

Original Research Article

The knowledge, practice, and attitude regarding antibiotic use among attendants of primary health care centres: a cross-sectional study in Qatar

Ameera Mohamedhayder J. B. Alkhuzaei¹, Rasha ElSayed Salama², Izz Eldin Eljak³,
Mohamad Abdel Halim Chehab^{4*}, Nagah Abdel Aziz Selim⁵

¹Department of Medicine, Primary Health Care Corporation, Doha, Qatar

²Department of Community Medicine, Suez Canal University, Ismailia, Egypt

³Department of Public health, Aspetar, Doha, Qatar

⁴Hamad Medical Corporation, Doha, Qatar

⁵Department of Public Health and Preventive Medicine, Cairo University, Cairo, Egypt

Received: 18 August 2017

Revised: 11 September 2017

Accepted: 12 September 2017

*Correspondence:

Dr. Mohamad Abdel Halim Chehab,

E-mail: mohamadchehab1989@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: The inappropriate use of antibiotics is a significant global health problem as it is contributing to the development of antimicrobial resistance. Thus, this study aimed at assessing the knowledge, attitude, and practice of antibiotic use among patients attending primary health care (PHC) centres in Qatar.

Methods: 722 adult patients from the primary health care centres were recruited and a self-administered questionnaire was employed.

Results: Regarding the knowledge, 69.9% of patients believed that completing the full course of antibiotics is a necessity. In addition, more than half of the interviewees believed that antibiotics are necessary to treat a sore throat or an ear infection. Interestingly, regarding the practice, more than half (54.4%) of the interviewed patients often requested antibiotics as part of their treatment. Regarding the attitude, many patients (87.2%) pressured physicians to be given an antibiotic.

Conclusions: This study revealed that patients often have inadequate knowledge about antibiotic use, which affects their attitude and practice. Thus, educating patients may reduce unnecessary antibiotic use and resistance in the community.

Keywords: Antibiotic resistance, Primary healthcare, Patients, Qatar

INTRODUCTION

In 1945 during his Nobel Prize speech, Alexander Fleming, the accidental father of penicillin, warned that bacteria could one day develop resistance against antibiotics. 72 years later, antimicrobial resistance has been increasing at an alarming rate worldwide; prompting it to become a public health threat that politicians, health

care professionals, and the community can no longer ignore. Moreover, the emergence of antimicrobial resistance is slowly demolishing what took decades to accomplish, with increasingly limited antibiotic choices for the treatment of many bacterial infections; rendering treatment expensive and in some cases non-existent. The aforementioned issue is leading medicine on a steady perilous course to a post-antibiotic era.¹ Although rates of

antimicrobial resistance are increasing, few novel antibiotics are being developed.

In addition to that, antibiotic resistance is taking a huge toll on the community as well as the health care system. Moreover, it has been responsible for at least 23,000 deaths and a staggering two million cases of antibiotic-resistant illnesses in the United States of America (USA) each year.² Also, the Centres for Disease Control and Prevention (CDC) estimated the economic impact of antimicrobial resistance in the USA alone to be approximately US \$35 billion per year, divided as \$20 billion resulting from direct health care expenses and as much as \$15 billion to the public due to loss of productivity.³ Furthermore, according to the World Health Organization's regional office for Europe, there were an estimated 25,000 deaths as well as 400,000 patients presenting with resistant strains during 2007; where the economic burden totalled at €1.5 billion annually.⁴ Thus, in an attempt to guide the development of new antibiotics, the WHO has released its first ever priority list of 12 antibiotic-resistant bacteria on February 27th, 2017; clearly depicting the global momentum this issue has gained.

In developing countries, the level of drug resistant-infections and deaths are almost the same or higher than developed countries. In addition to that, African countries have reported extensive resistance for a variety of diseases such as: cholera, typhoid, gonorrhoea, meningitis, tuberculosis, malaria and AIDS. Similarly, more than 50,000 cases of multidrug resistant tuberculosis have been reported in the continent between January 2004 and December 2011.⁵ Moreover, patients with such infections will reside longer in the hospital, suffer from more side effects; thus inflicting a large burden on the finances of an already struggling health care system.

Moreover, the World Health Organization has identified the inappropriate use of antibiotics to be a major risk factor for antimicrobial resistance.⁶ In addition to that, the major drivers of inappropriate antimicrobial use are patient-related factors; therefore contributing to the increased prevalence of antimicrobial resistance. Furthermore, the aforementioned factors include patient's misperceptions, self-medication, advertisement, promotion, and poor adherence to dosage regimens. On the same hand, a systematic review and meta-analysis conducted by Costelloe et al found a significant association between antibiotic use by individual patients in the primary care setting and subsequent antibiotic resistance within the following 12 months; where the effect was greatest after one month but persisted as long as one year.⁷ A survey conducted in the United States of America demonstrated that on average, each physician had encountered seven patients within the previous six months; each of whom had specifically requested prescription-only drugs as a result of direct-to-consumer advertising.⁸ Another study conducted in Trinidad and Tobago by Parimi et al among children caregivers,

revealed that more than half (54%) of the respondents believed antibiotics cure all infections; while 61% believed that antibiotics are free from side effects, and 11% believed that antibiotics are generally safe.⁹

A survey was conducted among 45 hospitals in the south-eastern Mediterranean region through short structured interviews in the out-patient clinics or primary health centres of Cyprus, Egypt, Jordan, Lebanon, Libya, Tunisia, and Turkey. The study revealed that, on average, 19% of patients were self-medicating (<0.1% in Cyprus to 37% in Lebanon), where 48.4% of the whole group replied that they kept antibiotics at home; the highest being in Lebanon (60%).¹⁰

In the GCC (Gulf Cooperation Council) region, a study by Al Rasheed et al in the Kingdom of Saudi Arabia during 2014 revealed that almost 79% of the respondents to the cross-sectional survey in Al Wazarat Health Centre practiced self-medication.¹¹ During 2016, the GCC infection control board (GCC-IC) released its first strategic plan to combat antimicrobial resistance with focus on four main aspects of the issue, one of which is the human aspect.¹² In Qatar, patients receive medications from private community pharmacies, dispensaries affiliated with primary care clinics, and outpatient dispensaries in hospitals. Several studies have been conducted regarding local antibiotic use; with some focusing on patients' attitude towards antibiotic use for certain diseases, while others being conducted in the community setting. In addition to that, a cross-sectional survey conducted by Moienzadeh et al among private pharmacies in Doha, revealed that the median knowledge score regarding proper antibiotic use was 4/8 among respondents of the public.¹³ However, no studies have been pursued in the primary health care setting, which represents the first and more comprehensive point of contact between the public and the health care system. Currently, there are legislations that prohibit dispensing antimicrobial agents without prescriptions in the State of Qatar. Moreover, the Ministry of Public Health in the country has revealed late last year of intentions to launch a national action plan to combat antimicrobial resistance; in alignment with the regional strategy.¹⁴ However, there is no sufficient information about the knowledge, practice, and attitude among patients of the primary health care centers towards antibiotic use; which triggered the conduction of this study to yield information for smart decision-making.

METHODS

Study design and setting

This was a cross-sectional study conducted in Qatar one of the GCC countries, located at the east of Arabia, between January and July of 2009. The statistics show that there is about 1 physician for approximately 3,900 people and 1 pharmacist for 14,000 people residing in Qatar. Health care services in Qatar are provided mainly

through the 21 PHC centres distributed across the country and offering preventive and curative services.

Study population and sample

The study subjects participating in the investigation were adult patients (20-65yrs) attending primary health care centres seeking medical care; both Qatari and non-Qatari. Multi-stage sampling was done, where in the first step

health care centres were stratified into two groups; those outside Doha (capital of Qatar) including 10 primary health care centres and those within Doha including 11 primary health care centres. Then, in the second step, six health centres were selected randomly, three from each stratum. After which, proportionate cluster random sampling was done to select patients from primary health care centres, according to the number of patients served/centre (Figure 1).

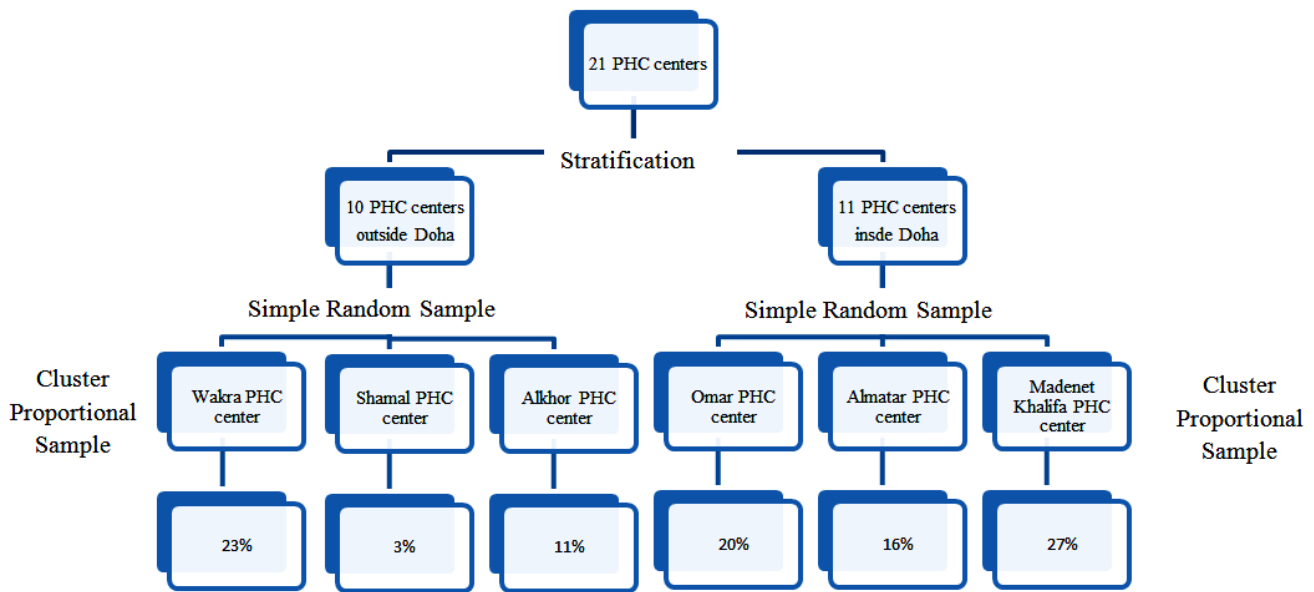


Figure 1: Schematic representation of the sampling technique.

The sample size was estimated using EPI info version 2.3. In addition, the rule of 50% was applied to estimate the prevalence of knowledge, practice, and attitude of antibiotic use in Qatar, as well as a precision of 5% with a 95% confidence interval (CI) and design effect of 1.88. The inflation rate was taken as 20% to compensate for non-response.

The following sample equation was used: $n = [DEFF * Np(1-p)] / [(d^2 / Z^2_{1-\alpha/2}) * (N-1) + p*(1-p)]$

- Zα=1.96 (C.I: 95%)
- P=Expected prevalence 50%
- d=Deviation 5%
- Adult population= 1159403

Thus, the estimated sample size was found to be as follows: 722 adult patients.

Study variables

Dependent variables

Those included the following:

Knowledge of antibiotic use: knowledge about appropriate uses of antibiotics, correct methods of use, and the side effects.

- Attitude toward appropriate antibiotics use
- Practice of appropriate uses of antibiotic

Independent variables

Those included the demographic variables: gender, nationality, marital status, and educational level.

Data collection and tools

The patient’s questionnaire was a modified self administered, structured validated questionnaire in English as well as in Arabic. It was divided into two parts: the first included demographic data (gender, age, nationality, educational level, marital status and employment status) and the second included data regarding the knowledge, attitude, and practice of antibiotic use. Moreover, the questionnaire was pre-tested to identify sources of potential errors as those due to method of delivery or those caused by sequencing. Also, the questionnaire was administered twice to assure that

patients understood the questions and answered accordingly. Finally, the investigator reviewed the completed questionnaires to assure completion of data.

Data entry and analysis

The data was coded and entered into the statistical package of social science [SPSS] (Window version No.15). Frequency distributions were carried out and a Chi-square test was utilized for testing the significance of association between the dependent variables and most of the independent variables.

RESULTS

Sociodemographic characteristics of participants

The calculated sample size for adult attendants of PHC centres was 722, of which 701 agreed to participate in the study, yielding a response rate of 97.1%. Furthermore, 354 (50.5%) males and 347(49.5%) females had participated in this study and most of the attendants were aged 26-35 years (41.5%). The study was inclusive of Qatari (55.2%) as well as non-Qatari (44.8%) attendants out of which, about 72.9% of the population were married and 66.8% had children (Table 1). In the present investigation, the education level and occupation of the subjects were collected during the interview, where more than half of the study attendants were highly educated with university degrees (57.1%). It was noted that most of the study attendants were engaged in clerical/administrative jobs (29.8%) followed by professional (25.1%) work (teachers, engineers, and technicians).

Table 1: Frequency distribution of sociodemographic characteristics among PHC attendants (n=701).

Characteristics	no.	%
Age group		
<=25	145	20.7
26-35	291	41.5
36-45	181	25.8
>45	84	12.0
Gender		
Male	354	50.5
Female	347	49.5
Nationality		
Qatari	314	44.8
Non Qatari	387	55.2
Marital status		
Single	150	21.4
Married	511	72.9
Divorced	32	4.6
Widow	8	1.1
Have children		
Yes	482	68.8
No	219	31.2

Knowledge

In this study, the PHC attendants were assessed regarding their knowledge on antibiotics and their use. Thus, it was revealed that 83% of them could identify the difference between a bacteria and a virus. Also, about three quarters of the interviewees (75.6%) were aware that the overuse of antibiotics will not help in treating future infections, while 69.9% knew the importance of completing the full course of an antibiotic. On the other hand, 40.5% of the patients were under the misperception that antibiotics are necessary to treat fever. Moreover, more than half of the participants (51.4%) believed that antibiotics are effective against viruses and are needed to treat sore throats and ear infections. Regarding the lack of knowledge about antibiotics, it was clear that more than one quarter of the attendants (27.4%) did not know that some germs were becoming harder to treat with antibiotics. In addition to that, it was noted that more than half of the PHC attendants (50.2%) were able to identify allergy as one of the common side effects of antibiotics. Around 38.9% of the attendants also identified loose stool as another side effect. Interestingly, more than a third (34.8%) of the participants knew that a major side effect of antibiotics is antibiotic resistance, while merely 12% of the attendants believed that antibiotics did not have any side effects. Also, almost 40% of the interviewees assumed that expensive antibiotics function better than cheaper ones. Regarding the source of antibiotic information, doctors/nurses were the most widespread (65.6%), followed by recommendations from friends and family (35.7%), the media (19.3%), newspapers/magazine (20.5%), and the internet (22.4%). Moreover, the interviewees who had children were compared with those who did not, regarding all aspects of knowledge about antibiotic use. Thus, it was found that parents had significantly ($p<0.001$) proven that they possessed a better understanding and knowledge of antibiotics.

Attitude

This study found that 41.8% of the attendants always carried antibiotics when going on a vacation. Out of the entire population (701), 16% of the participants were prescribed antibiotics over the phone, whereas 12.3% of them argued with doctors to be given antibiotics even though it was not necessary for their treatment. Furthermore, about 17% of the patients resisted undergoing laboratory investigation, where almost one quarter of them (20.4%) pressured their doctors for specific antibiotics; even resorting to different doctors to get their requested antibiotic. On the other hand, more than one third of the participants (35.0%) thought that doctors prescribe antibiotics unnecessarily. Also, the study revealed that the gender of the attendants played a significant role in determining their attitudes towards antibiotics and their use. Moreover, females were more likely to carry antibiotics when travelling on a vacation; implying that they practice self-medication significantly ($p<0.001$) more than males do (48.7% vs. 35.0%). In

addition to that, male participants reported a significantly ($p<0.001$) higher negative attitude and even argued with their doctors to attain prescriptions for specific antibiotics. Similarly, more than one quarter (25.9%) of male interviewees reported taking second opinions and a similar portion (20.3%) portrayed significantly ($p=0.033$) higher resistance to undergoing laboratory investigations, when compared with their female counterpart (13.8%). Interestingly, the different factors that influenced participants' decision towards antibiotic use, without the need of a prescription, were the severity of the disease (47.5%) and previous experience (46.1%). Also, about one third (37%) of the attendants would consider taking antibiotic without prescription if they did not find the current medication regimen to be effective. Additionally, a smaller percentage of participants (9.7% and 9.0%) had considered taking antibiotics without returning to their doctor due to crowded health centres and their busy schedule respectively (Figure 2). Finally, it was revealed that the principal factors affecting participant's decision towards specific antibiotic use were: the quality, side effects, dosage, taste, and price. Furthermore, more than half (55.2%) of the attendants requested a specific type of antibiotic because they were interested in the quality, while 42.4% of the attendants considered the absence of side effect as a key factor in deciding on their choice of antibiotics.

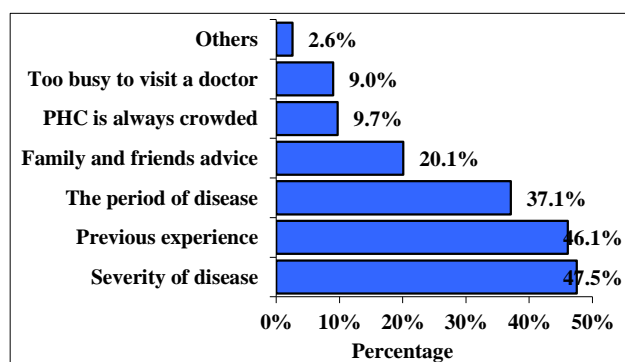


Figure 2: Factors affecting the decision towards antibiotic use without prescription among the PHC attendants (n=701).

Practice

Regarding the practice of antibiotic use among the interviewees, the majority (63.2%) reported completing the full course of their antibiotics while less than half (45.5%) of them stored the medicine for future use. Remarkably, a very high percentage of the attendants (43.5%) opted for self-medication during the time of sickness and avoided consulting the physician. When analysing the age as an independent factor, it was discovered that the older attendants (>45 years) were less likely to complete the full course of the antibiotics ($p<0.002$). In addition to that, the individual practice of attendants was studied according to gender, revealing that female participants followed the doctors instructions and

completed the full course of the antibiotic as compared to males ($p<0.001$). Finally, when compared to the Qatari attendants, the non-Qatari participants were more likely to store antibiotics for future use and significantly practiced self-medication ($p<0.001$).

DISCUSSION

In consistency with the results obtained above, a study conducted by Parimi et al among caregivers of paediatrics patients in Trinidad and Tobago revealed that more than half (54%) of the respondents thought antibiotics can cure all infections.⁹ Similarly, another research carried out by Larissa et al among European countries portrayed that non-awareness of antibiotic resistance is quite prevalent (approximately half of the respondents) with a wide variation across countries, from 87% in Malta to 29% in Belgium. Additionally, non-awareness of the adverse effects of antibiotics was also high (48%) but homogeneous between countries.¹⁵ In our study, more than half of the PHC attendants were able to define allergy as one of the common side effects of antibiotics. In addition, more than a third (34.8%) of the interviewees knew that a major side effect of antibiotic misuse is antibiotic resistance; while merely 12% of the participants believed that antibiotics did not have any side effects. In contrast, almost two-thirds (61%) of those who participated in the aforementioned Trinidad and Tobago study believed that antibiotics are free from side effects.

Furthermore, it was found that the majority of responders (43%) incorrectly agreed that 'Antibiotics can kill viruses' in a household survey conducted by the British department of health, investigating public attitude and awareness towards antibiotic use.¹⁶ Akin to our results, You et al. conducted a study in Hong Kong, where it was found that the participants possessed a sound knowledge regarding the treatment of bacterial infections through antibiotics (65%). In addition to that, the respondents also acknowledged the importance of completing the antibiotic regimen, even after symptoms of the infection waned (58%).¹⁷ Moreover, the relatively high level of knowledge among our study participants, as well as the results yielded from studies around the world, regarding the selective effect of antibiotics on bacteria rather than viruses is explained by the fact that the global regular use of antibiotics had rendered people knowledgeable about it. On the other hand, a report published in 2013 by the Directorate-General for Health and Consumers (Eurobarometer) revealed that 60% of the surveyed Europeans did not know that antibiotics are ineffective against viruses.¹⁸ Moreover, a study conducted in Portugal by Azevedo et al in order to assess antibiotic use, concluded that a lack of general knowledge on correct antibiotic use may be due to a lack of formal education on this subject.¹⁹ Consequently, this lack of accurate information may result in high rates of inappropriate consumption; even if antibiotics are available only by prescription, the education of the public

on the correct use of antibiotics remains a necessity for the prevention bacterial resistance.²⁰

In our study doctors and nurses were reported to be the most frequent source of antibiotic information by more than two thirds of the participants (65.6%) when compared to the media, TV/radio, newspapers/magazine or internet (around 20% combined). Interestingly, patient demand for antimicrobials might be triggered by mass media such as TV, internet, magazine or newspaper advertising; a behaviour which also contributes to the development of resistance.

In the current study, some attitudes regarding antibiotic use were scrutinized. Moreover, it was revealed that almost half of the respondents always carried antibiotics when going on a vacation, highlighting their aspect of self-medication. This finding is similar to that unveiled by other studies, as that of Awad et al in Kuwait and Emeka et al in Al Ahsa, Saudi Arabia where the prevalence of self-medication among respondents was 27.5% and 73.7% respectively.^{21,22} Similarly, about 16% of the participants in the current study requested antibiotic prescriptions via the phone; again indicating their confidence in self-medication. Thus, individual-level characteristics predispose to this self-medication behaviour, such as: a perceived availability of antibiotics without prescription in certain countries, the high cost of a medical consultation, and the prevailing dissatisfaction towards medical practitioners. In addition to that, this behaviour is further exacerbated due to other factors, which include: decreased knowledge, the lack of alternatives offered by clinicians and the lack of access to information regarding the rational use of antibiotics.

The present study stated that gender of the attendants played a significant role in determining their attitudes towards antibiotic and their use. Women, compared to men, were more likely to carry antibiotics with them (48.7% vs. 35.0%) when they went for vacation, implying their practice of self-medication and caution. On the other hand, men reported a more negative attitude (16.7% vs. 7.8%) towards the doctor regarding the prescribed antibiotics. Many clinical and non-clinical factors contribute to negative attitudes and the inappropriate use of antibiotics. These include doctor and consumer knowledge, perceived patient demand, pressure of promotion, fear of poor clinical outcomes, peer norms and local medical culture and supply mechanisms.²³

Regarding the practice of the PHC attendants towards antibiotic use, the majority (63.2%) of them completed the full course of antibiotics and almost half (45.5%) stored the medicine for future use. The latter observation suggests that certain social and cultural factors influence self-medication, despite antibiotics being prescription-only medicines in the state of Qatar. Moreover, in a recent study investigating self-medication with antibiotics in the United Arab Emirates, Abasaed et al pointed out that 54% of participants reporting antibiotic use, acquired

their antibiotics without prescription. Another 28% of all participants also declared that they were keeping antibiotics at home, mostly acquired from the community pharmacies without a prescription.²⁴ Similarly, Parimi et al from Trinidad and Tobago reported that about a quarter of their interviewees (21%) kept antibiotics in the house for emergency purposes.⁹

In the study at hand, the age factor was independent of all the other factors but elderly attendants were less likely to complete the full course of the antibiotics. However, according to a survey conducted by the CDC, antibiotic use varied by age group, with the highest use among persons 25–39 years old (13.2%) and those >60 (13.7%) - partially inconsistent with our study results.²⁵

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Review Board of Hamad Medical Corporation. A research proposal was prepared according to the guidelines of the Arab Board for carrying out investigations on human beings and the research committee of the Arab Board approved it. The research protocol was also approved by the authorities of the PHC centres. An informed consent (written) was obtained by the study subjects and they were assured of the confidentiality of the information

REFERENCES

1. World Health Organization. Antimicrobial resistance: global report on surveillance 2014. Geneva: World Health Organization; 2014.
2. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. ANTIBIOTIC RESISTANCE THREATS in the United States, 2013. Atlanta: Centers for Disease Control and Prevention; 2013.
3. Roberts R, Hota B, Ahmad I, Scott II R, Foster S, Abbasi F, et al. Hospital and Societal Costs of Antimicrobial-Resistant Infections in a Chicago Teaching Hospital: Implications for Antibiotic Stewardship. *Clin Infect Dis*. 2009;49(8):1175-84.
4. European Centre for Disease Prevention and Control. ECDC/EMEA Joint Technical Report The bacterial challenge: time to react. Stockholm: European Centre for Disease Prevention and Control; 2009.
5. Ndiokubwayo J, Yahaya A, Desta A, Ki-Zerbo G, Odei E, Keita B, et al. Antimicrobial resistance in the African Region: Issues, challenges and actions proposed. *African Health Monitor*. 2013;(16):27-30.
6. Kunst A, Looman C, Mackenbach J. Medical care and regional mortality differences within the countries of the European community. *Eur J Population*. 1988;4(3):223-45.
7. Costelloe C, Metcalfe C, Lovering A, Mant D, Hay AD. Effect of antibiotic prescribing in primary care on antimicrobial resistance in individual patients:

- systematic review and meta-analysis. *BMJ*. 2010;340:c2096.
8. Lipsky M, Taylor C. The opinions and experiences of family physicians regarding direct-to consumer advertising. *J Fam Pract*. 1997;45:495-9.
 9. Parimi N, M Pinto L, Prabhakar P. Caregivers' practices, knowledge and beliefs of antibiotics in paediatric upper tract infections in Trinidad and Tobago: a cross-sectional study. *BMC Family Practice*. 2004;5:28.
 10. Borg Ma, Cookson Bd, Gür D, Ben Rs, Rasslan O, Elnassar Z, et al. Infection control and antibiotic stewardship practices reported by south-eastern Mediterranean hospitals collaborating in the ARMed project. *J Hosp Infect*. 2008;70:228-34.
 11. Al Rasheed A, Yagoub U, Alkhashan H, Abdelhay O, Alawwad A, Al Aboud A, et al. Prevalence and Predictors of Self-Medication with Antibiotics in Al Wazarat Health Center, Riyadh City, KSA. *BioMed Res Int*. 2016;2016:1-8.
 12. Balkhy H, Assiri A, Mousa H, Al-Abri S, Al-Katheeri H, Alansari H, et al. The strategic plan for combating antimicrobial resistance in Gulf Cooperation Council States. *J Infect Public Health*. 2016;9(4):375-85.
 13. Moienzadeh A, Massoud T, Black E. Evaluation of the general public's knowledge, views and practices relating to appropriate antibiotic use in Qatar. *Int J Pharm Pract*. 2015;25(2):133-9.
 14. Plan to curb antimicrobial resistance. The Peninsula Qatar. 2016. Available at: <https://thepeninsulaqatar.com/article/06/12/2016/Plan-to-curb-antimicrobial-resistance>. Accessed on 3 June 2017.
 15. Grigoryan L, Burgerhof J, Degener J, Deschepper R, Lundborg C, Monnet D, et al. Attitudes, beliefs and knowledge concerning antibiotic use and self-medication: a comparative European study. *Pharmacoepidemiol Drug Safety*. 2007;16(11):1234-43.
 16. McNulty C, Boyle P, Nichols T, Clappison P, Davey P. The public's attitudes to and compliance with antibiotics. *J Antimicrobial Chemotherapy*. 2007;60(Suppl 1):i63-8.
 17. You J, Yau B, Choi K, Chau C, Huang Q, Lee S. Public Knowledge, Attitudes and Behavior on Antibiotic Use: A Telephone Survey in Hong Kong. *Infection*. 2008;36(2):153-7.
 18. Eurobarometer. Eurobarometer 2013. 2013. Available at: http://ec.europa.eu/health/sites/health/files/antimicrobial_resistance/docs/ebs_407_en.pdf. Accessed on 7 July 2017.
 19. Azevedo M, Pinheiro C, Yaphe J, Baltazar F. Portuguese students' knowledge of antibiotics: a cross-sectional study of secondary school and university students in Braga. *BMC Public Health*. 2009;9:359.
 20. Magee J, Pritchard E, Fitzgerald K, Dunstan F, Howard A. Antibiotic prescribing and antibiotic resistance in community practice: retrospective study, 1996-8. *Br Med J*. 1999;319(7219):1239-40.
 21. Awad A, Aboud E. Knowledge, Attitude and Practice towards Antibiotic Use among the Public in Kuwait. *PLoS One*. 2015;10(2):e0117910.
 22. Emeka P, Al-Omar M, Khan T. Public attitude and justification to purchase antibiotics in the Eastern region Al Ahsa of Saudi Arabia. *Saudi Pharm J*. 2014;22(6):550-4.
 23. Radyowijati A, Haak H. Improving antibiotic use in low-income countries: an overview of evidence on determinants. *Social Sci Med*. 2003;57(4):733-44.
 24. Abasaeed A, Vlcek J, Abuelkhair M, Kubena A. Self-medication with antibiotics by the community of Abu Dhabi Emirate, United Arab Emirates. *J Infect Developing Countries*. 2009;3(7):491-7.
 25. Vanden Eng J, Marcus R, Hadler J, Imhoff B, Vugia D, Cieslak P, et al. Consumer Attitudes and Use of Antibiotics. *Emerging Infect Dis*. 2003;9(9):1128-35.

Cite this article as: Alkhuzaei AMJB, Salama RE, Eljak IE, Chehab MAH, Selim NAA. The knowledge, practice, and attitude regarding antibiotic use among attendants of primary health care centres: a cross-sectional study in Qatar. *Int J Community Med Public Health* 2017;4:3969-75.