

Patients' awareness of antibiotic use in Bahraini health centers and community pharmacies

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ABSTRACT

Objective: Patients' understanding and perceptions of antibiotic use and resistance are crucial for the public health. This study aimed to explore the awareness of antibiotic utilization in 12 aspects among Bahraini patients attending health centers and community pharmacies and to find the associations of their awareness.

Materials and Methods: A cross-sectional survey study with questionnaire interviews was conducted in Bahraini patients attending five health centers or four community pharmacies during January – June 2013. All data were analyzed using descriptive statistics and a Chi-squared test was performed with a significance level set at 0.05.

Results: A total of 306 patients (156 in health centers and 150 in community pharmacies) participated in the study. Female respondents (57.2%) were nearly equal to the male. Most were adults aged 16–29 (47.7%) and educated at the university or school levels (88.2%). The majority were aware of the use for colds and relevant resistance, including 10 other aspects. Approximately 35% misconceived the medicine intake in terms of concomitant use with milk, daily doses, stopping time and reusability. Patients' education was associated with six aspects of awareness, that is, decision on antibiotic prescribing, drug administration, treatment duration, drug resistance, reusability, and perceived side-effects (all $P < 0.05$).

Conclusion: Bahraini patients are mostly aware of 12 antibiotic aspects despite some misconceptions. The public awareness and their expectations warrant further studies on a large scale to understand their self-medication and demand for antibiotic prescriptions.

Key words: Antibiotic use, awareness, Bahraini patients, community pharmacies, health centers

INTRODUCTION

Antibiotics have long been developed, especially during the "golden" period of 1940–1980. However, the rate of the drug discovery has gradually slowed down owing to the lack of production incentives, despite the increased consumption.^[1] The irrational use of antibiotics has created health problems in terms of drug ineffectiveness and resistance. The World Health Organization (WHO)^[2] recently reported the first comprehensive, global picture of antibiotic resistance,

which is now the worldwide threat to public health. This indicates a postantibiotic era "in which common infections and minor injuries can kill".^[3] The WHO report thus alerts all stakeholders, that is, the public, healthcare professionals, manufacturers, and the media, to taking co-ordinated action.

Three major types of antibiotic misuse were identified in the Middle Eastern countries.^[4] These embrace patient's self-medication through the over-the-counter antimicrobials, inappropriate prescribing by physicians and overuse in livestock. The self-medicated antibiotics are a matter of great concern, as many items are still freely sold without restriction in this region. In addition, some studies found that patients' expectations of the medicines, physicians' assumptions about the expectations and diagnostic uncertainty are major determinants for antibiotic over-prescribing.^[5,6] The expectations of patients

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are of paramount importance and closely related to their knowledge, attitudes, beliefs or experiences in the medicine use over a period of time.^[7] Although several studies focused on the investigation of the public's knowledge and attitudes,^[8-10] and university students' understanding of antibiotic treatment and its resistance,^[11,12] patients' awareness was not fully explored.

As with many countries around the Gulf, Bahrain also has many over-the-counter antibiotics in private pharmacies. It was not until 2013 the National Health Regulatory Authority imposed prescriptions only for all antibiotics in order to manage the medicine supply and pertinent issues (personal communication). Nevertheless, the problem of over-prescription might not be effectively tackled in hospitals or health centers partly due to the influence of patients' demand, as evidenced by few Bahraini studies.^[13,14] From an extensive literature search, there was no study conducted in the Bahraini public or patients regarding their views on antibiotics and drug resistance. In fact, the perceptions are crucial to gain insight into their medicine use behaviors. This study was therefore intended to explore the patients' awareness of antibiotic use in health centers and community pharmacies, and to find the associations of their characteristics and awareness. The "awareness" in this study refers to the understanding or perceptions of antibiotic utilization and resistance, whereas "antibiotics" are natural, semi-synthetic or synthetic compounds used to treat or prevent bacterial infections.

MATERIALS AND METHODS

The cross-sectional study with questionnaire interviews was initially approved by the Pharmacy Program in 2013. It was conducted in Bahraini patients who attended government-funded health centers or private community pharmacies during January - June 2013. The study methodology is detailed below.

Population and sample

The inclusion criteria were Bahraini adult patients aged 16 or over visiting one of five selected health centers or four community pharmacies in Manama City during the study period (January - June 2013). The "patients" were diseased persons by the time of the interview or those who once used antibiotics and came to see doctors or seek advice from healthcare professionals in the settings. Moreover,

those who could answer the questionnaire were included in the study. Excluded were those who refused to participate in the study due to personal reasons. The sample size (N) was determined using the equation,^[15] $N = 4(Z_{crit})^2p(1 - p)/d^2$; this was based on 67.1% of Jordanian clients that believed antibiotics can treat coughs and colds^[16] and a 95% confidence interval with the expected width of 15%. A sample of 225 was thus determined. As nine settings, that is, five health centers and four community pharmacies, were purposively chosen, approximately 30 participants of each were required to complete the survey.

Study instrument

A structured questionnaire was constructed based on the concept of antibiotic therapy and patients' awareness. The questionnaire items were mostly generated by the research team, but some were rephrased from those used in previous studies.^[7,9,11,12] The questionnaire consisted of two parts. Part 1 was involved in respondents' characteristics, that is, gender, age, and highest education level. Other personal background in terms of reasons for visits, medical condition or medication use was not incorporated to keep it short enough for patients' answering. Part 2 with 12 questions was to elicit respondents' awareness of antibiotic use in 12 aspects: (1) Susceptible microbes, (2) perceived efficacy, (3) self-diagnosis, (4) accessibility, (5) decision on antibiotic prescribing, (6) antibiotic administration, (7) dosage regimen, (8) treatment duration, (9) antibiotic resistance, (10) reusability, (11) perceived side-effects, and (12) examples of antibiotics. Of these, four questions, that is, Questions 6-8 and 10, were considered "contradictive" so as to check patients' misconceptions. In addition, the word "colds" in Question 2 implied bacterial superinfection after colds. Since all respondents had diverse qualifications, each question was designed with solely three choices, that is, "Yes" (or agree), "No" (or disagree), or "Do not know" (or not sure), to make it easier to respond. The final draft of the questionnaire was checked for face validity, that is, accuracy and wording, by two experts in the field of antibiotics.

Study procedure

At the outset, six research assistants were assigned as interviewers, namely five for health centers and one for community pharmacies, were trained how to identify potential respondents and how to ask them professionally using the questionnaire. Adult patients who met the eligibility criteria were then

interviewed accordingly. Each interview lasted approximately 10 min. If they did not clearly comprehend any questions or answers in English, they would be explained in Arabic. When all copies of the questionnaire were completed, they were sent to the Pharmacy Program of the College of Health Sciences for the data analysis.

Data analysis

All data were entered into IBM SPSS Statistics 21 (IBM Corporation, New York) and analyzed using descriptive statistics, that is, percentage. A Chi-squared test was employed to test differences of categorical variables between two settings, such as gender, and understanding of antibiotics, and also the association between patients' characteristics and awareness. As few patients replied "Not sure," the data were combined with the attribute "No" in order to make it valid for the Chi-squared test. A significance level was determined at $\alpha = 0.05$.

RESULTS

At the outset, 156 patients in health centers and 154 in community pharmacies were interviewed, but four patients in the communities were excluded owing to incomplete data. As patients in both groups were not entirely different, their data were grouped up for the data analysis. Table 1 demonstrates the characteristics of 306 patients in the study. The overall female patients (57.2%) were nearly equal to the male. However, there was the higher number of males in community pharmacies than health centers (64.0% vs. 22.4%, $P = 0.001$). Adults aged 16–29 accounted for virtually half of the total (47.7%), followed by older age groups (30–44 and 45–59 years

old), but few elderly patients participated in the study (3.9%). The age distribution in both settings was statistically different ($P = 0.001$), that is, most found in community pharmacies being the middle-aged rather than young adults. In regard to patients' highest education, they were mostly educated at the university or school levels (62.1% vs. 26.1%), but few were postgraduates (9.2%) or illiterate (2.6%).

Patients' awareness about antibiotic use

In Table 2, patients thought that micro-organisms susceptible to antibiotics were viruses plus bacteria, bacteria only, or viruses plus bacteria and fungi (23.2%, 19.9%, 17.0%, respectively), but very few (2.9%) did not know that. When specific microbes were taken into consideration, bacteria (82.0%) came first followed by viruses (69.3%), fungi (37.9%) and insects (21.6%). Most patients perceived colds and influenza (20.9%), as well as colds and influenza plus others (26.1%), could be mainly treated with antibiotics. However, some stated colds only (5.6%) or colds plus tuberculosis (5.2%). As with susceptible microbes, very few (2.9%) did not know the antibiotic indications. For individual diseases, influenza (71.9%) was mainly cited for antibiotic use, followed by colds, tuberculosis, and acquired immune deficiency syndrome. Most respondents (62.4%) confirmed they knew when they needed antibiotics. If needed, they would (35.9%) or would not (63.1%) buy the medicines from pharmacies. The discrepancy of this view between patients in the two settings was observed ($P = 0.001$); clients in pharmacies tended to purchase antibiotics in the shops. Nevertheless, the majority (87.6%) agreed physicians should make a decision on antibiotic prescribing.

Table 1: Characteristics of respondents

Characteristic	Total number (n=306)	Number of respondents (%)		P
		Health centers (n=156)	Community pharmacies (n=150)	
Gender				
Male	131 (42.8)	35 (22.4)	96 (64.0)	0.001*
Female	175 (57.2)	121 (77.6)	54 (36.0)	
Age (years)				
16-29	146 (47.7)	107 (68.6)	39 (26.0)	0.001*
30-44	88 (28.8)	30 (19.2)	58 (38.6)	
45-59	60 (19.6)	17 (10.9)	43 (28.7)	
≥60	12 (3.9)	2 (1.3)	10 (6.7)	
Highest education				
Illiterate	8 (2.6)	3 (1.9)	5 (3.3)	0.111
Primary or secondary certificate	80 (26.1)	33 (21.2)	47 (31.3)	
Diploma or undergraduate degree	190 (62.1)	107 (68.6)	83 (55.4)	
Postgraduate degree	28 (9.2)	13 (8.3)	15 (10.0)	

*Statistically significant ($P < 0.05$)

Table 2: Awareness of patients about antibiotic usage

Awareness	Total number (n=306)	Number of respondents (%)		P
		Health centers (n=156)	Community pharmacy (n=150)	
Susceptible microbes: Antibiotics are active against				
Do not know	9 (2.9)	6 (3.8)	3 (2.0)	-
Bacteria only	61 (19.9)	23 (14.7)	38 (25.3)	
Bacteria and fungi	13 (4.3)	9 (5.8)	4 (2.7)	
Viruses only	25 (8.2)	12 (7.7)	13 (8.7)	
Viruses and bacteria	71 (23.2)	28 (17.9)	43 (28.6)	
Viruses, bacteria and fungi	52 (17.0)	24 (15.4)	28 (18.7)	
Viruses, bacteria and insects	11 (3.6)	9 (5.8)	2 (1.3)	
Viruses, bacteria, fungi and insects	35 (11.4)	22 (14.1)	13 (8.7)	
Other	29 (9.5)	23 (14.5)	6 (4.0)	
Antibiotics for particular micro-organism ^a				
Bacteria ^b	251 (82.0)	122 (78.2)	129 (86.0)	0.819
Viruses ^b	212 (69.3)	109 (69.9)	103 (68.7)	0.076
Fungi ^b	116 (37.9)	67 (42.9)	49 (32.7)	0.064
Insects ^b	66 (21.6)	47 (30.1)	19 (12.7)	0.001*
Perceived efficacy: Antibiotics are used for the treatment of				
Do not know	9 (2.9)	7 (4.5)	2 (1.3)	-
Colds only	17 (5.6)	5 (3.2)	12 (8.0)	
Colds and tuberculosis	16 (5.2)	5 (3.2)	11 (7.3)	
Colds and influenza	64 (20.9)	50 (32.0)	14 (9.3)	
Colds, influenza, and tuberculosis	45 (14.7)	14 (9.0)	31 (20.7)	
Colds, influenza, tuberculosis, and AIDS	35 (11.4)	20 (12.8)	15 (10.0)	
Influenza only	28 (9.2)	14 (9.0)	14 (9.3)	
Influenza and tuberculosis	21 (6.9)	8 (5.1)	13 (8.6)	
Tuberculosis only	29 (9.5)	14 (9.0)	15 (10.0)	
Other	42 (13.7)	19 (12.2)	23 (15.3)	
Antibiotics for specific disease ^a				
Colds ^b	186 (60.8)	97 (62.2)	89 (59.3)	0.610
Influenza ^b	220 (71.9)	119 (76.3)	101 (67.3)	0.082
Tuberculosis ^b	176 (57.5)	73 (46.8)	103 (68.7)	0.001*
AIDS ^b	79 (25.8)	41 (26.3)	38 (25.3)	0.850
Self-diagnosis: I usually know when I need antibiotics ^b				
Yes	191 (62.4)	103 (66.0)	88 (58.7)	0.184
No	112 (36.6)	52 (33.3)	60 (40.0)	
Not sure	3 (1.0)	1 (0.6)	2 (1.3)	
Accessibility: If I feel I need an antibiotic, I will buy it directly from a private pharmacy ^b				
Yes	110 (35.9)	29 (18.6)	81 (54.0)	0.001*
No	193 (63.1)	127 (81.4)	66 (44.0)	
Not sure	3 (1.0)	-	3 (2.0)	
Decision on antibiotic prescribing: Decisions on the prescription of antibiotics have to be made by a doctor ^b				
Yes	268 (87.6)	142 (91.0)	126 (84.0)	0.062
No	34 (11.1)	14 (9.0)	20 (13.3)	
Not sure	4 (1.3)	-	4 (2.7)	
Antibiotic administration: Antibiotics need to be taken with milk ^b				
Yes	65 (21.2)	19 (12.2)	46 (30.7)	0.001*
No	238 (77.8)	137 (87.8)	101 (67.3)	
Not sure	3 (1.0)	-	3 (2.0)	
Dosage regimen: It is not necessary to take an antibiotic at the same time every day if the number of daily doses is respected ^b				
Yes	107 (35.0)	47 (30.1)	60 (40.0)	0.070
No	194 (63.4)	109 (69.9)	85 (56.7)	
Not sure	5 (1.6)	-	5 (3.3)	

Contd...

Table 2: Contd...

Awareness	Total number (n=306)	Number of respondents (%)		P
		Health centers (n=156)	Community pharmacy (n=150)	
Treatment duration: I stop the antibiotic treatment as soon as I feel better ^b				
Yes	109 (35.6)	43 (27.6)	66 (44.0)	0.003*
No	193 (63.1)	112 (71.8)	81 (54.0)	
Not sure	4 (1.3)	1 (0.6)	3 (2.0)	
Antibiotic resistance: The incorrect use of antibiotics can lead to the development of resistant bacteria ^b				
Yes	233 (76.1)	126 (80.8)	107 (71.4)	0.053
No	65 (21.2)	30 (19.2)	35 (23.3)	
Not sure	8 (2.6)	-	8 (5.3)	
Reusability: Antibiotics prescribed once can be used again for similar symptoms in the future ^b				
Yes	103 (33.7)	43 (27.6)	60 (40.0)	0.021*
No	197 (64.3)	113 (72.4)	84 (56.0)	
Not sure	6 (2.0)	-	6 (4.0)	
Perceived side-effects: Antibiotics may affect a patient's immunity ^b				
Yes	231 (75.5)	122 (78.2)	109 (72.6)	0.260
No	63 (20.6)	32 (20.5)	31 (20.7)	
Not sure	12 (3.9)	2 (1.3)	10 (6.7)	
Examples of antibiotics: Which one is an antibiotic?				
Do not know	20 (6.5)	12 (7.7)	8 (5.3)	-
Amoxicillin only	84 (27.4)	48 (30.8)	36 (24.0)	
Amoxicillin and erythromycin	43 (14.1)	16 (10.3)	27 (18.0)	
Amoxicillin and cefuroxime	32 (10.5)	16 (10.3)	16 (10.7)	
Amoxicillin, erythromycin and cefuroxime	56 (18.3)	22 (14.1)	34 (22.6)	
Erythromycin	9 (2.9)	8 (5.1)	1 (0.7)	
Cefuroxime	7 (2.3)	6 (3.8)	1 (0.7)	
Paracetamol	11 (3.6)	8 (5.1)	3 (2.0)	
Other	44 (14.4)	20 (12.8)	24 (16.0)	
Antibiotics patients selected ^a				
Amoxicillin ^b	250 (81.7)	115 (73.7)	135 (90.0)	0.001*
Erythromycin ^b	134 (43.8)	59 (37.8)	75 (50.0)	0.032*
Cefuroxime ^b	112 (36.6)	47 (30.1)	65 (43.3)	0.017*
Paracetamol ^b	41 (13.4)	21 (13.5)	20 (13.3)	0.974
Ibuprofen ^b	17 (5.6)	9 (5.8)	8 (5.3)	0.868

*Statistically significant ($P < 0.05$). ^aMore than one answer was allowed; thus the total percentage was not equal to 100. ^bThe Chi-squared test was performed using only two attributes, that is, "Yes" and "No" (plus "Not sure")

With respect to antibiotic misconceptions, some (21.2%) replied the medicines should be taken with milk. However, more patients in pharmacies than health centers agreed on this issue (30.7% vs. 12.2%, $P = 0.001$). Nearly one-third of the patients (35.0%) held with the idea that only the number of daily doses did count and no need to have them at the same time every day. Similarly, not many patients (35.6%) reckoned they would stop taking antibiotics if they felt better. The higher number of patients who expressed this opinion was found in pharmacies (44.0% vs. 27.6%, $P = 0.003$). Regarding antibiotic resistance, numerous patients (76.1%) conceded that inappropriate use of the medicines

could result in the resistance. Nevertheless, some respondents (33.7%) still believed that the prescribed antibiotics, either the same name or leftover, were reusable for similar symptoms occurring in the future. Like other misconceptions, the higher percentage of patients who had this reusability idea was reported in pharmacies (40.0% vs. 27.6%, $P = 0.021$). In addition, most patients (75.5%) believed antibiotics might have an impact on one's immunity. In regard to examples of antibiotics, a large number of respondents could give the name of amoxicillin only (27.4%), amoxicillin plus erythromycin and cefuroxime (18.3%), or amoxicillin plus erythromycin (14.1%). However, few (6.5%) did

not have knowledge of any antibiotics. Respondents specified the known antibiotics ranging from amoxicillin (81.7%), through erythromycin (43.8%) and cefuroxime (36.6%), to ibuprofen (5.6%). It was noteworthy that more patients in pharmacies than health centers were able to give antibiotic examples, that is, amoxicillin, erythromycin or cefuroxime (all $P < 0.05$).

Associations between patients' characteristics and their awareness

Table 3 delineates the awareness associations. There was no relationship between patients' gender and all aspects of awareness, except for reusability ($P = 0.029$); males tended to think that antibiotics were reusable for other similar cases. A significant association was found between age and dosage regimen ($P = 0.025$), which implied that younger adults did not care much about the time of administration as long as the daily doses were followed. As for the highest education, the associations were found in six aspects (all $P < 0.05$). That is to say, patients with higher education, such as the first degrees or diplomas in universities, were likely to give positive or correct answers compared with the less educated. For instance, they asserted that antibiotics should be prescribed by doctors, avoided taking with milk, never discontinued abruptly albeit feeling better, prone to create microbial resistance if not used properly, not reusable and likely to affect the patient's immunity. Two major patterns of awareness, that is, perceived efficacy (for colds and/or tuberculosis) and antibiotic resistance are depicted in Figure 1. Patients with school or university qualifications seemed to be aware of the antibiotic efficacy and their resistance, and the two awareness patterns were practically the same. Regarding the Internal consistency reliability of the questionnaire, the Cronbach's alpha values found in all patients and the groups attending health centers and community pharmacies were 0.47, 0.43 and 0.51, respectively.

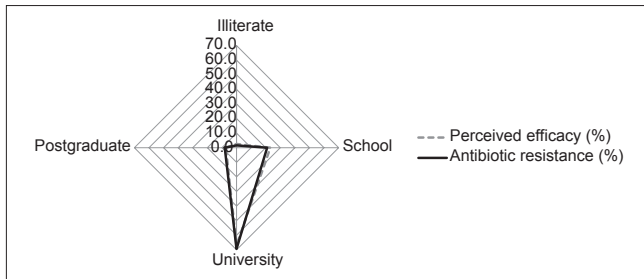


Figure 1: Patients' awareness of perceived efficacy (colds and/or tuberculosis) and antibiotic resistance as percentage according to their highest education

Table 3: Associations of patient's characteristics and their antibiotic awareness (n=306)

Awareness	Number of patients*										P
	Gender		Age				Highest education				
	Male (n=131)	Female (n=175)	16-29 (n=146)	30-44 (n=88)	45-59 (n=60)	≥60 (n=12)	Illiterate (n=8)	School (n=80)	University (n=190)	Postgraduate (n=28)	
Susceptible microbes: Bacteria only	28	33	27	20	13	1	0	11	45	5	0.129
Perceived efficacy: Colds and/or tuberculosis	26	36	29	21	12	0	1	13	43	5	0.603
Self-diagnosis	81	110	85	62	37	7	6	53	116	16	0.677
Accessibility	54	56	45	36	24	5	4	36	62	8	0.164
Decision on antibiotic prescribing	112	156	126	76	55	11	5	66	173	24	0.033*
Antibiotic administration	31	34	25	18	17	5	3	22	31	9	0.049*
Dosage regimen	51	56	42	42	20	3	4	33	61	9	0.397
Treatment duration	54	55	53	31	20	5	3	38	64	4	0.013*
Antibiotic resistance	93	140	117	64	45	7	6	54	156	17	0.014*
Reusability	53	50	47	30	22	4	3	39	53	8	0.010*
Perceived side-effects	93	138	115	63	43	10	5	49	154	83	0.004*
Examples of antibiotics: Amoxicillin, erythromycin and/or cefuroxime	48	95	97	60	39	7	4	42	133	24	0.003*

*Statistically significant ($P < 0.05$). *The number of patients with correct or "Yes" answers

DISCUSSION

This was the first antibiotic study in Bahrain that disclosed patients' awareness of 12 crucial aspects. The study primarily reflected the views of rather young adults (16–29 years old) educated at the school or university level. Regarding the antibiotic awareness, the majority of patients could respond to all queries, but only roughly 3% did not know antibiotics and their applications. Most people put viruses before bacteria and fungi as pathogens treatable with the medicines, for they were probably confused with the type of micro-organism as elaborated by André *et al.*^[17] This result differed from Al-Haddad's study that reported 85.6% of Malaysians can specify the use of antibiotics in bacterial infections, followed by viruses and other micro-organisms.^[9] The disparity is possibly due to the different study design or sample groups. Many patients in this present study thought antibiotics were indicated for influenza, which is in fact caused by influenza virus, and colds plus tuberculosis. This was quite similar to the study of McNulty *et al.*^[8] that noted one-third of the public still believe antibiotics are effective against coughs and colds. Emeka *et al.*^[10] also pointed out colds and sore throat are two important infections for which people tend to seek nonprescribed antibiotics for prevention rather than treatment. Although many patients themselves knew when they needed antibiotics, many of them did not want to get the medicines straightaway from pharmacies, except those being interviewed in the shops. This was certainly a good sign, as they still trusted their doctors to prescribe the medications. Nevertheless, there should be a measure, e.g., setting up a well-structured antimicrobial teams or antibiotic policy, to improve the rational antibiotic prescribing in all health care settings.^[13,14]

For antibiotic misconceptions, approximately 35% misunderstood the medicine intake in terms of concomitant use with milk, daily doses, stopping time and reusability. Slightly more patients in pharmacies than health centers possessed these ideas. One possible explanation was that they were not given sufficient information or advice on antibiotic usage by pharmacists or other healthcare professionals. As the milk is normally consumed by Bahraini people or others, pharmacists should have a major role in clarifying the drug-food interaction for some antibiotics like tetracyclines. Moreover, all antibiotics must be taken daily at the same time until the completion of the treatment course in order

to maximize the eradication effects. As one can get infected with different pathogens over a period of time, the same antibiotic might not be effective for the following infections. However, this misunderstanding has been widely addressed, as evidenced by one of the questions designed by Panagakou *et al.*^[18] to survey parents' knowledge, attitudes, and practices in antibiotic use – “Would you reuse an antibiotic that had been used in a previous upper respiratory infection (URI) to treat a new outcoming URI by yourself?”

In this study, most people were concerned about antibiotic resistance that was affected by inappropriate utilization, immunity impacts, and common antibiotics. In other words, they were aware of the adverse effects together with the effectiveness. Since some patients in the study picked paracetamol and ibuprofen as antibiotics, they might get confused with the indications. A study in Jordan revealed with the over-the-counter access 28.1% of adults misuse antibiotics as analgesics.^[16] The associations between patients' education and their awareness were comparable to other studies. McNulty *et al.* pointed out that those with higher education or more antibiotic knowledge are likely to complete a course, but they also tend to keep leftover antibiotics and to self-medicate (or “recycle”) them without advice.^[8] They also suggested a campaign to reduce antibiotic prescribing, especially in younger women and those with a low level of education.

Similar to other survey studies on antibiotic awareness,^[9,10,16,17,19] this present study was also carried out in adults who were able to express their perceptions and understanding about antibiotic use and resistance. It should be noted that different studies have different objectives and emphases based on antibiotic circumstances. For developed countries, like Sweden^[17] or the UK,^[19] where almost all antimicrobials are strictly controlled, the awareness research tends to focus on the patient-doctor relationship (i.e., trust in doctor's restrictive prescribing), antibiotic resistance, leftover antibiotics and determinants for prudent antibiotic use.^[17,19] However, these issues were not explored in this study. As antibiotics are partially or freely sold over-the-counter in Asia and the Middle East, the surveys mostly focus on the public's attitudes toward self-medication and antibiotic-seeking behaviors, in addition to basic knowledge about antibiotics. Emeka *et al.*^[10] primarily looked into the public's attitudes and justification for purchasing antibiotics in Al Ahsa,

Saudi Arabia; these were beyond the scope of the present study. A study in Jordan by Shehadeh *et al.*^[16] covered many aspects of adults' knowledge, attitudes, misuse behaviors using the 33-item questionnaire. Several issues were investigated here, except for antibiotic misuses and antibiotic use in detail, such as the safe use of antibiotics during pregnancy or lactation. As for the Malaysian study,^[9] Al-Haddad put more emphasis on the public awareness in terms of antibiotic information sources, self-medication and management of adverse effects. These facets were not examined in this study.

Owing to the widespread misuse of antibiotics, the current evidence suggested empowering patients with patient-centered healthcare strategies, such as shared decision-making or educational initiatives, to change their attitudes and behaviors.^[4,5] However, at the macro-level the country is in dire need of national awareness campaigns. The first campaign was recently organized by the Bahrain Pharmacists' Society and the second would follow in due course. In India, the "Chennai Declaration" is a good example of joint efforts to tackle antimicrobial resistance using comprehensive measures.^[20] In addition, the European Centre for Disease Prevention and Control has launched an initiative called "European Antibiotic Awareness Day," which is supported by WHO, on 18th November every year since 2008.^[21] The prime objective is "to raise public and professional awareness about prudent antibiotic use and the threat of antibiotic resistance to public health."^[22] Following the initiative, the "Start Smart – Then Focus" guidance with an antibiotic stewardship program has been implemented in the UK.^[23] Aside from the appropriate diagnosis and management of infection, the program provides general practitioners and other healthcare professionals with educational material for the public and also tools to manage public demand for antibiotics.^[23] Thus, the stewardship program may be of interest to antimicrobial researchers and practitioners worldwide.

Strengths and weaknesses of this survey

The present study was unique in that it was conducted by interviewing patients visiting the health centers or community pharmacies. In addition, it made use of a simple questionnaire consisting of 12 major questions with three options. Although the questionnaire had modest reliability, as evidenced by the overall Cronbach's alpha of 0.47, it provided useful findings for further antibiotic campaigns and relevant medication plans. The study was also

intended to explore patients' misconceptions about antibiotic use, that is, concomitant use with milk, daily doses, stopping time and reusability, in further detail. However, this study was able to recruit only a few older patients, as they mostly declined to discuss the antibiotic issues. Older people are, in fact, an interesting group of people who usually have their own understanding, attitudes and beliefs about antibiotic applications. The lower number of them might affect the interpretation and generalization of the results. Apart from that, the lack of patients' background, such as the history of antibiotic usage, medical conditions, and related medication, made it challenging to gain a full insight into their perceptions of antibiotic use.

CONCLUSION

The study could investigate the awareness of Bahraini patients about 12 antibiotic aspects in health centers and community pharmacies. Most patients are able to identify the use of the medicines against bacteria or the indications for colds and other infections. They are also aware of the resistance resulted from inappropriate use. However, some still have misconceptions about the medication use in terms of concomitant use with milk, daily doses, stopping time and reusability. As patients' education is clearly associated with their understanding and perceptions of antibiotic usage, a national awareness campaign is urgently required to educate the public as a whole. Especially important is the issue of antimicrobial resistance that is a threat to the public health as cautioned by WHO. Moreover, the campaign will enable all parties involved in the supply chains and applications of antibiotics to be concerned about the misuse or overuse issues. Obviously, pharmacists should have a vital role in patient counseling on prudent antibiotic use and relevant adverse effects. Further studies are required to explore the public awareness and their expectations that might impact on inappropriate prescribing in all healthcare settings.

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