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Practices and Factors for Self-Medication with Antibiotics Among Patients and Medical Students in Tunisia: A Cross-Sectional Study

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Abstract: Self-medication with antibiotics (SMA) becomes generally common practice due to multiple factors. This study aimed to identify the prevalence and factors associated with SMA among patients and medical students in Tunisia. A cross-sectional study was conducted between March 2018 and October 2018 on 752 subjects. The sample of this study consisted of 153 patients in the outpatient clinic of two Universities Hospitals (Habib Bourguiba and Hedi Chaker in Sfax, Tunisia) and 559 students in the Medical universities of Tunisia. The inclusion criteria included adult patients (≥18 years) who see in one of both hospitals during the study and Medical students who accepted to access the questionnaire on Google forms. Data were collected through a structured questionnaire reliable and validated by a pilot test in a subsample of participants. Data were analyzed using SPSS. Student's t-test and Mann-Whitney U test were used to compare differences between quantitative variables. Pearson's chi-square test was carried out to evaluate associations between qualitative variables. Of 752 participants, 71.68% self-medicated (70.9% of patients and 72% of medical students). There were no significant differences in SMA between patients and medical students (P=0.738). Amoxicillin was the most commonly used antibiotic for SM by patients (67.6%) and medical students (74.5%) (P=0.149). Furthermore, the most common indications for the use of self-medicated antibiotics were angina, influenza-like illness, and fever were the most frequent indications for the use of self-medicated antibiotics by patients (56.5%, 60.2%, 28.7%) and medical students (60.1%, 40.8%, 17.9%) (P=0.494, P=0.001, P=0.012). Furthermore, for reasons following previous experience, time-saving, and easy availability of drugs from pharmacies, the difference was statistically different between the two groups, with an increase in medical students compared to patients. The major source of information was pharmacies. Ninety-seven patients (90%) and 364 students (88.8%) got their antibiotics based on pharmacist consultancy. SMA is a common practice among patients and medical students in Tunisia. This infers the need for interventions to prevent the SMA, such as the implementation of appropriate health organizations for public education concerning the risks and consequences for the health of SMA.

Keywords: Amoxicillin, Antibiotics, Medical Students, Pharmacies, Questionnaire, Self-Medication

1. Introduction

Antimicrobials are revolutionary therapeutic agents used to prevent or treat some kinds of microbial diseases [1]. Unfortunately, despite advanced public knowledge and concern about health care services, the irrational use of

antimicrobial agents without a medical prescription has been reported as being a global rise (almost 100%) [2, 3]. This unreasonable use could lead to major implications for public health as treatment failures, resistance to most pathogens, increased morbidity, wastage of medical resources, prolonged hospitalization periods, and increased risk of drug interactions [4, 5]. The rapid emergence of microbial resistance related to the irrational use of antibiotics is a major clinical and social health problem in various developing and developed countries [4, 6-9]. The situation in Tunisia is particularly alarming. The rate of self-medication (SM) increased from 12.8% in 1992 to 25% in 2001 and 60% in 2014 [10].

Self-medication with antibiotics (SMA) practices have a major pitfall, which is that the user presenting to clinics family medicine has previously started SMA, does not follow a prescribed drug regimen, and stop this last once they are relieved of symptoms of the disease.

It was reported SMA practices vary widely in different populations. Many investigations have mentioned that age, gender, family, society, economic status, education level, and medical knowledge are significant predictive factors for SMA [1, 11-13]. University students are a population of great interest regarding SMA practices since they represent a privileged segment of the population, with access to information. Some studies have shown a high prevalence of SMA in medical and non-medical university students [3, 14-18]. SMA among the youth is associated with various factors such as less time for seeking medical advice, increased costs of medical consultations, poor compliance to treatment, and aggressive pharmaceutical publicity [19-24].

To date, the information on SMA in the industrialized world is limited. The inappropriate use of antibiotics for SM tends to carry more significance in the developing countries, the problem has studied in only a few of these countries [25-28]. The prevalent trend of SMA in the developing countries is associated with several factors like lack of adequate access for health care, availability of antimicrobials as over the counter drugs, poor regulatory practices and the higher prevalence of infectious illnesses [1, 24, 28].

To the best of our knowledge, in Tunisia, there is no study regarding SMA practices among medical students. Also, taking into of the different research methods used, and small selected samples, no meaningful comparison between countries was possible. Moreover, insufficient information exists on determinants that put a person at-risk for SMA.

The aim objectives of our study were: i) to estimate the prevalence of SMA in a sample of patients and medical students, and ii) to identify factors associated with the SMA practices.

2. Method

2.1. Ethics Approval

Ethical clearance was obtained before the commencement of the study from the Ethical Committee of Medical Ethics of Tunisia. The experimental protocol was established following the guidelines of the Declaration of Helsinki.

2.2. Study Design and Sampling

We conducted an observational, cross-sectional study questionnaire-based approved by the Committee of Medical Ethics of Tunisia. This study was conducted, between March 2018 and October 2018, on a sample of patients in the outpatient clinic of two Universities Hospitals (Habib Bourguiba and Hedi Chaker in Sfax, Tunisia) and students in the Medical universities of Tunisia.

Inclusion criteria were: patients aged 18 years old and over who see in the hospital during the time of the study and Medical students who accepted to access the questionnaire on Google forms.

2.3. Study Tool: The Questionnaire

The questionnaire was designed as a purpose of data collection. It consisted of four sections with 35 both closed- and sometimes open-ended questions. The first section evaluated the demographics information, such as; age, gender, marital status, level of education, place of residence, household income, as well as, health insurance. If the participant has affirmed her response to SMA, he has instructed to fill the other sections. The second section of the questionnaire focused on the different antimicrobials that the participants bought for SMA. The third section contained questions about aspects of SMA, including reasons for use, methods of supply, duration, and frequency of use, and the location for obtaining medicines and the people they approached for advice. The fourth section asked questions regarding the knowledge of adverse effects caused by antibiotics, and of inadequate use of antibiotics on antibiotic resistance.

The validity and reliability of the questionnaire were ascertained, by a pilot test, in a subsample of participants. The pilot study allowed quality improvement of questions by structural flaws modification, diminish the time needed for completing the questionnaire, and achieved high internal consistency and reliability. The questionnaire took about 10 minutes to complete. Patients were answering the questionnaire themselves.

We were classified participants as practiced SM if they announced that they had taken antibiotics at least once in the last six months without a prescription.

2.4. Statistical Analysis

The data collected were entered into Microsoft Excel and analyzed using SPSS (version 20). Descriptive analysis was performed and frequency tables were analyzed to calculate the prevalence of SMA. The data were presented as mean ± SD, percentages, and frequencies.

$P < 0.05$ was considered statistically significant.

The statistical analyses were carried out to estimate: prevalence of SMA, major antibiotics used in SMA, causal factors associated with SMA, as well as, the extent risk associated with SMA.

3. Results

3.1. Socio-Economic and Demographic Profile of the Study Population

Out of a total of 791 subjects interviewed in this cross-sectional study, only 752 subjects have met the inclusion criteria and took part. Thirty-nine persons have excluded following incomplete information.

The mean age of study participants was 32.65 ± 3.7 years. The study comprised of 196 (26%) males and 556 (74%) females. Out of the 752 participants: 16 (2.2%) were uneducated, 126 (16.7%) were married, 512 (68.1%) dwelling in rural areas, and 75 (9.9%) participants have height household income.

Our study population has constituted of 153 patients and 559 medical students. More details have presented in Table 1.

3.2. Prevalence of Self-Medication and Its Association with Demographic Characteristics

In this study, the use of antibiotics not prescribed by health physicians was reported by 539 participants, indicating a prevalence rate of 71.68%.

Comparing the prevalence of SM among patients and medical students, students were more self‑medicated (72%) as compared to patients (70.9%). This difference was not statistically significant ($P = 0.738$).

A further analysis was performed on rates obtained by self-medicated patients and self-medicated medical students (Table 1). In both of these groups, SM prevalence was higher in females, in participants with middle household income, and in participants with healthcare expenses covered.

Table 1. *Basic demographic features of participants practiced self-medication with antibiotics.*

Sociodemographic characteristics	Patients (n=153)		Students (n=599)	
	Practiced SMA (n=108)	Not practiced SMA (n=45)	Practiced SMA (n=431)	Not practiced SMA (n=168)
Age (years), mean ± SD	41.3±14.2*	44.2±12.9	22.2±2.9*	21.8±1.7
Gender				
Male, n (%)	41 (38)*	23 (51.1)	94 (21.8)*	38 (22.6)
Female, n (%)	67 (62)* †	22 (48.9) †	337 (78.2)*	130 (77.4)
Educational level				
Illiterate, n (%)	8 (7.4) †	9 (20) †	0 (0)	0 (0)
Primary, n (%)	24 (22.2)	11 (24.5)	0 (0)	0 (0)
Secondary, n (%)	41 (38)	16 (35.5)	0 (0)	0 (0)
University, n (%)	34 (31.4)	9 (20)	431 (100)	168 (100)
Household income				
High, n (%)	7 (6.5)* †	9 (20) †	37 (8.6)*	22 (13.1)
Middle, n (%)	63 (58.3)*	25 (55.6)	364 (85)*	142 (84.5)
Lower, n (%)	38 (35.2) †	11 (24.4) †	27 (6.3) ‡	4 (2.4) ‡
Marital status				
Single, n (%)	31 (28.7)*	11 (24.4)	407 (94.4)*	160 (95.2)
Married, n (%)	73 (67.6)*	30 (66.8)	19 (4.4)*	4 (2.4)
Divorced, n (%)	2 (1.9)	0 (0)	4 (0.9)	2 (1.2)
Widowed, n (%)	2 (1.9) †	4 (9) †	1 (0.2)	2 (1.2)
Place of residence				
Urban, n (%)	24 (22.2)*	16 (35.5)	344 (79.8)*	128 (76.2)
Semi urban, n (%)	25 (23.1)*	6 (13.5)	64 (14.8)*	24 (14.3)
Rural, n (%)	59 (54.6)*	23 (51)	23 (5.4)*	16 (9.5)
Medical insurance				
No	15 (13.9)*	4 (8.9)	150 (25)*	0 (0)
Yes	93 (86.1)*	41 (91.1)	327 (75.9)* ‡	168 (100) ‡

SMA: Self-medication with antibiotics

* statistically significant difference ($P<0.05$) between patients and medical students

† statistically significant difference ($P<0.05$) between patients practiced SMA and patients not practiced SMA

‡ statistically significant difference ($P<0.05$) between students practiced SMA and students not practiced SMA

There was no significant difference in the prevalence of SMA concerning age, and place of residence between practiced SM, and not practiced SM in patients as well as medical students (Table 1).

3.3. Types of Antibiotics and Indications for Self-Medication

Twenty-eight types of antibiotics were used without a medical prescription by study participants (Table 2).

Penicillin was significantly more self-medicated by medical students when compared with patients. In contrast, erythromycin and spiramycin were significantly more self-medicated by patients compared to medical students.

Amoxicillin was the most commonly used antibiotic for SM by patients and students.

Some antibiotic families (beta-lactam, aminoglycoside, macrolides, and fluoroquinolones) were used only by medical students. Table 2 depicts the frequency of usage for each antibiotic.

In both groups who used antibiotics as SM: the mean duration of antibiotics use was almost five days, the earlier discontinuation of antibiotics was frequency reported when

symptoms disappeared, as well as, the majority of these participants have completed their antibiotics course (Table 3).

Also, our study showed that only students, who used antibiotics as SM, determined the antibiotics dose by checking the package insert, as observed in Table 3.

Furthermore, the most common indications for the use of self-medicated antibiotics were angina, influenza-like illness, and fever (Table 3).

Table 2. *Prevalence of use of antibiotic for self-medication.*

Antibiotic purchased for use in self-medication	Patients Practiced SMA (n=108)	Medical Students Practiced SMA (n=431)	*P*
Beta-lactam, n (%)	97 (89.8)	396 (91.9)	0.492
Penicillin, n (%)	88 (81.5)	386 (89.6)	0.021
Amoxicillin, n (%)	73 (67.6)	321 (74.5)	0.149
Ampicillin, n (%)	1 (0.9)	5 (1.2)	0.998
Oxacillin, n (%)	4 (3.7)	10 (2.3)	0.495
Flucloxacillin, n (%)	0 (0)	2 (0.5)	-
Amoxicillin + clavulanic acid, n (%)	36 (33.3)	178 (41.3)	0.130
C1G	7 (6.5)	3 (0.7)	
Cefadroxil, n (%)	0 (0)	1 (0.2)	-
Cefalexine, n (%)	0 (0)	2 (0.5)	-
Cefazoline, n (%)	7 (6.5)	0 (0)	-
C2G: Cefuroxime, n (%)	22 (20.4)	24 (5.6)	-
C3G	0 (0)	14 (3.2)	-
Cefixime, n (%)	0 (0)	8 (1.9)	-
Cefpodoxime, n (%)	0 (0)	6 (1.4)	-
Ceftriaxone, n (%)	0 (0)	1 (0.2)	-
Aminoglycoside: Gentamicin, n (%)	0 (0)	4 (0.9)	0.588
Macrolides and related	24 (22.2)	50 (11.6)	0.004
Erythromycin, n (%)	8 (7.4)	5 (1.2)	10^{-3}
Spiramycin, n (%)	17 (15.7)	12 (2.8)	10^{-3}
Spiramycin+ metronidazole, n (%)	0 (0)	3 (0.7)	-
Azithromycin, n (%)	0 (0)	25 (5.8)	-
Clarithromycin, n (%)	0 (0)	11 (2.6)	-
Roxithromycin, n (%)	0 (0)	2 (0.5)	-
Fluoroquinolones	1 (0.9)	16 (3.7)	0.138
Ciprofloxacin, n (%)	1 (0.9)	8 (1.9)	0.695
Levofloxacin, n (%)	0 (0)	2 (0.5)	-
Ofloxacin, n (%)	0 (0)	6 (1.4)	-
Cyclines: Doxycycline, n (%)	3 (2.8)	16 (3.7)	0.638

SMA: Self-medication with antibiotics, C1G: First-generation cephalosporins, C2G: Second-generation cephalosporins, C3G: Third-generation cephalosporins.

Table 3. *Characteristics of used antibiotics for self-medication.*

Used Antibiotics	Patients Practiced SMA (n=108)	Medical Students Practiced SMA (n=431)	*P*
How many times			
Once, n (%)	97 (89.8)	293 (74.6)	0.857
Twice, n (%)	11 (10.2)	82 (20.9)	-
Thirce, n (%)	0 (0)	13 (3,3)	-
Completed the course			
Yes, n (%)	76 (70.8)	310 (76.3)	0.284
No, n (%)	33 (29.6)	91 (22,41)	
Duration of use (Days), mean ± SD	5,11±1,8	5,4±1,9	0.183
Antibiotic discontinuation time			
After symptoms disappeared, n (%)	86 (79.6)	116 (28.3)	0.001
After antibiotics ran out, n (%)	33 (30.6)	93 (22.7)	0.702
A few days after the recovery, n (%)	23 (21.3)	81 (19.8)	0.220
After a few days regardless of the outcome, n (%)	20 (18.5)	73 (17.8)	0.222
After consulting a doctor / pharmacist, n (%)	7 (6.5)	15 (3.7)	0.998
Antibiotic dose determination			
Checking the package insert, n (%)	0 (0)	244 (59.5)	0.001
Previous experience, n (%)	43 (39.8)	164 (40.0)	0.998
consulting a pharmacist, n (%)	75 (69.4)	145 (35.4)	0.024
Others, n (%)	0 (0)	71 (17.3)	-
Indications for self-medication			
Angina, n (%)	61 (56.5)	259 (60.1)	0.494
Influenza-like illness, n (%)	65 (60.2)	176 (40.8)	0.001
Fever, n (%)	31 (28.7)	77 (17.9)	0.012
Dental infections, n (%)	24 (22.2)	57 (13.2)	0.019

Used Antibiotics	Patients Practiced SMA (n=108)	Medical Students Practiced SMA (n=431)	*P*
Sputum, n (%)	22 (20.4)	37 (8.6)	0.001
Sinusitis, n (%)	5 (4.6)	49 (11.4)	0.037
Diarrhea, n (%)	6 (5.6)	26 (6.0)	0.851
Skin infection, n (%)	0 (0)	6 (1.4)	-
Otitis, n (%)	0 (0)	3 (0.7)	-

SMA: Self-medication with antibiotics

3.4. Reasons for Antibiotic Self Medication

Previous experience, followed by the time-saving, easy availability of drugs from pharmacies, and, economic reasons were the most important reasons for SM by patients and students (Table 4).

Furthermore, for reasons following previous experience, time-saving, and easy availability of drugs from pharmacies, the difference was statistically different between the two groups, with an increase in medical students compared to patients.

3.5. Source for Antibiotic Self-Medication

Information sources to practice SM were analyzed and illustrated in Table 4. The most important source of information was pharmacies. Ninety-seven patients (90%) and 364 students (88.8%) got their antibiotics based on pharmacist consultancy.

Table 4. *Characteristics of self-medication.*

	Patients Practiced SMA (n=108)	Medical Students Practiced SMA (n=431)	P
Reasons for self-medicating			
Previous experiences, n (%)	30 (27.8)	229 (53.1)	0.001
Lack of time and save time, n (%)	37 (34.3)	213 (49.4)	0.005
Drugs that are easy to buy in pharmacies, n (%)	19 (17.6)	156 (36.2)	0.001
Economic reasons (high cost of doctor visits / low cost of purchasing medicines), n (%)	20 (18.5)	66 (15.3)	0.416
Difficulty accessing healthcare services, n (%)	8 (7.4)	48 (11.1)	0.256
Source of antibiotic supply			
Pharmacies	97 (90)	364 (88.8)	0.99
Household	65 (60)	139 (33.9)	0.018
Relatives and friends	0 (0)	45 (11.0)	-
Adverse effects caused by antibiotics			
Diarrhea/abdominal pain, n (%)	11 (30.6)	29 (47.5)	0.001
Allergic Reactions, n (%)	10 (27.8)	14 (23)	0.11
Nausea/Vomiting, n (%)	14 (38.9)	9 (14.8)	0.02
Others, n (%)	1 (2.8)	9 (14.8)	0.005

SMA: Self-medication with antibiotics

3.6. Knowledge of Adverse Effects Caused by Antibiotics

In our study, diarrhea/abdominal pain and allergic reactions were the most common adverse effects reported. Table 4 depicted the individual frequencies obtained for knowledge on each adverse effect.

4. Discussion

Despite the national regulations that restrict the dispensation of antibiotics without doctor's advice, our study indicates a high prevalence of SMA in Tunisia. To the best of our knowledge, this survey represents the second published work, studying the prevalence of SMA among the adult population in Tunisia. Therefore, the level of SMA is difficult to estimate. Our results show that SMA is a common practice in Tunisia by patients as well as medical students with a prevalence of 70.9% and 72% respectively. These rates are above the one found by Ben Barhim S (2015) in Tunisia, which is 54.5% [10]. The high percentage of self-medicated person is a worldwide problem, and variations concerning medications self-medicated in terms of prevalence vary across the countries; Palestine (98%) [14], Slovenia (92.3%) [11], Nigeria (82.2%) [29], Italy (32.7%) [30], Southern China (47.8%) [31], Malta (19.2%) [32], Mexico (5%) [33], and Sweden (3%) [34]. These variations may be due to ethnic diversity between the different populations and different healthcare systems in each country. Our prevalence rate was lower compared to some countries but high enough to be taken sincerely.

By comparison, we found that did not show significant differences in SMA prevalence between patients practiced SM, and medical students practiced SM. As of fact, no research has been comparing the prevalence of SMA between patients and medical students. So, we can assume that health education has no role in addressing SM issues. Similar to our result, a Nigerian study showed that SM was higher among medical students compared to non-medical students [35].

We assessed for the first time the factors that could have contributed to people's self-medicating. Our survey showed that female patients were more self-medicated than male patients, while in students the irrational use of antibiotics was not correlated with gender. It stands to reason hormonal

changes and decreased immunity among the female, during their menstrual cycle, stand women to diseases more frequently than men. At such times in their cycle, females may feel reluctant to visit the doctor and treat their menstrual symptoms by antibiotics self-medicated. This trend has been reported elsewhere [36]. Moreover, our result showed that the majority of self-medicated participants have belonged to the low socioeconomic class, which is similar to this obtained by Muhammad et *al.* [37]. On the other hand, we observed a significant relationship between health insurance and SMA only in medical students. No significant association was seen between SMA and demographic factors such as age, as well as a place of residence. These outcomes are congruent with those of Muhammad et *al.* [37].

In our study, Beta-lactams were the most class of antibiotics chosen for SM, which is in accord with other studies [13, 35]. As our participant declared, amoxicillin was the most common antibiotic used to SM. The irrational use of this antibiotic is consistent with other studies [15, 30, 31, 37]. Amoxicillin was well known to the public because of low-cost across the word and its wide-spread prescription by health care providers [15]. Furthermore, we observed a high prevalence of SM about penicillin in medical students compared to patients. In contrast, erythromycin and spiramycin were the main antibiotics self-medicated by patients compared to medical students. Besides, the cephalosporins, aminoglycoside, macrolides, and fluoroquinolones were taken for SM, exclusively by students. The variations in antibiotics selection among both groups might be because of their different health knowledge and attitude to medication.

Our cross-sectional study revealed that angina following by influenza and fever were the most common indications for SM amongst patients and medical students. Similar to our outcomes, in studies from rural areas of Sindh [37] and rural of India [38], fever and influenza were the main symptoms for SM.

To gain more insight into the factors associated with the SMA practices, the reasons for self-medicating, the source of antibiotic supply, and the adverse effects caused by antibiotics were investigated, by comparative method, between self-medicated patients and self-medicated medical students.

Our results have clearly shown significant differences for reasons following previous experience, time-saving, and easy availability of drugs from pharmacies, between the two groups, with an increase for these in medical students, compared to patients. Long delay times in hospitals or clinics were the primary reason for the practice of SMA by our participants. Similarly, in accord with our findings, Rohit and colleagues [39] reported that the majority of participants announced that they practiced SMA because of saving time. Moreover, in this study, SMA appears to be more motivated by prior successful experiences as well as the easy availability of antibiotics. We concluded that the pharmacies are free to sell medications without prescriptions. Consequently, laws about drug sales are not correctly implemented, in Tunisia. Comparable to our result, a study carried out in rural areas of Sindh found that the acquisition of antibiotics from pharmacies without prescription was used by self-medicated subjects as the most viable reason [37].

Upon assessment of the source of antibiotic supply, we found that our participants seek advice regarding medication from pharmacists, family, and friends. Indeed, we mentioned that the principal source of SMA was the pharmacy. In Greece, the law still allows patients to obtain antibiotics from pharmacists without any medical prescription [13]. Besides, a work by Contopoulos-Ioannidis and colleagues published that 77% of Greek pharmacists offered expensive broad-spectrum antibiotics without medical prescription [40]. In contrast, in Kuwait, the pharmacist's role is defined as a drug salesman rather than that of a health care provider [41]. However, given the availability of the drug over the counter, pharmacists must assume this role after appropriate training and with continuing professional development programs.

Lastly, our participants were inquired concerning the adverse effects caused by antibiotics. We found that diarrhea/abdominal pain and allergic reactions were the most common adverse effects reported. The difference in these adverse effects was statistically significant between patients and students who practiced SMA. Our results are in agreement with the study by Muhammad et *al*. [37] show that 48% indicated diarrhea/ abdominal pain, and 32% reported an allergic reaction.

In this study, it is clear that our findings on students are generalizable to all Tunisian medical universities because we did have the ability to randomly select a sample of all these universities. In contrast, our findings regarding patients not generalized because this is a cross-sectional study carried only at the outpatient clinic of two Universities Hospitals in the Sfax government. Additionally, we introduced selection bias only choosing people from the medical universities and outpatient clinics of two Universities Hospitals in the Sfax government, as well as setting the time limit of six months for SMA. It could be possible that the prevalence of SMA would be greater in the Tunisian population, who do not visit the hospital, or who registered from the non-medical universities, or who self-prescribed before six months. Moreover, like any questionnaire-based survey, there is no way to gauge the truthfulness of the answers of the participants.

5. Conclusion

So far, this survey represents the first published work, studying the prevalence of SMA among the general population in Tunisia. Our findings confirm that SMA is a common practice among patients and medical students in Tunisia. We found that did not show significant differences in SMA prevalence between patients practiced SM, and medical students practiced SM. Therefore, to stem the tide of SMA, three important interventions should be taken. Firstly, the appropriate health organizations should be efforts to conduct an annual antibiotic knowledge campaign underscoring the importance of practicing antibiotics responsibly. Secondly, the care physician should be more judicious in prescribing

and must insist on antibiotics being provided by the pharmacist only on a legitimate medical prescription. Thirdly, effective legislation banning the unregulated sale of antibiotics without medical prescription. Future investigation should include other populations of Tunisia to estimate the overall prevalence of SMA.

Conflict of Interest Statement

All the authors do not have any possible conflicts of interest.

References

[1] Mainous AG, Diaz VA, Carnemolla M. Factors affecting Latino adults' use of antibiotics for self-medication. J Am Board Fam Med. 2008; 21 (2): 128-134.

[2] Gaash B. Irrational use of antibiotics. Indian Journal of Practicing Doctor 2008; 5 (1): 25-29.

[3] Zafar SN, Syed R, Waqar S, Zubairi AJ, Vaqar T, Shaikh M, et al. Self-medication amongst university students of Karachi: Prevalence, knowledge and attitudes. J Pak Med Assoc. Student's Corner. 2008; 58 (4): 214-217.

[4] Matuz M, Benko R, Doro R, Hajdu E, Soos G. Non-prescription antibiotic use in Hungary. Pharm World Sci. 2007; 29: 695-698.

[5] Parimi N, Pereira LMP, Prabhakar P. Caregivers' practices, knowledge and beliefs of antibiotics in paediatric upper respiratory tract infections in Trinidad and Tobago: A cross sectional study. BMC Family Practice. 2004; 5: 28.

[6] Harbarth S, Samore MH. Antimicrobial resistance determinants and future control. Emerg Infect Dis. 2005; 11: 794-801.

[7] Kristiansson C, Reilly M, Gotuzzo E, Rodriguez H, Bartoloni A, Thorson A, et al. Antibiotic use and health-seeking behaviour in an underprivileged area of Peru´. Tropical Medicine and International Health. 2008; 13 (3): 434-441.

[8] Sarahroodi S, and Arzi A. self-medication with antibiotics, is it a problem among Iranian College students in Tehran? J Biol Sci. 2009; 9 (8). 829-832.

[9] Skliros E, Merkouris P, Papazafiropoulou A, Gikas A, Matzouranis G, Papafragos C, et al. Selfmedication with antibiotics in rural population in Greece: a crosssectional multicenter study. BMC Family Practice. 2010; 11. 58-60.

[10] Ben Brahim S. Determinants of Self-Medication Practice by Tunisians. World Journal of Pharmacy and Pharmaceutical Sciences. 2015; 10 (4): 138-154.

[11] Klemenc-Ketis Z, Hladnik Z, Kersnik J. Self-medication among healthcare and non-healthcare students at University of Ljubljana, Slovenia. Med Princ Pract 2010; 19: 395-401. [12] Buke C, Hosgor-Limoncu M, Ermertcan S et al. Irrational use of antibiotics among university students. J Infect 2005; 51: 135-139.

[12] Skliros E, Merkouris P, Papazafiropoulou A, Aristofanis G, George M, Christos P, et al. Self-medication with antibiotics in rural population in Greece: a cross-sectional multicenter study. BMC Fam Pract 2010; 11: 58-62.

[13] Sawalha, A. F., A descriptive study of self-medication practices among Palestinian medical and nonmedical university students. Res. Social Adm. Pharm. 2008; 4 (2). 164-172.

[14] Al-Azzam, SI, Al-Husein BA, AlZubi F, Masadeh MM, and Al-Horani MAS. Self-medication with antibiotics in Jordanian population. Int. J. Occup. Med. Environ. Health. 2007; 20 (4). 373-380.

[15] Sarahroodi S, Arzi A, Sawalha AF, and ashtranezhad A. Antibiotic self-medication among Southern Iranian university students. Int. J. Pharmacol. 2010; 6 (1). 48-52.

[16] Fadare JO, and Tamuno I. Antibiotics self-medication among university medical undergraduates in Northern Nigeria. J. Pub. Health & Epidemiol. 2011; 3 (5). 217-220.

[17] Suaifan GARY, Shehadeh M, Darwish DA, Al-ljel H, yousef AM, and Darwish RM. A cross-sectional study on knowledge, attitude and behavior related to antibiotic use and resistance among medical and non-medical university students in Jordan. Afr. J. Pharmac. & Pharmacol. 2012; 6 (10). 763-770.

[18] Widayati A, Suryawati S, de Crespigny C, Hiller JE. Self medication with antibiotics in Yogyakarta City Indonesia: a cross sectional population-based survey. BMC Res Notes 2011; 4: 491-495.

[19] Shehnaz SI, Khan N, Sreedharan J et al. Self-medication and related health complaints among expatriate high school students in the United Arab Emirates. Pharm Pract (Granada) 2013; 11: 211-8.

[20] Badiger S, Kundapur R, Jain A et al. Self-medication patterns among medical students in South India. Australas Med J 2012; 5: 217-220.

[21] Banerjee I, Bhadury T. Self-medication practice among undergraduate medical students in a tertiary care medical college, West Bengal. J Postgrad Med 2012; 58: 127-131.

[22] Sarahroodi S, Maleki-Jamshid A, Sawalha AF et al. Pattern of self-medication with analgesics among Iranian University students in central Iran. J Family Community Med 2012; 19: 125-129.

[23] Pan H, Cui B, Zhang D et al. Prior knowledge, older age, and higher allowance are risk factors for selfmedication with antibiotics among university students in southern China. PLoS One 2012; 7: e41314.

[24] World Health Organization. Guidelines for the regulatory assessment of Medicinal Products for use in self-medication. Characteristics of self-medication. WHO/EDM/QSM/00.1; 2000.

[25] Adu-Sarkodie YA. Antimicrobial self medication in patients attending a sexually transmitted diseases clinic. Int. J. STD AIDS 1997, 8, 456–458.

[26] Donkor ES, Nartey E. Nasal colonisation of drug resistant bacteria in Ghanaian children less than five years. Internet J. Microbiol. 2008: 5.

[27] Vila J, Pal T. Update on antibacterial resistance in low-income countries: Factors favouring the emergence of resistance. Open Infect. Dis. J. 2010; 4, 38–54.

[28] Abdulraheem I S, Adegboye A, Fatiregun AA. Self-medication with Antibiotics: Empirical Evidence from a Nigerian Rural Population. Br. J. Pharm. Res. 2016, 11, 1–13.

[29] Napolitano F, Izzo MT, Di Giuseppe G, Angelillo IF. Public knowledge, attitudes, and experience regarding the use of antibiotics in Italy. PLoS One. 2013; 8 (12): e84177.

[30] Pan H, Cui B, Zhang D, Farrar J, Law F, Ba-Thein W. Prior knowledge, older age, and higher allowance are risk factors for self-medication with antibiotics among university students in southern China. PLoS One. 2012; 7 (7): e41314.

[31] Borg MA, Scicluna EA. Over-the-counter acquisition of antimicrobial drugs in the Maltese general population. Inter J Antimicrob Agents. 2002; 20: 253-57.

[32] Calva J, Bojalil R. Antibiotic use in a periurban community in Mexico: A household and drug store survey. SocSci Med. 1996; 42 (8): 1121-1128.

[33] Svensson E, Haaijer-ruskamp FM and Lundborg CS. Self-Medication with antibiotics in a Swedish general population. Scandinavian Journal of Infectious Diseases. 2004; 36 (6-7): 450-452.

[34] Olayemi OJ, Olayinka BO, Musa AI. Evaluation of antibiotic self-medication pattern amongst undergraduate students of Ahmadu Bello University (Main Campus), Zaria. Res. J. Appl. Sci. Eng. Technol. 2010, 2, 35–38.

[35] Sapkota AR, Coker ME, Goldstein RER, Atkinson NL, Sweet SJ, Sopeju PO, et al. Self-medication with antibiotics for the treatment of menstrual symptoms in southwest Nigeria: A cross sectional study. BMC Public Health. 2010, 10.

[36] Muhammad B, Abdul H, Mohammad HK, Mohammad HA, Asma AL, Sufyan KN, et al. Self-Medication with Antibiotics among People Dwelling in Rural Areas of Sindh. Journal of Clinical and Diagnostic Research. 2016; 10 (5): 08-13.

[37] Ahmad A, Parimalakrishnan S, Patel I, Kumar NV, Balkrishnan TR, Mohanta GP. Evaluation of self-medication antibiotics use pattern among patients attending community pharmacies in rural India, Uttar Pradesh. J Pharm Res. 2012; 5: 765-68.

[38] Rohit KV, Lalit M, Manisha P. Evaluation of self medication among professional students in North India: proper statutory drug control must be implemented. Asian J of Pharmaceutical and Clinical Research. 2010; 3 (1): 0974-2441.

[39] Patel J, Jha R, Totade S, Gupta V, Gupta C, Nema P. Antibiotics as Self Medication amongst Medical Students. RJPBCS. 2012; 3: 655-661.

[40] Contopoulos-Ioannidis DG, Koliofoti ID, Koutroumpa IC, Giannakakis IA, Ioannidis JP: Pathways for Inappropriate Dispensing of Antibiotics for Rhinosinusitis: A Randomized Trial. Clin Infect Dis. 2001, 339: 76-82. 10.1086/320888.

[41] Eman Abahussain, Lloyd K. Matowe, P. J. Nicholls. Self-Reported Medication Use among Adolescents in Kuwait. Med Princ Pract 2005; 14: 161–164.