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ORIGINAL ARTICLE

Antibiotic Self-Medication for Oral Conditions: Characteristics and Associated Factors

Najla Saeed Dar-Odeh[1,2], Badr M. Othman[3], Rayan H. Bahabri[4], Ahmad A. Alnazzawi[5], Sary S. Borzangy[5], Hani T. Fadel[3], Albraa B. Alolayan[6], Osama A. Abu-Hammad[2,5]

[1]Department of Oral Basic and Clinical Sciences, College of Dentistry, Taibah University, Al Madinah Al Munawara, Saudi Arabia.
[2]School of Dentistry, University of Jordan, Amman, Jordan.
[3]Department of Preventive Dental Sciences, College of Dentistry, Taibah University, Al Madinah Al Munawara, Saudi Arabia.
[4]Department of Restorative Dental Sciences, College of Dentistry, Taibah University, Al Madinah Al Munawara, Saudi Arabia.
[5]Department of Substitutive Dental Sciences, College of Dentistry, Taibah University, Al Madinah Al Munawara, Saudi Arabia.
[6]Department of Oral and Maxillofacial Surgery, College of Dentistry, Taibah University, Al Madinah Al Munawara, Saudi Arabia.

Author to whom correspondence should be addressed: Professor Najla S. Dar-Odeh, College of Dentistry, Taibah University, Al Madinah Al Munawwarah, Saudi Arabia. Phone: +00966 592231888. E-mail: najla_dar_odeh@yahoo.com.

Abstract

Objective: To investigate the prevalence and contributing factors of antibiotic self-medication for oral conditions in dental patients. **Material and Methods:** A questionnaire was distributed to 501 patients attending Taibah University Dental College and Hospital, Al Madinah, Saudi Arabia during late 2016. Questions were on socio-demographic characteristics, and pattern of antibiotic self-medication for oral disease. Statistical analysis was performed using IBM SPSS software version 21. Statistical significance level was set at p ≤.05. **Results:** Age range was 15-64 years (29.08±9.32 years) with 297 females (59.3%) and 204 males (40.7%). 135 patients (27%) self-medicated with antibiotics for oral disease. This practice was statistically significantly associated with the older adults (p=0.001), lack of medical or dental insurance (p=0.014 and 0.007, respectively), and poor dental attendance (p=0.021). A number of 26 (25.7%) perceived analgesics as antibiotics. Amoxicillin-clavulanic acid was the most commonly cited antibiotic by 18 patients (17.8%). Dental pain was the most frequently reported oral condition. Pharmacists were the most common source for antibiotic prescription cited by 58 (57.4%). **Conclusion:** Antibiotic self-medication for oral disease is associated with the use of broad-spectrum antibiotics for non-indicated clinical oral conditions. The practice was encouraged by lenient behavior of pharmacists, lack of health insurance, and poor dental attendance.

Keywords: Anti-Bacterial Agents; Patients; Self Medication.

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Introduction

Recent reports stated that the global burden of oral disease increased markedly during the first decade of the 21st century [1]. Diseases affecting teeth, their supporting structures and oral mucosa are best treated by operative interventions in the form of restorations, extractions, and periodontal therapy as well as other clinical interventions [2]. The need for therapeutic antimicrobial prescribing arises in a limited number of situations where operative intervention is either contraindicated or insufficient to achieve a complete resolution of inflammation [3,4]. Antibiotics use is not without cost; gastrointestinal disturbances, anaphylactic shock, and potentially fatal conditions like Stevens-Johnson syndrome [2] are only a few of the many side effects that antibiotics are known to be associated with. On the other hand, antibiotic resistant bacterial infections have been blamed for an estimated 25,000 deaths per year in Europe alone [5].

Taking into consideration the importance of antibiotic use among the community, it is also important to investigate antibiotic self-medication (ASM). This practice usually presents in the form of using leftover antibiotics, and using antibiotics for non-indicated conditions [6].

Unfortunately, ASM was shown to exist particularly in developing as well as some western countries where the prevalence was estimated to be 38.8% [7], qualifying this practice to be a leading cause of increased antimicrobial resistance [8]. Research on the pattern of ASM among dental patients in developing countries is needed as the problem is primarily there. Previous research has focused mainly on attitudes of pharmacists toward antibiotic dispensing without a prescription, and found that self-confidence in the ability for diagnosis and treatment characterizes pharmacists who demonstrate this attitude [9]. Self-medication practices of dental patients in general with no particular focus on antibiotics was also investigated previously [10,11].

Considering the high prevalence of oral disease [12] and virulence profile of microorganisms in the oral cavity [13-15] the main aim of this study was to investigate prevalence, associated factors, and characteristics of ASM for oral disease among dental patients.

Material and Methods

Sampling and Participants

Epidemiological software Epi Info™ (CDC, Centers for Disease Control, Atlanta, USA) was used to calculate sample size based on findings of previous studies that approximately 60% of the population practice self-medication [16], and an estimated number of 3000 patients attending at Taibah University Dental College and Hospital (TUCDH) monthly. Using a 5% confidence limit a sample size of 500 patients gave a confidence level between 97% and 99%.

Inclusion criteria were dental patients attending TUCDH for treatment of various oral diseases of both genders who were aged ≥ 18 years. A convenience sample of patients were invited to complete the questionnaire during their routine visit to the TUCDH for dental treatment. Consent was obtained from patients, or from their guardians if aged less than 18 years. After giving consent patients completed the online questionnaire by accessing its link using a smart phone provided by a

designated group of dental interns who were trained to do so. Data collection was performed during November and December, 2016.

Questionnaire

Study tool in the form of a pre-structured online questionnaire was used in this study. The first version of the questionnaire was designed by authors ND, and BO using Google Forms, and it was written in English. It was translated to Arabic and back translated to English by authors AAA, SB and ABA for validity purposes. Translation to Arabic was modified until the back-to-English translation matched the original questions.

Questions were close-ended and they were organized in the following sections: socio-demographic characteristics (marital status, educational level, and occupation); pattern of dental attendance (when in need, once or more yearly); and lastly pattern of ASM (ever practice of ASM, history of ASM in the past year, source of antibiotics; type of antibiotic, clinical reasons for its intake, and occurrence of complications).

The questionnaire was validated by distributing the questionnaire to ten volunteer patients attending TUDCH. The questionnaire was distributed to the same volunteers after ten days. Whenever a patient gave a different answer to a specific question, they were interviewed, and when necessary the question was modified to rule out misunderstanding. The process was repeated until there was complete agreement between responses of each volunteer.

Statistical Analysis

Statistical analysis was performed using IBM SPSS software version 21 (IBM Corp., Armonk, NY, USA) to find descriptives and frequencies. Chi-square test was used to calculate statistically significant differences between groups. Cross-tabulation was performed for the following groups: age (two groups: 15-24 years and $\geq$25 years), marital status (single, married or previously married), occupation (student, unemployed, non-health occupations, and health occupations), education (illiterate, school level, university level, postgraduate level), dental attendance (when in need, once or more yearly). Statistical significance level was set at p $\leq$0.05.

Ethical Aspects

The study was conducted in complete accordance with the World Medical Declaration of Helsinki, and ethical approval was obtained from Research Ethics Committee, College of Dentistry, Taibah University (IRB #00010037).

Results

Among the 544 responses that were obtained, 43 responses were excluded due to incomplete answers making the final number of valid responses 501 responses (92.1%). Age range was 15-64

years (29.08±9.32 years) with 297 females (59.3%) and 204 males (40.7%). Socio-demographic characteristics of gender, marital status, occupation, and education are displayed in Table 1.

Table 1. Socio-demographic characteristics of the study sample.

Socio-Demographic Characteristics	N	%
Gender		
Male	204	40.7
Female	297	59.3
Marital Status		
Single	232	46.3
Married (or Previously Married)	269	53.7
Occupation		
Unemployed	200	39.9
Non Healthcare Occupations	162	32.3
Student	107	21.4
Healthcare Occupations	32	6.4
Education		
Postgraduate	29	5.8
University	333	66.5
School	137	27.3
Illiterate	2	0.4

A total number of 135 (27%) indicated that they practice ASM for oral disease, and there was a statistically significant association with older age group (p=0.001). Other socio-demographic factors had no statistically significant association with ASM (p>0.05) (Table-2).

Table 2. Socio-demographic characteristics with antibiotic self-medication.

Socio-Demographic Characteristics	Antibiotic Self-Medication		p-value
	Yes N (%)	No N (%)	
Age groups			
15-24 years	37 (18.8)	160 (81.2)	0.001*
25-64 years	98 (32.2)	206 (67.8)	
Total	135 (27.0)	366 (73.0)	
Gender			
Male	59 (28.9)	145 (71.1)	0.409
Female	76 (25.6)	221 (74.4)	
Marital status			
Single	53 (22.8)	179 (77.2)	0.055
Married (and Previously Married)	82 (30.5)	187 (69.5)	
Occupation			
Unemployed	52 (26.0)	148 (74.0)	0.825
Non-Health Occupations	48 (29.6)	114 (70.4)	
Student	27 (25.2)	80 (74.8)	
Health Occupations	8 (25.0)	24 (75.0)	
Education			
University	81 (24.3)	252 (75.7)	0.181
School	46 (33.6)	91 (66.4)	
Postgraduate	7 (24.1)	22 (75.9)	
Illiterate	1 (50.0)	1 (50.0)	

Health-related factors such as lack of medical insurance and dental insurance, as well as irregular dental attendance were all significantly associated with ASM (p=0.014, 0.007 and 0.021 respectively) as shown in Table 3.

Table 3. Practice of antibiotic self-medication and relevant factors that might contribute to this behavior.

Contributing Factor	Antibiotic Self-Medication				p-value
	Yes	No	Total		
	N (%)	N (%)	N	%	
Having Medical Insurance					
Yes	31 (19.7)	126 (80.3)	157	31.3	0.014*
No	104 (30.2)	240 (69.8)	344	68.7	
Having Dental Insurance					
Yes	19 (17.0)	93 (83.0)	112	22.3	0.007*
No	116 (29.8)	273 (70.2)	389	77.7	
Having a Specific Dentist					
Yes	38 (26.8)	104 (73.2)	142	28.3	0.953
No	97 (27.0)	262 (73.0)	359	71.7	
Frequency of Dental Visits					
Once or more yearly	25 (19.2)	(18.8)	130	25.9	0.021*
When in need	110 (29.6)	(70.4)	371	74.1	

A number of 101 (20.2%) of patients practiced ASM in the past year for oral disease. Pattern and Characteristics of ASM in the past year for oral disease are displayed in Table 4, which shows the sources of antibiotics, type of antibiotics, complications, and oral diseases for which antibiotics were taken.

Table 4. Pattern and characteristics of ASM for oral disease in the past year.

Aspects of ASM in the Past Year	N	%
Source of Antibiotics		
Pharmacist	58	57.4
Left overs	32	31.7
Pharmacist and left overs	5	5.0
No response	6	5.9
Name of the Antibiotic		
Don't remember	54	53.5
Metronidazole	2	2.0
Amoxicillin-clavulanic acid	18	17.8
NSAIDS	26	25.7
Amoxicillin	1	1.0
Occurrence of Complications		
Yes	4	4.0
No	97	96.0
Type of Complications		
Difficulty in breathing	1	1.0
Diarrhea	2	2.0

Oral Disease for Antibiotics Self-Medication

Dental pain	75	74.2
Odontogenic abscess	9	8.9
Gingivitis	3	3.0
Facial swelling	6	5.9
Oral ulcers	4	4.0
Halitosis	4	4.0

NSAIDS: Nonsteroidal anti-inflammatory drugs.

Discussion

This study recruited patients who were attending Taibah University Dental School and Hospital (TUCDH) in Al Madinah, western Saudi Arabia, which is affiliated to Taibah University, the only university in the province with a dental college. It provides free oral healthcare services to the community of Al Madinah of both genders and all age groups.

The study found that approximately one in four dental patients self-medicate with antibiotics for oral disease. More importantly, it found that older dental patients (25-64 years) have a higher prevalence of ASM than younger patients and the difference was statistically significant. Previous research in Europe found that antibiotic use was higher among young individuals [17], and that there was an association between ASM and younger age [18]. However, in this sample older patients practice ASM more than younger patients probably due to cumulative knowledge and experience gained by ageing and marriage to establish families. Several factors have been implicated in ASM, such as financial condition, cultural beliefs, and uncertainty of diagnosis [19].

A closer look at the factors that were associated with ASM in this study show that health-related factors like lack of medical/dental insurance, and poor dental attendance were all significantly associated with ASM. The study did not investigate the socioeconomic profile of patients, however, there seems to be a link between availability of oral healthcare and ASM. A factor that complicates this condition is the fact that oral hygiene practices in this geographic area fall short of the optimum level [20,21], and that oral healthcare is not in a better situation [22]. On the other hand, patients are able to obtain antibiotics from pharmacists to treat oral disease without the need for prescription or even dental advice [23]. It has been confirmed that in many countries, pharmacies sell antibiotics as an OTC (over the counter) items [24-27].

In the last 5 years, an increasing number of studies were conducted in Saudi Arabia, to investigate dispensing antibiotics without prescription and to propose the appropriate interventions and solutions [28-30]. The main outcome of these studies was that dispensing antibiotics without prescription is a common practice in Saudi Arabia suggesting legislation enforcement to terminate this practice [9].

In this study most patients who explained the source of antibiotics cited the pharmacist as the primary source of antibiotics. Interestingly, a substantial proportion of patients who stated the name of antibiotic they self-medicated with during the past year, actually used a non-steroidal anti-inflammatory analgesic like ibuprofen or diclofenac, and perceiving it as an antibiotic. These analgesics were mostly obtained from pharmacists indicating that they have an acceptable level of

awareness regarding the role of analgesics in relief of oral problems as more suitable and safer alternatives than antibiotics in terms of antimicrobial resistance. Patients' awareness of the repercussions of antibiotic abuse is still inadequate; many patients in this study do not recognize the name of the medications they take as most of the responses to the question on the type of antibiotic could not determine the name of the antibiotic (medication) they used.

Previous studies have found that hospitalized patients show significant deficits in their knowledge of hospital medications [31]. This issue becomes more important for outpatients since most medications are prescribed and used outside hospitals [32]. Lack of patients' knowledge on their medications may be associated with compromised drug safety and subsequent adverse reactions. Antibiotics used for bacterial oral infections are known to cause gastrointestinal problems, photosensitivity, fungal infections, Stevens-Johnson syndrome, inhibition of bone growth, and allergic reactions including anaphylactic shock [33]. Furthermore, some of them are known for their drug interactions; a good example being the interaction of azithromycin and metronidazole with warfarin [34].

Side effects stated by patients following ASM in this study have been reported previously and this confirms that antibiotic use is not without complications. It was not surprising to find that most of the self-medicating participants used antibiotics for non-indicated conditions like dental pain, gingivitis, oral ulcers, odontogenic abscess and halitosis. The aforementioned conditions are best treated by operative dental interventions where antibiotics have no role to play and have to be avoided [2,35]. On the other hand, facial cellulitis is a classic indication for antibiotic use in dental practice, being a spreading infection with serious consequences [36]. Ironically it was one of the least cited situations for antibiotic use among the study sample. Another indication for antibiotics include specific types of periodontal diseases like aggressive periodontitis and necrotizing ulcerative gingivitis which require antibiotics as adjunctive option besides to operative interventions [2], and this should be determined by the dental clinician and not by the patient.

The most commonly used antibiotic by the study sample was amoxicillin-clavulanic acid, followed by amoxicillin, and metronidazole. Amoxicillin is a recommended antibiotic for the empiric treatment of odontogenic infections [37], however, amoxicillin-clavulanic acid has been a popular choice among dentists in this geographic area [38], the latter has been associated with a higher success rate, albeit the higher possibility for severe gastrointestinal disturbances due to its content of clavulanic acid [39].

The study has limitations. It was a single-center study recruiting patients who attend mostly for the free dental services so it may not be representative of all socioeconomic groups. Furthermore, the community of Al Madinah is multicultural reflecting the multiethnic background of people who live in the holy city, so it may not be representative of all the Saudi community. On the other hand, this study provided important data on the practice of ASM for the treatment of oral diseases. This is expected to inspire and motivate oral healthcare professionals to participate actively in the efforts against the spread of antimicrobial resistance.

Conclusion

A substantial proportion of dental patients in Al Madinah, western Saudi Arabia self-medicate with antibiotics for the treatment of oral disease, and this practice becomes more prevalent with age. The patients mainly obtain medications from pharmacists, and many of them lack knowledge on the type of antibiotic and the appropriate clinical indications.

Interventions from official institutions like Ministry of Health are needed; these should target both pharmacists and patients. It is time to regulate the medications dispensing by pharmacies and to enforce legislation, which considers antibiotics "prescription", and not "over-the-counter" medications. Educational programs targeting patients should address the importance of periodic dental attendance and preventive dental services. These programs should also educate the public on the many risks of antibiotic abuse particularly those related to antibiotic resistance. It may also be useful to establish more emergency dental clinics affiliated to the Ministry of Health to provide emergency services for patients who complain of acute dental pain. This should go hand in hand with improving access and facilitating the provision of oral healthcare services to those in pain in an effort to eliminating patients' need for obtaining medications that they look for to alleviate their dental pain.

Acknowledgements

References

1. Jin LJ, Lamster IB, Greenspan JS, Pitts NB, Scully C, Warnakulasuriya S. Global burden of oral diseases: Emerging concepts, management and interplay with systemic health. Oral Dis 2016; 22(7):609-19. doi: 10.1111/odi.12428.
2. Dar-Odeh NS, Abu-Hammad OA, Al-Omiri MK, Khraisat AS, Shehabi AA. Antibiotic prescribing practices by dentists: A review. Ther Clin Risk Manag 2010; 6:301-6.
3. Dar-Odeh N, Al-Beyari M, Abu-Hammad O. The role of antifungal drugs in the management of denture-associated stomatitis. Int Arabic J Antimicrob Agents 2012; 2(1):1-5. doi: 10.3823/705.
4. Al-Shayyab MH, Abu-Hammad OA, Al-Omiri MK, Dar-Odeh NS. Antifungal prescribing pattern and attitude towards the treatment of oral candidiasis among dentists in Jordan. Int Dent J 2015; 65(4):216-26. doi: 10.1111/idj.12173.
5. European Centre for Disease Control. The bacterial challenge: Time to react. Available at: http://www.ecdc.europa.eu/en/publications/Publications/0909_TER_The_Bacterial_Challenge_Time_to_React.pdf. [Access 15 Nov 2017].
6. Shehadeh MB, Suaifan GA, Hammad EA. Active educational intervention as a tool to improve safe and appropriate use of antibiotics. Saudi Pharm J 2016; 24(5):611-5. doi: 10.1016/j.jsps.2015.03.025.
7. Ocan M, Obuku EA, Bwanga F, Akena D, Richard S, Ogwal-Okeng J, Obua C. Household antimicrobial self-medication: A systematic review and meta-analysis of the burden, risk factors and outcomes in developing countries. BMC Public Health 2015; 15:742. doi: 10.1186/s12889-015-2109-3.
8. 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. doi: 10.1371/journal.pone.0084177.

9. Bahnassi A. Pharmacists views and practices in regard to sales of antibiotics without a prescription in Madinah, Saudi Arabia. J Patient Saf 2016; 12(3):159-64. doi: 10.1097/PTS.0000000000000087.

10. Jain A, Bhaskar DJ, Gupta D, Agali C, Yadav P, Khurana R. Practice of self-medication for dental problems in Uttar Pradesh, India. Oral Health Prev Dent 2016; 14(1):5-11. doi: 10.3290/j.ohpd.a35000.

11. 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. doi: 10.1186/1756-0500-4-491.

12. El Khateeb SM, Abu-Hammad O, Fadel H, Dar-Odeh N. A retrospective analysis of radiographic jaw findings in young women: Prevalence and predictors. J Int Soc Prev Community Dent 2017; 7(1):22-7. doi: 10.4103/2231-0762.200707.

13. Dar-Odeh N, Shehabi A, Al-Bitar Z, Al-Omari I, Badran S, Al-Omiri M, Naser M, Al-Beyari M, Abu-Hammad O. Oral candida colonization in patients with fixed orthodontic appliances: The importance of some nutritional and salivary factors. Afr J Microbiol Res 2011; 5(15):2155-9. doi: 10.5897/AJMR11.382.

14. Salah R, Dar-Odeh N, Abu Hammad O, Shehabi AA. Prevalence of putative virulence factors and antimicrobial susceptibility of enterococcus faecalis isolates from patients with dental diseases. BMC Oral Health 2008; 8:17. doi: 10.1186/1472-6831-8-17.

15. Abu-zineh R, Dar-odeh N, Shehabi A. Macrolide resistance genes and virulence factors of common viridans Streptococci species colonizing oral cavities of patients in Jordan. Oral Health Dental Manag 2015; 14(6):350-4.

16. Nayir T, Okyay RA, Yesilyurt H, Akbaba M, Nazlican E, Acik Y, Akkus HI. Assessment of rational use of drugs and self-medication in Turkey: A pilot study from Elazig and its suburbs. Pak J Pharm Sci 2016; 29(4 Suppl):1429-35.

17. European Commission. Special eurobarometer 407. Antimicrobial resistance. Available at: http://ec.europa.eu/public_opinion/archives/ebs/ebs_407_en.pdf. [Access 15 Nov 2017].

18. Grigoryan L, Haaijer-Ruskamp FM, Burgerhof JG, Mechtler R, Deschepper R, Tambic-Andrasevic A, Andrajati R, Monnet DL, Cunney R, Di Matteo A, et al. Self-medication with antimicrobial drugs in Europe. Emerg Infect Dis 2006; 12(3):452-9. doi: 10.3201/eid1205.050992.

19. Barden LS, Dowell SF, Schwartz B, Lackey C. Current attitudes regarding use of antimicrobial agents: Results from physician's and parents' focus group discussions. Clin Pediatr 1998; 37(11):665-71. doi: 10.1177/000992289803701104.

20. Al-Humaidi SF, Dar-Odeh NS, Alnazzawi A, Kutkut A, Hudieb M, Abu-Hammad O. Volatile sulphur compounds in exhaled air of dental students smoking the waterpipe: A nested case control study. Minerva Stomatol 2017; 66(4):157-62. doi: 10.23736/S0026-4970.17.04061-4.

21. Dar-Odeh N, Aleithan F, Alnazzawi A, Al-Shayyab M, Abu-Hammad S, Abu-Hammad O. Factors affecting oral Health determinants in female university students: A cross-sectional survey in Saudi Arabia. Int J Adolesc Med Health 2017; 1. doi: 10.1515/ijamh-2017-0084.

22. Khateeb S, Hamdan B, Gafar A, Jaber S, Dar-Odeh N. Prevalence of dental caries among young women in central western region of Saudi Arabia. Int J Adv Dent Med Sci 2015; 1(2):46-9.

23. Guinovart MC, Figueras A, Llop JC, Llor C. Obtaining antibiotics without prescription in Spain in 2014: even easier now than 6 years ago. J Antimicrob Chemother 2015; 70(4):1270-1. doi: 10.1093/jac/dku526.

24. Farah R, Lahoud N, Salameh P, Saleh N. Antibiotic dispensation by Lebanese pharmacists: A comparison of higher and lower socio-economic levels. J Infect Public Health 2015; 8(1):37-46. doi: 10.1016/j.jiph.2014.07.003.

25. Barker AK, Brown K, Ahsan M, Sengupta S, Safdar N. What drives inappropriate antibiotic dispensing? A mixed-methods study of pharmacy employee perspectives in Haryana, India. BMJ Open 2017; 7(3):e013190. doi: 10.1136/bmjopen-2016-013190.

26. Sabry NA, Farid SF, Dawoud DM. Antibiotic dispensing in Egyptian community pharmacies: An observational study. Res Social Adm Pharm 2014; 10(1):168-84. doi: 10.1016/j.sapharm.2013.03.004.

27. Zapata-Cachafeiro M, Gonzalez-Gonzalez C, Vaquez-Lago JM, Lopez-Vazquez P, Lopez-Duran A, Smyth E, Figueiras A. Determinants of antibiotic dispensing without a medical prescription: A cross-sectional study in the north of Spain. J Antimicrob Chemother 2014; 69(11):3156-60. doi: 10.1093/jac/dku229.

28. Hadi MA, Karami NA, Al-Muwalid AS, Al-Otabi A, Al-Subahi E, Bamomen A, Mohamed MM, Elrggal ME. Community pharmacists' knowledge, attitude, and practices towards dispensing antibiotics without

prescription (DAwP): A cross-sectional survey in Makkah Province, Saudi Arabia. Int J Infect Dis 2016; 47:95-100. doi: 10.1016/j.ijid.2016.06.003.

29. Abasaeed AE, Vlcek J, Abuelkhair MA, Andrajati R, Elnour AA. A comparative study between prescribed and over-the-counter antibiotics. Saudi Med J 2013; 34(10):1048-54.

30. Bin Abdulhak AA, Altannir MA, Almansor MA, Almohaya MS, Onazi AS, Marei MA, Aldossary OF, Obeidat SA, Obeidat MA, Riaz MS, et al. Non prescribed sale of antibiotics in Riyadh, Saudi Arabia: A cross sectional study. BMC Public Health 2011; 11:538. doi: 10.1186/1471-2458-11-538.

31. Cumbler E, Wald H, Kutner J. Lack of patient knowledge regarding hospital medications. J Hosp Med 2010; 5(2):83-6. doi: 10.1002/jhm.566.

32. Budnitz DS, Layde PM. Outpatient drug safety: new steps in an old direction. Pharmacoepidemiol Drug Saf 2007; 16(2):160-5. doi: 10.1002/pds.1242.

33. Norris P, Chamberlain K, Dew K, Gabe J, Hodgetts D, Madden H. Public beliefs about antibiotics, infection and resistance: A qualitative study. Antibiotics 2013; 2(4):465-76. doi: 10.3390/antibiotics2040465.

34. Onysko M, Holcomb N, Hornecker J. Antibiotic interactions: Answers to 4 common questions. J Fam Pract 2016; 65(7):442-8.

35. Dar-Odeh NS, Al-Abdalla M, Al-Shayyab MH, Obeidat H, Obeidat L, Abu Kar M, Abu-Hammad OA. Prescribing antibiotics for pediatric dental patients in Jordan; knowledge and attitudes of dentists. Int Arab J Antimicrob Agents 2013; 3(4):1-6.

36. DeCroos FC, Liao JC, Ramey NA, Li I. Management of odontogenic orbital cellulitis. J Med Life 2011; 4(3):314-7.

37. Holmes CJ, Pellecchia R. Antimicrobial therapy in management of odontogenic infections in general dentistry. Dent Clin North Am 2016; 60(2):497-507. doi: 10.1016/j.cden.2015.11.013.

38. Dar-Odeh N, Ryalat S, Shayyab M, Abu-Hammad O. Analysis of clinical records of dental patients attending Jordan University Hospital: Documentation of drug prescriptions and local anesthetic injections. Ther Clin Risk Manag 2008; 4(5):1111-7. doi: 10.2147/TCRM.S3727.

39. Bax R. Development of a twice daily dosing regimen of amoxicillin/clavulanate. Int J Antimicrob Agents 2007; 30(Suppl 2):S118-121. doi: 10.1016/j.ijantimicag.2007.09.002.