Knowledge, attitude and practices towards antibiotic use among patients attending Al Wazarat health center

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ABSTRACT

Background: Despite recent government efforts to control antibiotic purchase by the public, the rate of self-prescription is still alarmingly high in Saudi Arabia. Increased and inappropriate antibiotic use has been identified as an important factor behind bacterial resistance. Recently, there has been an increased interest in the Saudi public's awareness of antibiotic use and resistance. However, none of the local studies examined the awareness and practices among patients attending primary care services. Additionally, the influencing factors of awareness and practices have never been comprehensively examined. **Objective:** To assess the levels of knowledge, attitude, and practices of antibiotic use and their influencing factors among a sample of patients at a primary care setting. **Methods:** A cross-sectional design was used to examine patients attending Al Wazarat Health Center in Riyadh between 1 January 2018 and 31 March 2018. Data was collected using a structured study questionnaire which included data on socio-demographic and clinical characteristics of the participants, as well as knowledge, attitude, and practices of antibiotic use. Scores were calculated for knowledge, attitude, and practices of antibiotic use and were translated to a 100-point scale for easy interpretation. **Results:** The current analysis included 343 participants. The average age was 32.5 ± 10.0 years. The majority of the participants were women (63.0%), married (65.9%), and had college or higher education (57.0%). The overall antibiotic awareness level was 54.7% (including 43.9% for knowledge and 71.7% for attitude) and appropriate antibiotic practices were 68.3%. The scores of both awareness and practices were positively and significantly correlated (correlation coefficient = 0.440, $P < 0.001$). In addition to appropriate antibiotic practices, awareness was significantly associated with higher educational level and having children. **Conclusions:** The current findings indicate the need to improve awareness and understanding of the public regarding appropriate antibiotic use by targeting patients who attend primary care services with posters, structured educational sessions, and physician advice.

Keywords: Antibiotic, attitude, knowledge, practices, Saudi Arabia

Introduction

Increased antibiotic use has been identified as an important factor for the observed bacterial resistance worldwide, with excess use of specific antibiotics correlating with specific types of antibiotic resistance.[1,2] In Saudi Arabia, high rates of antibiotic use have been reported inside hospitals.[3] Outside hospitals, antibiotic sales without medical prescriptions have been reported as common practice.[4-7] In addition to exacerbating the problem of antibiotic resistance, the illegitimate use of antibiotics can increase overall treatment cost and drug adverse reactions.[4]

It has been reported that inappropriate beliefs and socio-demographic characteristics of the parents are the detrimental factors that lead to antibiotic misuse among Saudi children.[8] Additionally, the awareness of the dangers of

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inappropriate antibiotic use was shown to correlate inversely with self-medication.[5,9] A number of studies in Saudi Arabia sought to examine the knowledge, attitude, and practices of antibiotic use among physicians and pharmacists, who directly engaged in prescribing and dispensing antibiotics to their clients.[10-13] Recently, there has been more interest in public awareness of antibiotic use and resistance.[5,6,9,14,15] Local studies show generally high rates of self-medication and/or low levels of awareness regarding antibiotics use.[5,6,9,14,15] Additionally, those studies note several inappropriate beliefs and behaviors concerning antibiotic use such as inappropriate indication, early discontinuation, and storage of leftover antibiotics for future use.[5,6,15] Herein we aimed to assess the levels of knowledge, attitude, and practices of antibiotic use and their influencing factors among a sample of patients attending Al Wazarat Health Center (WHC), Saudi Arabia.

Materials and Methods

Study setting and design

The paper is a cross-sectional study to examine the knowledge, attitude, and practices of antibiotic use among patients attending WHC in Riyadh, Saudi Arabia. The study was conducted between 1 January 2018 and 31 March 2018. Patients who were older than 18 years old and visited any of the WHC clinics for regular appointments were included in the study. Those working in health-related occupations, such as doctors, nurses, technicians, and children aged less than 18 years and those who agreed to join the study and provided informed consent were excluded.

Sample size

The sample size calculation was done using the software OpenEpi 2.2, with the following equation

$$N = \frac{Z^2_{\alpha/2} * P * (1-p) * D}{E^2}$$

$Z_{\alpha/2}$ is normal deviate at a level of significance = 1.96

P is the hypothesized percentage frequency of inappropriate use, which was set at 65%

E is the desired precision (half desired confident interval (CI) width), which was set at 5%

D the design effect, which is usually set to 1 in cross-sectional studies

Data collection

Data was collected using self-administered questionnaire, which included data on socio-demographic and clinical characteristics of the participants as well as knowledge, attitude, and practices of antibiotic use. The questionnaire was developed based on previous similar studies done in Sweden, Kuwait, and Oman.[16-18] It was developed in English (the language of previous studies and final report) but an Arabic copy was given to the participants.

Assistance was allowed (through a companion or researcher) for the participants who could not read (such as illiterate or visual disability). A pilot study was conducted on 10 participants. This pilot study was used to test the logistics and applicability of the data collection, clarity of the tool questions, and expected time consumed on data collection.

Ethical consideration

Data was collected after obtaining approval from the Research Ethics Committee of the Prince Sultan Military Medical City (PSMMC). The confidentiality of the anonymously collected data will be maintained all of the time. All data will be stored in a secure and safe place, which will be accessible only by the researcher.

Statistical analysis

The questionnaires were coded and the collected data was entered into an excel file. IBM SPSS Statistics 24 software was used for all statistical analysis. All *P* values were two-tailed. *P* < 0.05 was considered as significant. Categorical data were presented as frequency and percentages. Continuous data were checked for normality and then presented as mean and standard deviation (SD) for normally distributed variables (such as age), and median and interquartile range for no normally distributed variables. Scores were calculated for knowledge, attitude, and practices of antibiotic use. For knowledge, 1 point was given for correct answer and 0 was given for incorrect answer. For attitude, 5 points were given for "strongly agree", 4 for "agree", 3 for "neutral", 2 for "disagree", and 1 for "strongly disagree" responses. For practices, 4 points were given for "always", 3 for "sometimes", 2 for "rarely", and 1 for "never" responses.

Results

A total 357 participants completed the study questionnaire. A total 14 participants were excluded in which 10 participants were aged less than 18 years and 4 participants were non-Saudi nationals. Therefore, 343 participants were included in the final analysis.

Table 1 shows the socio-demographic and medical characteristics of the study's participants. The ages of the participants were between 18 and 65 years with an average age of 32.5 ± 10.0 years [Table 1]. Approximately 68.9% of the participants aged below 35 years. The majority of the participants were women (63.0%) and married (65.9%). Approximately 80.1% of ever-married participants had children and 58.6% of them had children below the age of 6 years. The median number of children was 3 (interquartile range between 1 and 4). Approximately 57.0% of the participants had college or higher education but only 42.1% of the participants were working. The majority of non-working participants were housewives (34.1%), followed by students (16.4%), and lastly retired employees (7.4%) [Table 2]. Only 3.9% of the participants had a household member working in healthcare.

Table 1: Socio-demographic and medical characteristics of the study participants		
	Number*	Percentage*
Age (years)		
Mean±SD	32.5±10.0	
18-25	91	26.5%
26-35	145	42.3%
>35	107	31.2%
Gender		
Male	127	37.0%
Female	216	63.0%
Marital status		
Single	97	28.3%
Married	226	65.9%
Divorced/separated	14	4.1%
Widow	6	1.7%
Having children		
No	47	19.9%
Yes	189	80.1%
Number of children		
Median (IQR)	3 (1-4)	
Having children with age<6 years		
No	99	41.4%
Yes	140	58.6%
Education		
Illiterate	9	2.6%
High School or less	138	40.4%
College or higher	195	57.0%
Working status		
Working	131	42.1%
Not-working	180	57.9%
Unemployed including housewives	106	34.1%
Retired	23	7.4%
Students	51	16.4%
Having a household working in healthcare occupations		
No	324	96.1%
Yes	13	3.9%
Having chronic disease		
No	261	76.1%
Yes	82	23.9%
Chronic disease types		
Diabetes	21	25.6%
Hypertension	11	13.4%
Asthma or other chronic respiratory disease	23	28.0%
Others	27	32.9%
Visits to primary care during last year		
No	152	44.3%
Yes	191	55.7%
Number of visits		
Median (IQR)	3 (2-5)	
Use of antibiotics during last year		
No	105	30.6%
Yes	238	69.4%
Number of antibiotics used during last year		
Median (IQR)	3 (2-4)	
≤2	77	45.0%
≥3	94	55.0%

Unless mentioned otherwise; SD, standard deviation; IQR, intra-quartile range

Approximately 23.9% of the participants had chronic diseases. These mainly included asthma and other chronic respiratory disease (28.0%), diabetes (25.6%), and hypertension (13.4%). Approximately 55.7% of the participants had made one or more visits to primary care centers during the last year. These were on average 3 visits (interquartile range between 2 and 5). Approximately 69.4% of the participants used one or more antibiotics during the last year. These were on average 3 antibiotics (interquartile range between 2 and 4).

Table 2 shows the participants' responses to 11 knowledge questions concerning antibiotic use and resistance. Questions that were correctly answered by at least 60% of the participants were included; antibiotics should not be purchased and taken without a doctor's prescription (74.8%), overuse of antibiotics can cause antibiotic resistance (60.5%), and antibiotics are effective against bacteria (59.6%). On the other hand, 4 of the 11 questions were correctly answered by less than 30% of the participants. These included questions about the incorrect referral of antibiotic resistance to human rather than bacteria (15.9%), the nonrequirement of antibiotic use for the majority of ear infections in children 3–6 years old (18.0%), the ineffectiveness of antibiotics against viruses (19.2%), and the non-quicker cure of common colds with antibiotics use (26.8%).

Table 3 shows the participants' responses to 7 attitude statements concerning antibiotic use and resistance. In 5 of the 7 statements, at least 60% of the participants either agreed or strongly agreed on positively stated statements, or disagreed or strongly disagreed on negatively stated statements. For example, 69.7% of the participants agreed or strongly agreed that it is good to complete the course of treatment with antibiotics even if they feel better. Additionally, 68.2% of the participants agreed or strongly agreed that it is bad to get antibiotics from relatives or friends without having seen a medical doctor. Similarly, 72.9% of the participants disagreed or strongly disagreed on the preference to be able to buy antibiotics from the pharmacy without a prescription.

Table 4 shows the participants' responses to 8 practice questions for antibiotic use. In 4 of the 8 practices, at least 60% of the participants were frequently (always or sometimes) following positively stated practices or infrequently (rarely or never) following negatively stated practices. For example, 76.5% of the participants were frequently completing the course of antibiotics for the period prescribed by their doctor, and 80.0% were frequently not missing any of the doses while completing the course of antibiotics. Similarly, 64.8% of the participants were infrequently taking the antibiotic directly from the pharmacists without a prescription, and 62.4% were infrequently keeping leftover antibiotics at home for future use.

Figure 1 shows the scores for knowledge, attitude and practice towards antibiotic use and resistance among the participants. The overall knowledge score was 43.9% while the overall attitude score was 71.7%. These constituted 54.7% overall awareness score, based on both knowledge and attitude scores. The overall

Table 2: Knowledge of antibiotic use among the study participants*

	Agree		Disagree		Not sure		Correct answer	
	n	%	*n*	%	*n*	%	*n*	%
1- Common colds are cured more quickly with antibiotics	187	55.0%	91	26.8%	62	18.2%	91	26.8%
2- Antibiotics are effective against bacteria	199	59.6%	37	11.1%	98	29.3%	199	59.6%
3- Antibiotics are effective against viruses	185	57.3%	62	19.2%	76	23.5%	62	19.2%
4- Ear infections in children 3-6 years old almost always require antibiotics	161	47.5%	61	18.0%	117	34.5%	61	18.0%
5- Antibiotics can cause adverse drug reactions	151	44.9%	46	13.7%	139	41.4%	151	44.9%
6- Leftover antibiotics can be kept at home for future need for oneself or others	112	33.2%	185	54.9%	40	11.9%	185	54.9%
7- Antibiotics should not be purchased and taken without a doctor's prescription	252	74.8%	53	15.7%	32	9.5%	252	74.8%
8- Antibiotics can be safely stopped before the prescription is finished as long as the patient feels better	111	32.6%	179	52.5%	51	15.0%	179	52.5%
9- Overuse of antibiotics can cause antibiotic resistance	205	60.5%	54	15.9%	80	23.6%	205	60.5%
10- Humans can become resistant to antibiotics	167	49.3%	54	15.9%	118	34.8%	54	15.9%
11- Bacteria can become resistant to antibiotics	189	55.3%	42	12.3%	111	32.5%	189	55.3%

Knowledge statements number 2, 5, 7, 9, and 11 are correct statements

Table 3: Attitude towards antibiotic use among the study participants

	Strongly agree		Agree		Neutral		Disagree		Strongly disagree	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
It is bad to get antibiotics from relatives or friends without having to see a medical doctor	190	55.6%	43	12.6%	20	5.8%	45	13.2%	44	12.9%
I prefer to be able to buy antibiotics from the pharmacy without a prescription.	21	6.2%	35	10.3%	36	10.6%	149	43.8%	99	29.1%
I prefer to keep antibiotics at home in case there may be a need for them later	21	6.2%	62	18.3%	51	15.1%	120	35.5%	84	24.9%
It is good to complete the course of treatment with antibiotics even if I feel better	144	42.9%	90	26.8%	40	11.9%	50	14.9%	12	3.6%
Taking low-dose of antibiotics is worse than not taking any dose	50	14.9%	123	36.7%	55	16.4%	89	26.6%	18	5.4%
Missed doses of antibiotics should be taken with the next dose	18	5.5%	36	10.9%	43	13.0%	155	47.0%	78	23.6%
I prefer to use an antibiotic if I have a cough for more than a week	39	11.6%	110	32.6%	40	11.9%	111	32.9%	37	11.0%

Attitude statements number 1, 4, and 5 are positive attitude statements

Table 4: Practices for antibiotic use among the study participants

	Always		Sometimes		Rarely		Never	
	n	%	*n*	%	*n*	%	*n*	%
I am taking the antibiotic directly from the pharmacists without need for a prescription from a doctor	25	7.3%	96	28.0%	99	28.9%	123	35.9%
I usually keep leftover antibiotics at home for future need	36	10.6%	92	27.0%	86	25.2%	127	37.2%
I usually complete the antibiotic course for the period described by my doctor	139	41.2%	119	35.3%	54	16.0%	25	7.4%
I usually do not miss any of the doses while completing the course of antibiotic	157	46.9%	111	33.1%	41	12.2%	26	7.8%
If I feel better after a few days, I usually stop taking my antibiotics before completing the course of treatment	69	20.3%	124	36.5%	60	17.6%	87	25.6%
I do not share antibiotic with someone else in my/our family/friends with similar symptoms	87	25.4%	73	21.3%	52	15.2%	130	38.0%
I usually ask the doctor for antibiotic prescription once I or one of my family members have sore throat or fever and cough	48	14.1%	113	33.1%	85	24.9%	95	27.9%
I do not usually see another doctor if he/she do not prescribe antibiotics	70	20.5%	72	21.1%	76	22.3%	123	36.1%

Practice statements number 3, 4, 6, and 8 are positive practices

practice score was 68.3%, based on the frequency of following 8 antibiotic practices.

Table 5 shows the socio-demographic and medical characteristics of the study participants by the awareness groups. High awareness score (> median of 54.4%) was associated with having children (85.7% in higher awareness group versus 74.4% in lower awareness group, *P* = 0.029) and having higher educational level (65.7% in higher awareness group versus 48.6% in lower awareness group, *P* = 0.003).

Table 6 shows the socio-demographic and medical characteristics of the participants by the practice groups. High

practice score (> median of 68.8%) was associated with older age (34.3 ± 11.1 in higher practice group versus 31.2 ± 8.8 in lower practice group, *P* = 0.005), married status (74.5% in higher practice group versus 59.3% in lower practice group, *P* = 0.001), higher educational level (65.5% in higher practice group versus 50.5% in lower practice group, *P* = 0.021), and lower number of antibiotics used during the last year (52.9% in higher practice group versus 36.9% in lower practice group, *P* = 0.036).

Awareness score which was calculated from both knowledge and attitude scores correlated positively and significantly with practice score (correlation coefficient = 0.440, *P* < 0.001). Practice score

Table 5: Socio-demographic and medical characteristics of the study participants by the awareness groups			
	Awareness score		P
	≤ median (54.4%)	> median (54.4%)	
Age (years)			
Mean±SD	31.6±9.2	33.4±10.7	0.102
18-25	45 (25.9%)	46 (27.2%)	0.216
26-35	81 (46.6%)	64 (37.9%)	
>35	48 (27.6%)	59 (34.9%)	
Gender			
Male	68 (39.1%)	59 (34.9%)	0.424
Female	106 (60.9%)	110 (65.1%)	
Marital status			
Single	53 (30.5%)	44 (26.0%)	0.275
Married	114 (65.5%)	112 (66.3%)	
Divorced/separated/widow	7 (4.0%)	13 (7.7%)	
Having children			
No	30 (25.6%)	17 (14.3%)	0.029
Yes	87 (74.4%)	102 (85.7%)	
Number of children			
Median (IQR)	2 (1-4)	3 (2-4)	0.645
Having children with age <6 years			
No	48 (40.7%)	51 (42.1%)	0.817
Yes	70 (59.3%)	70 (57.9%)	
Education			
Illiterate	7 (4.0%)	2 (1.2%)	0.003
High School of less	82 (47.4%)	56 (33.1%)	
College or higher	84 (48.6%)	111 (65.7%)	
Working status			
Working	63 (41.2%)	68 (43.0%)	0.660
Unemployed including housewives	57 (37.3%)	49 (31.0%)	
Retired	10 (6.5%)	13 (8.2%)	
Students	23 (15.0%)	28 (17.7%)	
Having a household working in healthcare occupations			
No	164 (96.5%)	160 (95.8%)	0.752
Yes	6 (3.5%)	7 (4.2%)	
Having chronic disease			
No	132 (75.9%)	129 (76.3%)	0.919
Yes	42 (24.1%)	40 (23.7%)	
Chronic disease types			
Diabetes	8 (19.0%)	13 (32.5%)	0.448
Hypertension	5 (11.9%)	6 (15.0%)	
Asthma or other chronic respiratory disease	14 (33.3%)	9 (22.5%)	
Others	15 (35.7%)	12 (30.0%)	
Visits to primary care during last year			
No	79 (45.4%)	73 (43.2%)	0.681
Yes	95 (54.6%)	96 (56.8%)	
Number of visits			
Median (IQR)	3 (2-5)	3 (2-5)	0.654
Use of antibiotics during last year			
No	58 (33.3%)	47 (27.8%)	0.267
Yes	116 (66.7%)	122 (72.2%)	
Number of antibiotics used during last year			
Median (IQR)	3 (2-4)	3 (2-3.5)	0.105
≤2	32 (41.0%)	45 (48.4%)	0.335
≥3	46 (59.0%)	48 (51.6%)	

on the other hand was correlated positively and significantly with knowledge, attitude, and awareness (*P* < 0.001 for all).

Table 7 shows the multivariate logistic regression analysis for awareness. Awareness was independently associated with both

Table 6: Socio-demographic and medical characteristics of the study participants by the practice groups			
	Practice score		*P*
	≤ median (68.8%)	> median (68.8%)	
Age (years)			
Mean±SD	31.2±8.8	34.3±11.1	0.005
18-25	57 (29.4%)	34 (22.8%)	0.222
26-35	83 (42.8%)	62 (41.6%)	
>35	54 (27.8%)	53 (35.6%)	
Gender			
Male	72 (37.1%)	55 (36.9%)	0.97
Female	122 (62.9%)	94 (63.1%)	
Marital status			
Single	70 (36.1%)	27 (18.1%)	0.001
Married	115 (59.3%)	111 (74.5%)	
Divorced/separated/widow	9 (4.6%)	11 (7.4%)	
Having children			
No	25 (21.2%)	22 (18.6%)	0.625
Yes	93 (78.8%)	96 (81.4%)	
Number of children			
Median (IQR)	2.5 (1.8-4.3)	3 (1-4)	0.939
Having children with age <6 years			
No	45 (37.2%)	54 (45.8%)	0.179
Yes	76 (62.8%)	64 (54.2%)	
Education			
Illiterate	6 (3.1%)	3 (2.0%)	0.021
High School of less	90 (46.4%)	48 (32.4%)	
College or higher	98 (50.5%)	97 (65.5%)	
Working status			
Working	72 (41.4%)	59 (43.1%)	0.085
Unemployed including housewives	60 (34.5%)	46 (33.6%)	
Retired	8 (4.6%)	15 (10.9%)	
Students	34 (19.5%)	17 (12.4%)	
Having a household working in healthcare occupations			
No	186 (96.9%)	138 (95.2%)	0.422
Yes	6 (3.1%)	7 (4.8%)	
Having chronic disease			
No	153 (78.9%)	108 (72.5%)	0.170
Yes	41 (21.1%)	41 (27.5%)	
Chronic disease types			
Diabetes	11 (26.8%)	10 (24.4%)	0.385
Hypertension	6 (14.6%)	5 (12.2%)	
Asthma or other chronic respiratory disease	14 (34.1%)	9 (22.0%)	
Others	10 (24.4%)	17 (41.5%)	
Visits to primary care during last year			
No	90 (46.4%)	62 (41.6%)	0.377
Yes	104 (53.6%)	87 (58.4%)	
Number of visits			
Median (IQR)	3 (2-5)	3 (2-5)	0.980
Use of antibiotics during last year			
No	66 (34.0%)	39 (26.2%)	0.118
Yes	128 (66.0%)	110 (73.8%)	
Number of antibiotics used during last year			
Median (IQR)	3 (2-4)	2 (2-3)	0.001
≤2	31 (36.9%)	46 (52.9%)	0.036
≥3	53 (63.1%)	47 (47.1%)	

educational level (odds ratio = 2.70, 95% confidence 1.58–4.61, *P* < 0.001) and having children (odds ratio = 2.10, 95% confidence 1.06–4.14, *P* = 0.033).

Table 8 shows the multivariate logistic regression analysis for the predictors of appropriate antibiotic practices, defined as practice score above the median (of 68.8%). Appropriate antibiotic

Table 7: Multivariate logistic regression analysis* for the predictors of awareness					
Predictors	Groups compared	Odds ratio	95% confidence interval		*P*
			Lower	Upper	
Educational level	College or higher vs. high School of less	2.70	1.58	4.61	<0.001
Having children	Yes vs. no	2.10	1.06	4.14	0.033

Adjusted for educational level and having children. Adjusted R^2=0.102. Equation: Awareness = (0.994 x education) + (0.74 X having children)

Table 8: Multivariate logistic regression analysis* for the predictors of appropriate antibiotic practices					
Predictors	Groups compared	Odds ratio	95% confidence interval		*P*
			Lower	Upper	
Marital status	Ever married vs. single	3.58	1.50	8.54	0.004
Educational level	College or higher vs. high School of less	2.06	0.95	4.45	0.068
Number of antibiotics used during last year	≥3 times vs. ≤2 times	0.47	0.23	0.96	0.037
Awareness score	> median vs. ≤ median	3.83	1.88	7.79	<0.001

Adjusted for age, marital status, educational level, working status, number of antibiotics used during the last year, and attitude score. Adjusted R^2=0.292. Equation: appropriate antibiotic practices = (1.276 x marital status) + (-0.761 X number of antibiotics) + (1.343 X awareness score)
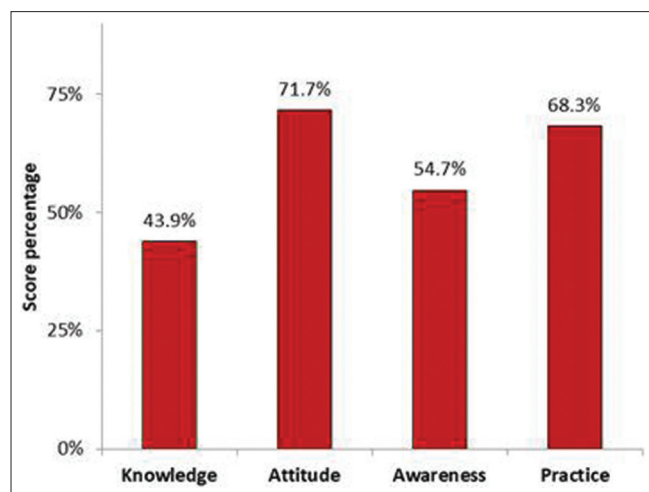

Figure 1: Scores of Knowledge, attitude and practice towards antibiotic use among the study patients

practices were independently associated with high awareness score (odds ratio = 3.83, 95% confidence 1.88–7.79, *P* < 0.001), married status (odds ratio = 3.58, 95% confidence 1.50–8.54, *P* = 0.004), and lower number of antibiotics used during the last year (odds ratio = 0.47, 95% confidence 0.23–0.96, *P* = 0.037).

Discussion

The current study reported the levels of awareness and practices of antibiotic use and their influencing factors among a sample of patients at a primary care setting in Saudi Arabia.

Our study showed 54.7% antibiotic awareness usage level among the study participants. Comparing the current moderate awareness with previous studies, we reported a higher awareness level than those reported by El Zowalaty and Al-Shawi *et al.*;[15] according to their report antibiotic usage awareness levels were 48% and 48.4% respectively.[6] Similarly, 62% of the participants in that study agreed that antibiotics should not be purchased and taken without a doctor's prescription compared with 75% in the current study.[6]

We reported an overall 68.3% appropriate antibiotic practices among the study participants. Only 35.3% of the current participants were frequently (always or sometimes) taking antibiotics directly from the pharmacists without a prescription compared with 48% to 67% in previous local studies.[5,6,15] Additionally, 37.6% of the current participants were frequently (always or sometimes) keeping leftover antibiotics at home for future use compared with 20% to 45% leftover rates in previous local studies.[6,15] Furthermore, 56.8% of the current participants frequently (always or sometimes) discontinued antibiotics when they felt better compared with 48% to 67% in previous local studies.[5,6]

The current study showed a significant positive association or correlation between awareness level and appropriate antibiotic practices among the study participants. Additionally, the scores of both awareness and practices were positively and significantly correlated. The expected findings are similar to what have been reported in previous local studies[5,9] and international studies.[18,19] On the other hand, some previous local studies failed to detect the positive correlation between awareness levels and appropriate antibiotic practices.[6,15]

Awareness of antibiotic use and resistance in the current study was associated with higher educational level and having children. Similar to the current findings, previous studies consistently showed a positive association between the level of education and the level of knowledge, beliefs, and attitude of antibiotic use and resistance, both in Saudi Arabia[6,9,15] and internationally.[19-21]

Appropriate antibiotic practices in the current study were associated with married status and lower number of antibiotics used during the last year. As 80% of the married participants in the current study had children, the observed higher appropriate antibiotic practices among married individuals compared with singles may reflect more exposure to antibiotic information while treating their children. Additionally, participants who had children in the current study had better awareness. Previous local studies did not show any significant association between marital status

and appropriate antibiotic practices, as the majority of these studies targeted parents (consequently no singles were included to compare).[6,9,15]

The current study had several strengths and few limitations. It is considered the first local study to examine awareness and practices of antibiotic use among a sample of patients at a primary care setting. Additionally, the association between awareness and practices of antibiotic use has been examined using both univariate and multivariate analyses. Moreover, the influences of a large number of socio-demographic and medical characteristics on awareness and appropriate antibiotic practices have been examined. Nevertheless, we acknowledge a few limitations; for example, the cross-sectional design does not prove causations but only associations. Additionally, convenience sampling used in the current study may limit the generalizability of the current findings. However, lack of casualty and limited generalizability are almost unavoidable limitations in all similar studies done previously.

Conclusion

The current finding indicates the need for improving awareness and understanding of the public regarding appropriate antibiotic use by targeting patients visiting primary care services with posters, structured educational sessions, and physician advice. Additionally, it calls for effective implementation for already available regulations that prohibit selling antibiotics without prescriptions. Further studies which target different populations are recommended.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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