Data presented as number (%) were performed using Chi2 respectively and a p-value < 0.05 is considered significant.				

Table 2. Self-medication practice among participants

	Total participants N=501	Participants with medical prescription N= 187	Participants without medical prescription N= 314	p-value
Antibiotic Classes:				
coamoxiclav	169(33.7%)	52 (27.8%)	117 (37.3%)	<.001
Amoxicillin or penicillins	64 (12.8%)	10 (5.3%)	54 (17.2%)	
Cephalosporins	106 (21.2%)	40 (21.4%)	66 (21.0%)	
Fluoroquinolones	45 (9%)	33 (17.6%)	12 (3.8%)	
Macrolides	46 (9.2%)	27 (14.4%)	19 (6.1%)	
Others	71 (14.2%)	25 (13.4%)	46 (14.6%)	
Ab request/year				
1st time	170 (33.9%)	70 (37.4%)	100 (32.2%)	.132
More than 1 time	328 (65.5%)	117 (62.6%)	211 (67.8%)	
Types of infection				
Respiratory tract infections:				
Tonsillitis	138 (27.5%)	43 (23%)	95 (30.3%)	.629
Cold	88 (17.6%)	19 (10.2%)	69 (22%)	.629
Sore throat	42 (8.4%)	6 (3.2%)	36 (11.5%)	.001
Cough	34 (6.8%)	14 (7.5%)	20 (6.4%)	.631
Otitis	32 (6.4%)	13 (7%)	19 (6.1%)	.320
Sinusitis	21 (4.2%)	10 (5.3%)	11 (3.5%)	.690
Chest tightness	14 (2.8%)	7 (3.7%)	7 (2.2%)	<.001
Runny nose or sneezing	10 (6.8%)	3 (1.6%)	7 (2.2%)	.079
Gastrointestinal infections:				
Diarrhea	60 (12%)	18 (9.6%)	42 (13.4%)	.394
Teeth infections	33 (6.6%)	17 (9.1%)	16 (5.1%)	.211
Urinary tract infections:	62 (12.4%)	36 (19.3%)	26 (8.3%)	.022
Skin infections:				
Skin infection	21 (4.2%)	12 (6.4%)	9 (2.9%)	.319
Acne	9 (1.8%)	6 (3.2%)	3 (1%)	.055
General:				
Fever	7 (1.4%)	3 (1.6%)	4 (1.3%)	.750
Pain	18 (3.6%)	5 (2.7%)	13 (4.1%)	.179
Others	35 (7%)	14 (7.4%)	17 (5.3%)	.750
Data presented as number (%) were performed using Chi2 respectively and a p-value < 0.05 is considered significant.				

The most concern indications were for respiratory tract infections mainly tonsillitis (27.5%) and flu (17.6%), followed by oral and gastrointestinal tract infections (18.6%) and urinary tract infection (12.4%). Our study shows high percentage of non-prescribed acquisition of antibiotic to treat respiratory tract infections: tonsillitis (30.3%), cold (22%) and cough (6.4%), oral and gastrointestinal tract infections: diarrhea (13.4%) and teeth infections (5.1%), skin and urinary tract infections (8.3%). Patients buying antibiotics for urinary tract infections had significantly more prescriptions ($p<0.05$). (Table 2)

3.2. Appropriateness of Antibiotic

There was statistical difference in the appropriateness between patients buying antibiotic with or without prescription regarding the drug choice ($p=0.003$), appropriate dose ($p=0.036$) and treatment duration ($p=0.054$). Moreover, the difference in global appropriateness was also statistically significant ($p=0.003$). (Figure 1).

Our study has shown that 67.3% of patients have used the right antibiotic against 32.7% of patients have failed to do so. 47.1% used the first line treatment and 19.3% of patients have misused the antibiotic for conditions of sore throat, cough, flu, runny nose, chest tightness, pain and sneezing. 5.3% have used non-recommended drugs for their condition. In the majority of the cases, the dose used by patients was appropriate (88.7%). 9.5% have used low dosage and 5% have exceeded the right dose compared to VIDAL. However, the duration of treatment was inappropriate in majority of cases (58.3%), where the majority didn't complete the full course of antibiotic or used it for low duration (43.2%). When all of these three factors were summed together, it turned out that only 20.2% of antibiotic were used appropriately.

Appropriateness in use was seen in 27.6% and 16.4% of the prescribed and non-prescribed antibiotics, respectively. Among participants buying antibiotic without prescription, 62.4% were dispensed the right antibiotic for their complaint conditions. 32.2% misused the antibiotic and 5.4% used non-recommended drug for their condition. Most of the patients (80.1%) used the correct dose. The duration of treatment was inappropriate in majority of cases (68.6%). (Table 3)

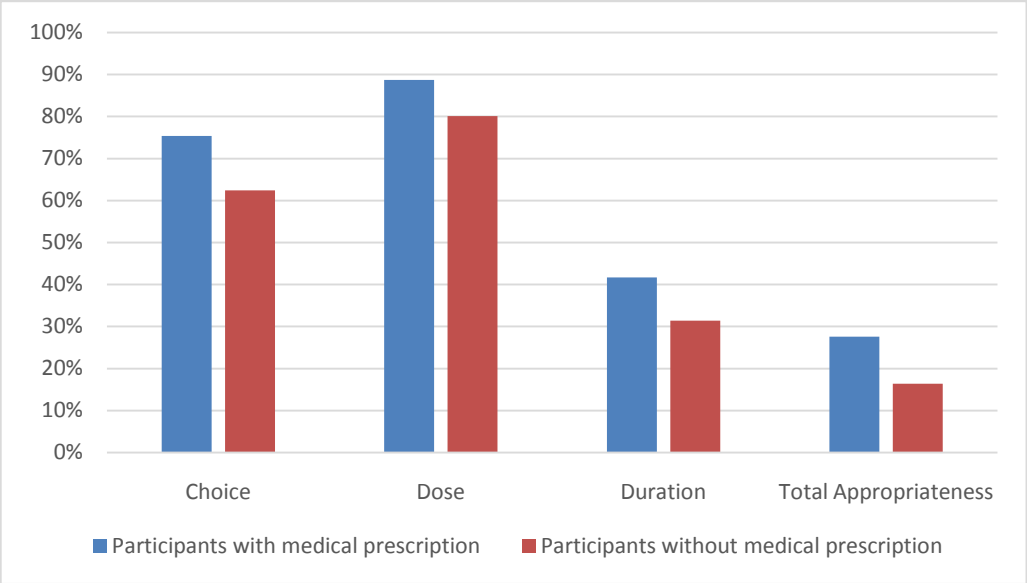

Figure 1. Percentages of appropriateness of choice, dose, duration and overall conformity between participants with prescription or self-medicated antibiotic

Table 3. Percentages of appropriateness of choice, dose, duration and overall conformity between participants with prescription or self-medication antibiotic

	Total participants N=501	Participants with medical prescription N= 187	Participants without medical prescription N= 314	p-value
Choice				
Misuse	137 (27.3%)	36 (19.3%)	101 (32.2%)	0.015
1st line	204 (40.7%)	88 (47.1%)	116 (36.9%)	
2nd line	133 (26.5%)	53 (28.3%)	80 (25.5%)	
Not recommended	27 (5.4%)	10 (5.3%)	17 (5.4%)	
Dose				
Low dose	32 (9.5%)	9 (6.4%)	23 (11.7%)	.110
Appropriate dose	282 (83.7%)	125 (88.7%)	157 (80.1%)	
Overdose	23 (6.8%)	7 (5%)	16 (8.2%)	
Duration				
Short period	171 (52.8%)	60 (43.2%)	111 (60.0%)	0.008
Appropriate	116 (35.8%)	58 (41.7%)	58 (31.4%)	
Long period	37 (11.4%)	21 (15.1%)	16 (8.6%)	

Data presented as number (%) were performed using Chi2 respectively and a p-value < 0.05 is considered significant.

3.3. Factors Affecting Antibiotic Use Appropriateness

When studying the following factors affecting appropriateness: gender, age category, education levels, marital status, employment, family income, and presence of comorbidities, none of these studied factors have shown a significant difference with respect to choice and dose of antibiotic medication. While studying the duration conformity only presence of comorbidities showed a significant difference that was statically significant (p=.001), patients without comorbidities have shown greater appropriateness (70.7%). Only this factor has shown also a significant difference with respect to overall appropriateness (p=.032). (Table S1)

The appropriateness of choice of antibiotic was significantly different between the different conditions. Patients used the medication appropriately in cases of tonsillitis, diarrhea, teeth infection, urinary infection and skin infection. The dose of antibiotic was appropriate in case of tonsillitis, urinary infection. The treatment duration was appropriate in most cases of diarrhea, otitis, sinusitis. The overall appropriateness was significantly different between different conditions treated. The majority of patients were using antibiotic inappropriately in all indications except sinusitis (52% appropriate use, p<0.001). (Table S2)

3.4. Multivariate Analysis

We observed several factors affecting overall appropriateness (Table 4). Patients with sinusitis have better appropriateness compared to other complaints. Patients with tonsillitis and flu had less appropriateness. As the number of request per year increases, the overall appropriateness significantly decreases by 9%. Patients with dyslipidemia had also better appropriateness.

Table 4. Multivariate analysis among factors affecting appropriate choice, dose, duration, and overall appropriateness

Multivariate Analysis	aOR	95% CI	p-value
overall appropriateness			
Predictors			
Presence of insurance	2.00	1.18-3.40	.01
Sinusitis	5.19	1.87-14.44	.002
Tonsillitis	.346	.19-.64	.001
Flu	.22	.087-..56	.002
Number of request per year	.904	.83-.98	.017
Dyslipidemia	4.27	1.65-11.08	.003
Appropriate Choice			
Pain	.212	.046-.98	.047
Flu	.222	.1-.51	<.001
Cough	.37	.13-1.07	.066
Tonsillitis	123.45	33.74-451.72	<.001
Sore throat	.12	.035-.422	.001
Diarrhea	27.44	8.04-93.61	<.001
Teeth infection	68.27	8.49-549.05	<.001
Urinary infection	11.07	4.53-27.05	<.001
Appropriate Dose			
OTC	.51	.24-1.06	.070
Antibiotic Classes:			.025
coamoxiclav	.61	.22-1.72	.353
Amoxicillin or penicillins	.42	.13-1.36	.148
Cephalosporins	.26	.09-.798	.018
Fluoroquinolones	.17	.03-.947	..043
Macrolides	4.52	.49-41.45	.182
Others	Reference		
Urinary tract infections	6.31	1.57-25.37	.009
Antibiotic request per year	1.99	1.04-3.84	.039
Water pipe	.45	.219-.904	.025
Taking other medications at the time of administering antibiotic	2.21	1.17-4.15	.014
Appropriate Duration			
Presence of Insurance	1.99	1.14-3.456	.014
Tonsillitis	.152	.083-.276	<.001
Sinusitis	4.32	1.26-14.76	.020
Hypertension	5.05	1.48-17.15	.009

aOR: adjusted odds ratio above 1 indicates increased n appropriateness and below 1 less appropriateness. CI: Confidence Interval
Only factors significantly associated with better or worse appropriateness are shown.

The following factors have shown a statistical difference of drug conformity. Pain, sore throat, cough, and flu were associated with significant less appropriateness. Diarrhea, teeth infections, and urinary tract infections were associated with better choice.

Self-medication negatively influenced the dosage appropriateness. Patients who used cephalosporins was associated with significant less appropriateness as well as fluoroquinolones. Patients with increased antibiotic request per year have greater dose conformity. Patients with urinary infection have better dose adequacy. Consumption of other drugs at the time of dispensation has also positively influenced the dose conformity.

Many factors were found to be significantly associated with better duration conformity to IDSA guideline: sinusitis, and hypertension. Tonsillitis has negatively influenced the duration conformity. Presence of insurance has positively influenced the duration conformity.

3.5. Follow up on Adherence

Current study shows that only 43.8% (n=213) completed the full course of antibiotic while 273 patients have admitted to underuse (94.9%) or overuse (5.12%). The most common reasons reported for under use were feeling better and symptoms were already resolved (86.8%), didn't feel better (5.12%), and feeling unwell (2.56%). The justifications for overuse were better control of disease and symptoms (2.56%), looking for faster healing (2.19%), and need more effect (0.36%). Moreover, 12 cases have increased the dose (4.8%).

Almost half of the sample patients reported stopping their medications when the disease is under control (51.2%) and only 12.9% reported forgetting to take their medications sometimes. 10.4% missed taking their medications for reasons other than forgetting. Moreover, only 3.3% of the patients reported cutting back their medications when they felt better or worse during the duration of treatment.

4. Discussion

This study has revealed a high rate of antibiotic self-medication (62.7%). The easy availability of antibiotics without prescription from CPs and the low price for some antibiotics explains the wide use of antimicrobial drugs whether needed or not. The prevalence of self-medication was relatively higher than that reported by Cheaito et al study (40%) which was restricted to Beirut and its suburbs. [7]

In this pilot study, we found a high percentage of non-appropriateness of the used self-medicated antibiotics concerning treatment duration (64.2%) and overall appropriateness (77.6%). Antibiotic use was not conforming to the guidelines in the majority of cases. This could be explained by several factors including low adherence and rapid relief of symptoms. Poorer compliance with antibiotic therapy has been associated with the use of longer courses of therapy and regimens having more daily doses; [8] patients also frequently report discontinuing antibiotic therapy when they begin to feel better or when adverse events occur. [9]

The prescribed daily dose (PDD) of antibiotics consumed by each patient was highly appropriate (83.7%). This could be explained by several factors. First, a high percentage of self-medication antibiotics is based on pharmacists' advice (34.7%). We should not neglect the role of pharmacists in guidance of customers on the appropriate use of antibiotics. Secondly, 40.4% of self-medication antibiotics are based on previous experience or previous prescription for the same signs and symptoms; thus, physicians indirectly contributed to these self-medicated drugs. Moreover, many patients have requested antibiotic several times per year which explain the high percentage of conformity of dosage compared to VIDAL.

Furthermore, coamoxiclav was highly consumed which replicates findings to that reported in Lebanon (48.9%). [7] Similarly, in United Arab Emirates, it was the most commonly used (48.9%) [10] and in Pakistan (62.8%). [11] Although broad spectrum antibiotics are effective against many bacterial infections and are relatively safe, prudent use of antibiotics promotes the use of narrow-spectrum targeted drugs when appropriate in order to decrease the emergence of drug-resistant microbial strains. Incorrect use could cause the development of resistant bacteria and diminish the ability of the endogenous flora to resist colonization by harmful microorganism, thereby leading to super infections by multi-resistant bacteria and yeasts. [12]

The common use of antibiotic for minor illnesses is consistent with results of other studies in Abu Dabi, [13] Iran, [14] Jordan, [15] Kuwait, [16] Libya, [17] Lebanon, [7] Egypt, [18] Saudi Arabia [19] and Northern and Western Europe. [20] The rapid relief of signs and symptoms of many complaints causes patients stopped treatment when the illness symptoms disappear and use it for several times over year. This usage pattern is one that typically results in the emergence of resistance.

Presence of comorbidities as dyslipidemia or hypertension have shown better overall appropriateness and better duration conformity. This could be explained by that patients with comorbidities are regular users of medical resources, see physicians and are used to take drugs as directed and have a high rate of POM.

Appropriateness of prescribing antibiotics was higher than that of self-medication although the overall appropriateness of prescribed antibiotics is still low (27.6%). This could be explained by several factors, such as the lack of simple and clear recommendations for treatment duration, the lack of clinical trials to assess the optimal treatment duration, variability in medical knowledge, and psychosocial factors involved in medical decision making. [21] Patients should be encouraged to the proper use of antibiotics using all appropriate public media. Physician's decision to prescribe an antibiotic may be influenced by pharmaceutical promotions and patient demand. As a result, interventions are required to improve the appropriate prescribing of antibiotics.

Our results show that patients with tonsillitis have less conformity to overall appropriateness and duration since based on the IDSA guideline the treatment should be completed for 10 days which is greater than the treatment duration of other complaints and the usual symptoms for tonsillitis resolve within a few days. Moreover, patients

with fewer antibiotic request per year have better overall conformity. These are important findings, because inappropriate antibiotic use has contributed to the rising incidence of antimicrobial resistance. [22]

Other problems with self-medication are self-diagnosis and buying of antimicrobial drugs in sub-therapeutic quantities, which tend to become cultural norms in countries with few regulations on the acquisition of non-prescribed antimicrobial drugs. [23] Patients with insurance have shown better duration conformity since they would buy the box of antibiotic and not in sub-therapeutic quantities.

This study is the first prospective study done in Lebanese population reflecting the appropriateness of antibiotic use and consumption. However, our study suffers from several limitations. To begin with, since not all pharmacists accepted to participate to the study, the sample may not be representative of Lebanese population. We might also expect a change in behavior of the pharmacists in the presence of researchers, since the study addresses an illegal practice; thus our results may be underestimating the reality of antibiotic self-medication practice. Second, there could also be a possibility of respondent and information bias, since the results of our study are based on a face to face questionnaire. Third, the sample was limited by its small size. Many people did not agree to participate, which may also introduce a selection bias. The small size of the sample affects also the power of tests to find significant differences. Additional large scale studies are recommended to take into account the cited limitations.

This study suffers from most consumer-based surveys issues, mostly the willingness or not of subjects coming to the pharmacy to spend tie filling a questionnaire or speaking to an interviewer. Patients may also be reluctant divulge information about disease of socioeconomic factors. As such our results represent only the part of the population that participated; mostly young, relatively healthy subjects who may have better educational level than older subjects. However, subjects in this study were recruited in various parts of the country. And difference in the spectrum of ages and professional status one might expect. The results are found were not unexpected and confirm to another studies done in the same area. [7,15] The fact that we did find two third non-prescribed dispensing of antibiotics shows the respondents answer making information bias unlikely.

5. Conclusion

This study reflects on the fact that antibiotic consumption in Lebanon is uncontrolled and that non-appropriateness to guidelines is common. In Lebanon, inadequate enforcement of drug regulations raised inappropriate antibiotics consumption. Patients should be educated about the proper use of drugs and the need for medical advices, especially for antibiotics considering the personal and populational risks of drug resistance. This should be accompanied by educational programs for pharmacists and physicians before reinforcing the regulatory aspects of drug prescription and dispensing.

Conflicts of Interest

The authors declare no conflicts of interest.

Acknowledgements

The authors thank the Lebanese University for funding this project.

Funding

Malak Khalifeh received a grant from Lebanese University for her PhD research. No other internal funding were received for the study.

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Table S1. Sociodemoraphic factors affecting appropriate choice, dose, duration, and overall:

	non-appropriate Choice	Appropriate Choice	P-value	non-appropriate Dose	Appropriate Dose	P-value
Gender						
Male	49 (29.9%)	104 (30.9%)	0.823	18 (32.7%)	86 (30.5%)	0.743
Female	115 (70.1%)	233 (69.1%)		37 (67.3%)	196 (69.5%)	
Age group						
16-25	81 (49.4%)	163 (48.4%)	0.396	31 (56.4%)	132 (46.8%)	0.247
25-50	59 (36%)	137 (40.7%)		21 (38.2%)	116 (41.1%)	
>50	24 (14.6%)	37 (11%)		3 (5.5%)	34 (12.1%)	
Educational level						
primary and less	53 (32.3%)	100 (29.7%)	0.298	12 (21.8%)	88 (31.2%)	0.314
secondary	17 (10.4%)	52 (15.4%)		8 (14.5%)	44 (15.6%)	
university	94 (57.3%)	185 (54.9%)		35 (63.6%)	150 (53.2%)	
Marital status						
single	84 (51.2%)	175 (51.9%)	0.881	33 (60%)	142 (50.4%)	0.19
married	80 (48.8%)	162 (48.1%)		22 (40%)	140 (49.6%)	
Currently working						
yes	104 (63.4%)	224 (66.5%)	0.449	36(65.5%)	188 (66.7%)	0.862
no	60 (36.6%)	113 (33.5%)		19 (34.5%)	94 (33.3%)	
Family income (LL)						
<2000000	46 (28%)	87 (25.8%)	0.442	15 (27.3%)	72 (25.5%)	0.712
>2000000	11 (6.7%)	34 (10.1%)		7 (12.7%)	27 (9.6%)	
unemployed	107 (65.2%)	216 (64.1%)		33 (60%)	183 (64.9%)	
Presence of comorbidities						
No	121 (73.8%)	271 (80.4%)	0.091	48 (87.3%)	223 (79.1%)	0.161
Yes	43 (26.2%)	66 (19.6%)		7 (12.7%)	59 (20.9%)	
Daman						
No	54 (34%)	123 (69.5%)	0.52	145 (37.8%)	28 (28.3%)	0.079
Yes	105 (66%)	210 (66.7%)		239 (62.2%)	71 (71.7%)	
Ab request						
1st time	56 (34.6%)	110 (32.7%)	0.68	24 (44.4%)	86 (30.5%)	0.045
More than once/ year	106 (65.4%)	226 (67.3%)		30 (55.6%)	196 (69.5%)	
	Non-appropriate duration	**Appropriate duration**	**p-value**	**Non Overall appropriate**	**Overall Appropriate**	**p-value**
Gender						
Male	59 (28.4%)	39 (33.6%)	0.323	114 (29.3%)	33 (32.7%)	0.511
Female	149 (71.6%)	77 (66.4%)		275 (70.7%)	68 (67.3%)	
Age group						
16-25	110 (52.9%)	49 (42.2%)	0.125	200 (51.4%)	41 (40.6%)	0.143
25-50	80 (38.5%)	51 (44%)		144 (37%)	47 (46.5%)	
>50	18 (8.7%)	16 (13.8%)		45 (11.6%)	13 (12.9%)	
Educational level						
primary and less	64 (30.8%)	31 (26.7%)	0.66	121 (31.1%)	28 (27.7%)	0.801
secondary	31 (14.9%)	16 (13.8%)		50 (12.9%)	14 (13.9%)	
university	113 (54.3%)	69 (59.5%)		218 (56%)	59 (58.4%)	
Marital status						
single	116 (55.8%)	53 (45.7%)	0.082	208 (53.5%)	46 (45.5%)	0.155
married	92 (44.2%)	63 (54.3%)		181 (46.5%)	55 (54.5%)	
Currently working						
yes	147 (70.7%)	75 (64.7%)	0.264	262 (67.4%)	64 (63.4%)	0.478
no	61 (29.3%)	41 (35.3%)		127 (32.6%)	37 (36.6%)	
Family income (LL)						
<2000000	48 (23.1%)	28 (24.1%)	0.072	97 (24.9%)	27 (26.7%)	0.145
>2000000	16 (7.7%)	18 (15.5%)		31 (8.0%)	14 (13.9%)	
unemployed	144 (69.2%)	70 (60.3%)		261 (67.1%)	60 (59.4%)	
Presence of comorbidities						
No	179 (86.1%)	82 (70.7%)	0.001	312 (80.2%)	71 (70.3%)	0.032
Yes	29 (13.9%)	34 (29.3%)		77 (19.8%)	30 (29.7%)	
Daman						
No	24 (43.6%)	99 (35.6%)	0.26	86 (41.3%)	32 (28.1%)	0.018
Yes	31 (56.4%)	179 (64.4%)		122 (58.7%)	82 (71.9%)	
Ab request						
1st time	68 (32.9%)	42 (36.2%)	0.54	131 (33.9%)	35 (34.7%)	0.89
More than once/ year	139 (65.3%)	74 (63.8%)		255 (66.1%)	66 (65.3%)	

Table S2. Factors affecting appropriateness of choice, dose, duration and overall:

	Non-appropriate choice	Appropriate Choice	p-value	Non-appropriate Dose	Appropriate Dose	p-value
Antibiotic Classes:			0.314			
coamoxiclav	57 (33.7%)	112 (66.3%)		17 (15.2%)	95 (84.8%)	0.026
Amoxicillin or penicillins	25 (39.1%)	39 (60.9%)		10 (25.6%)	29 (74.4%)	
Cephalosporins	40 (37.7%)	66 (62.3%)		17 (25.8%)	49 (74.2%)	
Fluoroquinolones	11 (24.4%)	34 (75.6%)		4 (11.8%)	30 (88.2%)	
Macrolides	12 (26.1%)	34 (76.9%)		1 (2.9%)	33 (97.1%)	
Others	19 (26.8%)	52 (73.2%)		6 (11.5%)	46 (88.5%)	
Types of infection						
Respiratory tract infections:						
Tonsillitis	3 (1.8%)	135 (97.8%)	<.001	27 (20%%)	108 (80%)	0.135
Cold	60 (68.2%)	28 (31.8%)	<.001	4 (14.3%)	24 (85.7%)	0.761
Sore throat	36 (85.7%)	6 (14.3%)	<.001	1 (16.7%)	5 (83.3%)	0.982
Cough	21 (61.8%)	13 (38.2%)	<.001	5 (38.5%)	8 (61.5%)	0.028
Otitis	13 (40.6%)	19 (59.4%)	0.335	3 (15.8%)	16 (84.2%)	0.949
Sinusitis	5 (23.8%)	16 (76.2%)	0.373	2 (12.5%)	14 (87.5%)	0.672
Chest tightness	12 (85.7%)	2 (14.3%)	<.001	0	2	0.531
Runny nose or sneezing	5 (50%)	5 (50%)	0.24	2 (40%)	3 (60%)	0.149
Gastrointestinal infections:						
Diarrhea	4 (6.7%)	56 (93.3%)	<.001	10 (17.9%)	46 (82.1%)	0.733
Teeth infections	1 (3.1%)	31 (96.9%)	<.001	3 (9.7%)	28 (90.3%)	0.294
Urinary tract infections:	7 (11.3%)	55 (88.7%)	<.001	4 (7.3%)	51 (92.7%)	0.047
Skin infections:						
Skin infection	0	21 (100%)	0.001	6 (28.6%)	15 (71.4%)	0.117
Acne	7 (77.8%)	2 (22.2%)	0.004	0	2	0.531
General:						
Pain	16 (88.9%)	2 (11.1%)	>.001	1 (50%)	1 (50%)	0.196
	Non-appropriate duration	**Appropriate duration**	**p-value**	**Non Overall Appropriate**	**Overall Appropriate**	**p-value**
Antibiotic Classes:						0.024
coamoxiclav	71 (65.7%)	37 (34.3%)	0.061	134 (34.4%)	33 (19.8%)	
Amoxicillin or penicillins	32 (82.1%)	7 (17.9%)		58 (90.6%)	6 (9.4%)	
Cephalosporins	38 (59.4%)	26 (40.6%)		84 (21.6%)	20 (19.2%)	
Fluoroquinolones	20 (58.8%)	14 (41.2%)		34 (75.6%)	11 (24.4%)	
Macrolides	24 (70.6%)	10 (29.4%)		37 (80.4%)	9 (19.6%)	
Others	23 (51.1%)	22 (48.9%)		42 (65.6%)	22 (34.4%)	
Types of infection						
Respiratory tract infections:						
Tonsillitis	114 (85.7%)	19 (14.3%)	<.001	121 (88.3%)	16 (11.7%)	0.002
Cold	20 (71.4%)	8 (28.6%)	0.404	82 (93.2%)	6 (6.8%)	<.001
Sore throat	4 (1.9%)	1 (20%)	0.458	41 (100%)	0	0.001
Cough	9 (69.2%)	4 (30.8%)	0.699	32 (94.1%)	2 (5.9%)	0.028
Otitis	8 (42.1%)	11 57.9%)	0.038	23 (71.9%)	9 (28.1%)	0.277
Sinusitis	4 (25%)	12 (75%)	0.001	10 (47.6%)	11 (52.4%)	<.001
Chest tightness	0	2	0.057	12 (85.7%)	2 (14.3%)	0.553
Runny nose or sneezing	1 (20%)	4 (80%)	0.038	8 (80%)	2 (20%)	0.961
Gastrointestinal infections:						
Diarrhea	19 (40.4%)	28 (59.6%)	<.001	27 (51.9%)	25 (48.1%)	<.001
Teeth infections	19 (63.3%)	11 (36.7%)	0.917	21 (67.7%)	10 (32.3%)	0.098
Urinary tract infections:	31 (57.4%)	23 (42.6%)	0.254	40 (65.6%)	21 (34.4%)	0.004
Skin infections:	4 (25%)	12 (75%)	0.001			
Skin infection	13 (61.9%)	8 (38.1%)	0.821	15 (71.4%)	6 (28.6%)	0.357
Acne	1	1	0.674	8 (88.9%)	1 (11.1%)	0.477
General:						
Pain	0	2 (1.7%)	0.057	17 (94.4%)	1 (5.6%)	0.108