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ORIGINAL ARTICLE

# Assessment of self-medication in population buying antibiotics in pharmacies: a pilot study from Beirut and its suburbs

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**Abstract**
*Objectives* This study was performed to assess self-medication with antibiotics (ATB) in the general population and its associated factors.
*Methods* Face to face interviews using a structured questionnaire were conducted to collect data from ATB buyers in pharmacies in Beirut area. Data were analyzed using descriptive statistics and Chi-square test. A multivariate logistic regression was performed to predict self-medication.
*Results* 42 % of 319 participants were buying ATB without prescription and the pharmacists were the main helpers (18.8 %). Saving time was the most common cited reason for self-medication with ATB (39.7 %). The logistic regression showed that self-medication with ATB was significantly increased among men [OR = 3.03; IC 95 % (2–5)]; it was associated with sore throat symptoms [OR = 2.38; IC 95 % (1.40–4.03)] and the ignorance of ATB use dangers [OR = 3.33; IC 95 % (1.96–5.55)]. In addition, it was prominent with amoxicillin [OR = 1.93; IC 95 % (0.17–1.34)], and inversely related to quinolone [OR = 0.44; IC 95 % (0.18–1.03)] and cephalosporin families [OR = 0.28; IC 95 % (0.11–1.68)] or other ATB classes [OR = 0.96; IC 95 % (0.41–2.22)].
*Conclusions* Self-medication with antibiotics is a relatively frequent problem in Beirut area. Interventions are required to reduce antibiotic misuse.

**Keywords** Self-medication · Antibiotic · Antimicrobial resistance · Antibiotic misuse

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## Introduction

Increasing rates of antimicrobial resistance (AMR) is a major worldwide public health problem that has severe implications at all levels (Levy 2005). It reduces the effectiveness of treatment and prolongs the period of illness, thus extending the spread of resistant microorganisms among people (WHO, fact sheet n:194 2011) Several examples of resistant bacteria have been reported in literature including penicillin-resistant *Streptococcus pneumoniae*, vancomycin-resistant Enterococci, methicillin-resistant *Staphylococcus aureus*, multi-resistant Salmonellae, and multi-resistant *Mycobacterium tuberculosis* (WHO, fact sheet n:194 2002). Several studies discussed the correlation between antibiotic (ATB) misuse, self-medication with ATB and antimicrobial resistance.

Self-medication can be defined as 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 disease or symptoms (WHO guidelines 2000). People may self-medicate with ATB mainly for throat symptoms, teeth and gum symptoms, nasal congestion, influenza, bronchitis, and urinary discomfort (Goossems et al. 2005). Non prescribed drugs can sometimes be obtained from community pharmacies without any

prescription or they could be leftover medications from previous treatments, drugs obtained from relative's friends and drugs obtained over the internet (Belongia et al. 2002). However, the World Health Organization (WHO) confirms that antibiotic self-medication is a dangerous behavior that may lead to the use of inappropriate drugs with incorrect dosages for an unsuitable period of time, in unnecessary cases mostly recovering without any antibiotic (Grigoryan et al. 2006); this may eventually lead to drug resistance.

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 AMR in countries with high levels of antibiotic consumption such as eastern and southern Mediterranean regions, compared to low resistance rates in northern countries (Borg et al. 2006). 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 ATB are not available without medical prescription (Byarugaba 2004; Belongia et al. 2002; Sosa et al. 2010). Other determinants of self-medication with ATB in developing countries include high cost of medical consultation in addition to the misconceptions regarding the efficacy of ATB (Belongia et al. 2002; Sosa et al. 2010).

In Lebanon, the self-medication with ATB is observed but poorly documented. In this study, we intended to explore the frequency of self-medication with ATB in the Lebanese population and its associated factors.

## Methods

### Design and study population

A descriptive, cross-sectional study was conducted over a period of 3 months, from March to May 2011. A proportionate sample of fourteen populated regions in the city of Beirut and its suburbs were selected. In each selected region, three pharmacies were randomly selected from the list of community pharmacies provided by the order of Lebanese pharmacists. Pharmacists in charge were given letters explaining the purpose of the study, and ensuring the confidentiality of information. In each pharmacy, persons older than 18 years, buying ATB for themselves or for their children were asked to consent to participate to the study after a briefing on its objectives. Persons who asked for ATB on behalf of another adult were excluded. The target number was 10 patients per pharmacy. Since the study is observational and anonymous, and since oral informed consent was obtained by participants, the ethics committee of the Lebanese University waived the necessity of an approval for the study.

### Questionnaire

Data were collected by face to face interviews with eligible subjects, using a structured questionnaire in Arabic local language. The questionnaire consisted of four parts.

Part A: Knowledge and information regarding the ATB purchased on the day of the interview. It comprised the following items: Antibiotic's definition, name of the delivered drug, the reasons of use, the way of purchasing (with or without medical prescription), and the source if the drug was bought without medical prescription.

Part B: General characteristics of buyers. It included the following items: Age, gender, marital status, residence area, profession, income, insurance, having a medical reference and way of seeking medical advice.

Part C: Attitudes towards ATB use. Here respondents were asked to state their reasons for self-medication with ATB in general, describe the symptoms, identify the sources, and state the duration of use. Respondents also reported if they have ever taken ATB without medical prescription.

Part D: perceptions of the dangers of frequent use of ATB. In this part, participants were asked if they knew the dangers of frequent use of ATB and if they find it necessary to educate public about the misuse of ATB.

### Statistical analysis

The collected data were entered and analyzed using SPSS software version 18. Descriptive statistics was performed to describe the characteristics of the study population and bivariate analysis (Chi-square test) was used to compare percentages between categorical variables in the two comparison groups of the study: participants that were buying ATBs without a medical prescription versus participants buying ATBs with a medical prescription; the main dependent variable was thus self-medication with ATB.

In order to take into consideration the influence of the multiple factors that may affect the main dependent variable, a stepwise forward logistic regression was performed to evaluate the factors associated with using self-medication with ATB (ATB). In this model, independent variables were the patient's characteristics variables having $p$ value $\leq 0.2$ in bivariate analysis: Sex, type of antibiotic used, sore throat, vaginal/penile discharge, seeking medical advice, knowing the danger of frequent ATB use, indications of use, having a reference doctor. Models adequacy to data was insured by Hosmer–Lemeshow test. Non significant $p$ value ($>0.05$) was a condition to test the goodness of fit

of the model and its ability to predict the dependent variable. The Nagelkerke $R^2$ was checked to assess the usefulness of the explanatory variables in predicting the dependent variable. The final model was retained. The contribution of each determinant in the multivariable analysis was expressed as an adjusted odds ratio (ORa) and a 95 % confidence interval (CI). A $p$ value <0.05 was considered statistically significant.

## Results

### Baseline characteristics

The total number of pharmacy stores that participated in the study was 40 out of 45 (88.8 %), and 319 out of 340 persons (93.8 %) agreed to participate to the study.

Table 1 summarizes the main characteristics of the participants in the two groups of the study population: 319 participants that were buying ATB for their children or for themselves. The mean age of participants was 38.24 ± 13.7 years. Females constituted 55.2 % of the sample. Among participants, 58 % had a medical prescription for their ATB while the remaining 42 % had no prescription. In this sample, males were buying ATB without prescription more frequently than females (54.5 vs 31.8 %; $p < 0.001$). Participants with no medical prescription had less reference doctors (33.1 vs 66.7 %) and generally sought less medical advice (30 vs 70 %) than those with a medical prescription ($p < 0.001$). Socioeconomic level and education were not significantly associated with self-medication with antibiotics (Table 1).

### ATB utilization patterns

As declared by the participants, pharmacist constituted the first source for obtaining ATB without prescription (18.8 %); in other cases, participants obtained their ATB names by referring to their personal experience or to a previous satisfaction with the same antibiotic (11.6 %). The remaining participants asked their friends and neighbors (9.4 %) or their doctors by phone (2.2 %). Among all respondents, 201 (63 %) buyers have used ATB without medical prescription in the last months or years. The main reason reported by participants for self-medication was saving time (55.7 %), followed by saving the cost of a doctor prescription (33.6 %). The remaining reported reasons were lack of insurance that covered their health costs (2.9 %) and other reasons (7.8 %) (Fig. 1).

Most adults in our study were buying ATB for themselves (79.2 %) more than for their children (20.8 %). There was no significant difference between the two groups regarding the indications for which ATB were given. We also found that amoxicillin–clavulanic acid combination (Augmentin®) was the most purchased antibiotic (48.9 %) and most of participants were using ATB less than once per year (60 %). Our results indicated that among participants buying ATB without prescription, Augmentin was the most used by 47.7 % ($p = 0.004$) (Table 2).

### Participants' knowledge and perceptions regarding antibiotic use

Among the 272 participants who declared knowing ATB definition (85 %), only 31.7 % answered correctly, i.e., ATB are "antibacterial" (21.7 %), "antimicrobial" (6.3 %) or "anti-infectious" (3.7 %) agents. Other responses were wrong and most of respondents defined ATB as "anti inflammatory agents" (59.9 %), "antiviral" (5.5 %), a drug that "helps the immune system" (0.8 %) or a drug "used in case of fever" (0.4 %). Our study showed that participants without medical prescription could start their treatment more frequently at home (64.5 vs 35.55 %) or with a pharmacist advice (58.9 vs 41.1 %) ($p < 0.001$). In contrast, participants with a prescription found more frequently that doctor prescription consisted a condition to start a treatment with ATB (76.5 vs 23.5 %; $p < 0.001$). In addition, participants with prescription believed that treatment with ATB could be stopped when the bottle finishes (61.5 %) and should be continued as advised by the doctor while (68.1 %) of participants without prescription thought that treatment could be stopped when the symptoms disappear ($p < 0.001$) (Table 3).

As for participants' knowledge about symptoms leading to ATB use, few respondents answered correctly that ATB could not be automatically used for just fever (53.8 %), sore throat (39 %), and symptoms of genital discharge (53.8 %) or rhinitis (40.6 %). By comparing the correct answers between the two groups, a significant difference was observed for those related to sore throat ($p < 0.00$), genital discharge ($p = 0.013$), and rhinitis ($p < 0.002$). Non users of self-medication give more correct answers than the other group, except for rhinitis where we have more correct answers in the first group.

In Table 4, we present the perception of danger after frequent ATB use: 85 % of participants thought that antibiotic had dangers if used without prescription and the perception of danger was more important with participants with prescription comparing to those without prescription (62.7 vs. 37.3 % respectively, $p < 0.001$) (Table 4). Among the 271 respondents who answered that ATB's frequent use has dangers, only 35.9 % were aware about antimicrobial resistance, 38.8 % knew that it could affect hepatic and renal system. Most of the participants (95.9 %) thought it was important to educate the public about appropriate ATB use.

**Table 1** Comparison of antibiotic buyers with and without medical prescription in pharmacies in Beirut area, Lebanon, 2011

| General characteristics | Total participants N = 319 (100 %) | Participants without medical prescription N = 134 (%) | Participants with medical prescription N = 185 (%) | p value[a] |
|---|---|---|---|---|
| Sex | | | | |
| Male | 143 (44.8) | 78 (54.5) | 65 (45.5) | 0.001* |
| Female | 176 (55.2) | 56 (31.8) | 120 (68.2) | |
| Age (years) | | | | |
| 18–30 | 126 (39.5) | 49 (38.9) | 77 (61.1) | 0.516 |
| 30–60 | 170 (53.3) | 73 (42.9) | 97 (57.1) | |
| >60 | 23 (7.2) | 12 (52.2) | 11 (47.8) | |
| Marital status | | | | |
| Single | 109 (34.2) | 42 (38.5) | 67 (61.5) | 0.36 |
| Married | 210 (65.8) | 92 (43.8) | 118 (56.2) | |
| Educational level[b] | | | | |
| Primary and less | 67 (21) | 34 (50.7) | 33 (49.3) | 0.15 |
| Secondary | 96 (30.1) | 42 (43.8) | 54 (56.3) | |
| University and postgraduate | 156 (48.9) | 58 (37.2) | 98 (62.8) | |
| Currently working | | | | |
| Yes | 206 (64.6) | 91 (44.2) | 115 (55.8) | 0.28 |
| No | 113 (35.4) | 43 (38.1) | 70 (61.9) | |
| Covered by insurance | | | | |
| Yes | 192 (61) | 76 (39.6) | 116 (60.4) | 0.23 |
| No | 123 (39) | 57 (46.3) | 66 (53.7) | |
| Family monthly salary[c] | | | | |
| <3,000,000 LBP | 278 (87.7) | 117 (42.1) | 161 (57.9) | 0.85 |
| >3,000,000 LBP | 39 (12.3) | 17 (43.6) | 23 (56.4) | |
| Do you have a doctor you refer to usually? | | | | |
| Yes | 225 (70.5) | 75 (33.3) | 150 (66.7) | <0.001* |
| No | 43 (13.5) | 25 (58.1) | 18 (41.9) | |
| Sometimes | 51 (16) | 34 (66.7) | 17 (33.3) | |
| When do you seek medical advice? | | | | |
| Regularly | 80 (25.1) | 24 (30) | 56 (70) | 0.012* |
| Occasionally | 239 (74.9) | 110 (46) | 129 (54) | |
| Would treat their children the same way they treat themselves | | | | |
| Yes | 56 (28) | 20 (35.7) | 36 (64.3) | 0.14 |
| No | 144 (72) | 68 (47.2) | 76 (52.8) | |
| Sometimes | 119 (37.3) | 46 (38.7) | 73 (61.3) | |

All data are given as N (%)

* Refers to significant p value (<0.05)

[a] p values refer to $\chi^2$ tests for nominal variables

[b] We identified three educational levels in the study population, primary and less: for 1st till 5th graders, secondary: 11th to 12th graders, universities and post graduates : people who have <back +5 or >back + 5

[c] Income is expressed by the local currency in Lebanon (1.0 US dollar = 1,500 LBP)

Factors affecting self-medication with ATB

Table 5 presents results of the logistic regression analysis. Among the potential factors that showed a p value <0.20 (sex, type of antibiotic used, sore throat, genital discharge, seeking medical advice, knowing the danger of frequent use of antibiotic, having a reference doctor, and indications of use), only 4 were retained in the final step of the logistic regression as associated with self-medication with antibiotics.

Female gender was associated with lower likelihood of self-medication (ORa = 0.30, 95 % CI 0.18–0.51), using ATB for some symptoms such as sore throat was related to a higher likelihood of self-medication (ORa = 2.38, 95 % CI 1.40–4.03), and knowing that frequent use of antibiotic is dangerous was associated with a lower risk of self-medication (ORa = 0.3, 95 % CI 0.18–0.51).

Participants who used quinolone and cephalosporin families had a lower risk of self-medication, whereas the use of amoxicillin and amoxicillin–clavulanic acid combination (Augmentin®) was associated with a higher risk of self-medication. $R^2$ indicated that this model is able to predict the factors that influence self-medication with ATBs in 25.9 % of cases.

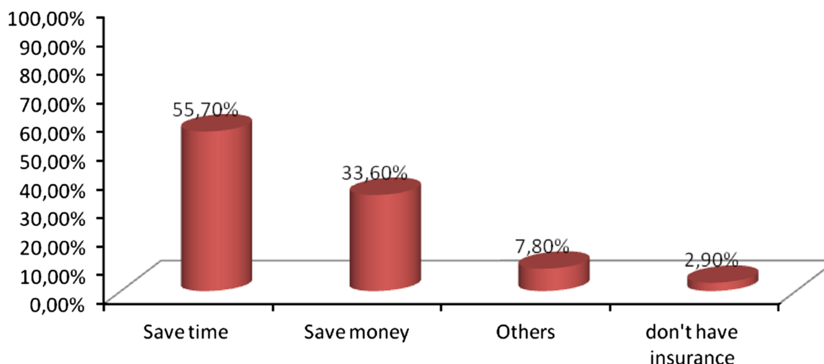


**Fig. 1** Reasons behind current or previous self-medication with antibiotics in Beirut pharmacies ($N = 201$). The *X* axis represents reasons behind previous or current use of ATBs without medical prescription by the participants, and *Y* axis represents the percentage of those who ever self-medicated

**Table 2** Comparison of the antibiotics used by the antibiotic buyers with and without medical prescription in pharmacies in Beirut area, Lebanon, 2011

| Variables | Total participants $N = 319$ (100 %) | Participants without medical prescription $N = 134$ (%) | Participants with medical prescription $N = 185$ (%) | *p* value[a] |
|---|---|---|---|---|
| ATB consumers | | | | |
| Adults buying for themselves | 252 (79.2) | 107 (79.8) | 145 (78.8) | 0.820 |
| Adults buying for children (<18) | 66 (20.8) | 27 (20.2) | 39 (21.2) | |
| Indications of use | | | | |
| URTI | 205 (64.3) | 92 (68.6) | 113 (61.08) | 0.163 |
| UTI | 40 (12.5) | 18 (33.5) | 22 (11.8) | |
| Others[b] | 74 (23.2) | 24 (17.9) | 50 (27.02) | |
| ATB classes | | | | |
| Augmentin® | 156 (48.9) | 64 (47.7) | 92 (49.7) | 0.004* |
| Amoxicillin | 58 (18.2) | 36 (26.8) | 22 (11.8) | |
| Quinolones | 37 (11.6) | 10 (7.4) | 27 (14.5) | |
| Cephalosporins | 37 (11.6) | 11 (8.2) | 26 (14.05) | |
| Miscellaneous[c] | 31 (9.7) | 13 (9.7) | 18 (9.7) | |
| Frequency of use of ATBs | | | | |
| <Once a year | 189 (60) | 74 (55.2) | 115 (62.1 6) | 0.137 |
| >Once a year | 126 (40) | 60 (44.7) | 66 (35.6) | |

*URTI* upper respiratory tract infection, *UTI* urinary tract infection, *ATB* antibiotics

* Refers to significant *p* value (<0.05)

[a] *p* values refer to $\chi^2$ tests for nominal variables

[b] Other indications of use include skin rash, abdominal pain, treatment after a surgery and other reasons for using the indicated antibiotics

[c] Other classes of antibiotics include tetracycline, macrolides, aminoglycosides, sulfonamides, and fusidic acid

Seeking medical advice in general, perceived appropriateness of antibiotic use for genital discharge, having reference doctor and indications of use were no longer significantly associated with the use of self-medication in the logistic regression.

## Discussion

In this study, we found that 42 % of the population buying ATB in pharmacies in Beirut and its suburbs self-medicated without prescription. This self-medication was predominant in males and in people who do not regularly seek medical advice or refer to a doctor. People who self-medicated proclaimed that the main source of their ATB use was from pharmacist advice and that they used ATB without prescription mainly to save time and money. We demonstrated that self-medication was present in case of different indications and with different antibiotic classes. However, it was significantly pronounced with amoxicillin and amoxicillin–clavulanic acid combination. In addition, after taking into consideration all potential factors that may affect self-medication, we found that antibiotics without prescription were frequently used in case of sore throat symptoms and were affected by the ignorance of the dangers of ATBs misuse and the type of some ATBs that are easily and commonly taken without medical prescription more than other types.

The high prevalence of self-medication with antibiotic in our sample was not surprising considering the ease with which ATB are acquired from pharmacies despite the Lebanese law that restricts the dispensation of drugs without medical prescription (Ordre des pharmaciens du Liban 1994). However, this law is not reinforced. Our

**Table 3** Knowledge assessment of antibiotics' use in the antibiotic buyers with and without medical prescription in pharmacies in Beirut area, Lebanon, 2011

| Variables | Total participants $N = 319$ (100 %), (%) | Participants without medical prescription ($n = 134$) (%) | Participants with medical prescription ($n = 185$) (%) | $p$ value |
|---|---|---|---|---|
| Knowing ATBs definition | | | | |
| Yes | 31.5 | 41.2 | 58.8 | 0.75 |
| No | 68.5 | 40.5 | 59.5 | |
| Treatment with antibiotics could be started | | | | |
| At home | 19.4 | 64.5 | 35.5 | <0.001* |
| With pharmacist advise | 29.8 | 58.9 | 41.1 | |
| As advised by the doctor | 50.8 | 23.5 | 76.5 | |
| Treatment with ATBs could be stopped | | | | |
| Until the bottle finishes | 24.5 | 38.5 | 61.5 | <0.001* |
| Until symptoms disappear | 28.5 | 68.1 | 31.9 | |
| As advised by the doctor | 47 | 28 | 72 | |

* Refers to significant $p$ value (<0.05)

**Table 4** Perceptions of the dangers of frequent use of antibiotics in the antibiotic buyers with and without medical prescription in pharmacies in Beirut area, Lebanon, 2011

| Questionnaire item | Response | Number | Participants without medical prescription ($N = 134$) (%) | Participants with medical prescription ($N = 185$) (%) | $p$ value |
|---|---|---|---|---|---|
| Do you think that frequent use of ATB without prescription has any danger? | Yes | 271 | 37.3 | 62.7 | 0.001* |
| | No | 13 | 53.8 | 46.2 | |
| | Do not know | 35 | 74.3 | 25.7 | |
| If yes, do you know what types of danger? | Yes | 201 | 30.8 | 69.2 | 0.001* |
| | No | 71 | 54.9 | 45.1 | |
| Increase bacterial resistance and decrease in drug efficiency | Yes | 115 | 32.2 | 67.8 | 0.63 |
| Affect the hepatic/renal system | Yes | 124 | 33.1 | 66.9 | 0.38 |
| Need for patient education | Yes | 306 | 40.8 | 59.2 | 0.07 |
| | No | 12 | 66.7 | 33.3 | |

* Refers to significant $p$ value (<0.05)

results are similar to those reported by the self-medication with ATB and resistance project (SAR) in the Mediterranean region, where the overall median proportion of self-medication among these countries was 23.8 % (IQR 4–31.6 %), while in Lebanon this figure was 37 % of self-medication with ATB (Sawair et al. 2009); our results also replicate findings from other studies in settings where pharmacies were the main source of ATB used for self-medication (Al-Bakri et al. 2005; Grigoryan et al. 2007; Longman and Martin 1991). In contrast, developed countries such as European ones where over the counter ATB sales are strictly regulated have much lower prevalence rates of self-medication with ATB ranging from 1 to 4 % (Grigoryan et al. 2006).

Our study suggested that the most common ATB used for self-medication in Beirut were amoxicillin and amoxicillin–clavulanic acid combination. This finding was concordant with reported results from studies in Sudan, Jordan, India, and United Arab Emirates (Abasaeed et al. 2009; Avorn and Solomon 2000; Nyazema et al. 2007; Saradamma et al. 2000). Parallel results were also found in Europe, according to the European Surveillance of Antimicrobial Consumption (ESAC) project, where penicillins are the most used ATB in outpatient care, followed by cephalosporins, tetracycline, macrolides and quinolones (Goossems et al. 2005).

However, macrolides and cephalosporins were the most commonly used in Greece (Mitsi et al. 2005) and not much used in our population. The high use of amoxicillin without prescription may be due to its widespread reputation among Lebanese people, its low cost, wide marketing efforts by pharmaceutical companies or the fact that it does not have disturbing side effects like other classes of ATB, such as macrolides. Although less frequently used than

**Table 5** Regression for self-medication with antibiotics predictors among the antibiotic buyers in pharmacies in Beirut area, Lebanon, 2011

| Independent variable | ORa | 95 % CI | *p* value | Model summary ($R^2$) |
|---|---|---|---|---|
| Gender | | | | |
| Male | 1.0 | Reference | | 25.9 % |
| Female | 0.33 | [0.2–0.5] | <0.001 | |
| Sore throat | | | | |
| No | 1.0 | Reference | | |
| Yes | 2.38 | [1.40–4.03] | 0.001 | |
| Danger of frequent use of antibiotic use | | | | |
| No | 1.0 | Reference | | |
| Yes | 0.30 | [0.18–0.51] | <0.001 | |
| Type of antibiotic used | | | | |
| Augmentin® | 1.0 | Reference | 0.60 | |
| Amoxicillin | 1.93 | [0.171–34] | 0.05 | |
| Quinolones | 0.44 | [0.18–1.03] | 0.005 | |
| Cephalosporins | 0.28 | [0.11–0.68] | 0.92 | |
| Others[a] | 0.96 | [0.41–2.22] | | |

Variables included but not retained in the final model: seeking medical advice, genital discharge, having a reference doctor and indications of use

[a] Other classes of antibiotics include tetracycline, macrolides, aminoglycosides, sulfonamides, and fusidic acid

penicillins, quinolones were found to be used quite commonly; this may also reflect marketing efforts of pharmaceutical companies. Further studies are necessary to explain these findings.

Most participants declared using ATB without prescription to save time and money. These main reasons are consistent with findings from other developing countries in Ethiopia (Suleman et al. 2009), India (Andrajati et al. 2005), and Jordan (Sawair et al. 2009). It may indicate that respondents think that they are knowledgeable about ATB use based on their past experience so they prefer saving time and money instead of going to a doctor to take prescription. However, antibiotics were given for wrong indications although advised by pharmacists and bought from a community pharmacy. In addition to legal issues reported above, we suspect that pharmacists' lack of knowledge or commercial behaviors and general population low health education level are also reasons that could explain our findings. The last point was clearly expressed by the study participants, who were not always aware of the dangers of ATB frequent use and who asked for education regarding these products. The vast majority of participants used ATB (with and without prescription) to relieve and cure predominantly viral upper respiratory tract infections. This finding is consistent with results of other studies in Abu Dabi (Abasaeed et al. 2009), Jordan (Nyazema et al. 2007), Czech Republic (Saradamma et al. 2000), Greek (Mitsi et al. 2005), and Northern and Western Europe (Grigoryan et al. 2008). It may indicate that participants did not realize the considerable health risks of the inappropriate use of ATB and that they believed that ATB can treat and eradicate any infection irrespective of its origin. In addition to inaccurate indications of use, self-medicated participants started their treatment with any ATBs found at home or advised by a pharmacist and stopped it just when the illness symptoms disappear. This incorrect use could cause the development of resistant bacteria and diminish the ability of the oral flora to resist colonization of harmful microorganism, thereby leading to super infections by multi-resistant bacteria and yeasts (Barbosa and Levy 2000).

With the exception of sex, the current study did not reveal any significant difference on socio-demographic characteristics between self-medicated and non self-medicated groups. This result was in concordance with a study in Syria (Barah and Gonçlaves 2010) where males self-medicated with ATB more than females and another one in Europe where general characteristics were not significantly different between participants with and without medical prescription. However, a study in Jordan (Sawair et al. 2009) revealed an association with age and income, while another survey highlighted on the cultural determinants that may have an impact on difference in outpatient antibiotic use in 12 countries of European regions (Al-Bakri et al. 2005). Our study suggested that, in Beirut, self-medication with ATB is much more affected by the person's knowledge, attitudes and perceptions toward ATBs use than by socio-demographic features. Furthermore, the inappropriate attitudes and lack of knowledge and awareness about antibiotic resistance, and adverse effects are widespread in Lebanon. Less than half of our participants did not know what is an antibiotic and resistance. This is similar to the results obtained in the United Arab Emirates, where the community believes that ATB can treat any

infection and participants were unaware of the consequences of inappropriate use of ATB (Longman and Martin 1991).

In order to reduce the frequency of self-medication, some developing countries suggested prohibiting over-the-counter antibiotic sales. In Chile, the prohibition of over-the-counter sales of ATB and a simultaneous public education campaign had an immediate and significant impact on the acquisition of ATB from pharmacies (Abasaeed et al. 2009). Similarly, sales of ATB without prescription in Zimbabwe decreased when the law against over-the-counter sales was strictly enforced. Fear of losing their license was a factor mentioned by some pharmacists for their compliance (Avorn and Solomon 2000). Thus, the situation can be changed in Lebanon by enforcing and controlling laws and regulations related to ATB dispensation in pharmacies, and by increasing the public's awareness about the dangers of ATB excessive consumption.

In this study, we had the possibility to study antibiotic use in Beirut. However, our study may suffer from several limitations. Since not all pharmacists accepted to participate to the study, the sample may not be representative of Beirut population. We 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 ATB self-prescribing behavior. Second, the duration of data collection in this study was limited only to 3 months from March to May, but the seasonal occurrence of certain diseases that lead to ATB usage among people such as upper respiratory tract infections could affect the estimated prevalence. Third, the use of a face to face interview in the pharmacy may be affected by subjectivity since the respondents' answers may be influenced by the interviewer or they are intimidated especially when it comes to wrong practices. Fourth, the sample was limited by its small size because of the short period specified for data collection. Despite that our questionnaire was relatively short some people did not agree to fill it out, which may also introduce a selection bias. Moreover, the small size of the sample affects also the power of tests to find significant differences. Further large scale studies are recommended to take into account the cited limitations.

In conclusion, self-medication with ATB is relatively a frequent problem in Lebanon. We recommend reinforcing the existing law to prohibit over the counter selling of antibiotics, investing in an antibiotic educational program about the possible risks of an inappropriate use of ATB and educating health care professionals, particularly pharmacists, to strengthen their role in advising patients about the correct use of the prescribed ATB. Such initiatives are vitally needed to improve current trends of community antibiotic consumption.

**Conflict of interest** The authors declare that they have no competing interests.

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