Knowledge, Attitude and Practice towards the Use of Antibiotics

Bahlas R.[1], Ramadan I.[2,3], Bahlas A.[4], Bajunaid N.[5], Al-Ahmadi J.[2], Qasem M. Farghaly[3], Bahy K.[6]

[1] Infection Control, King Abdulaziz University Hospital, Jeddah, Saudi Arabia
[2] Family and Community Medicine, King Abdulaziz University, Jeddah, Saudi Arabia
[3] Community Medicine, Alazhar University, Cairo, Egypt
[4] Nuclear Medicine, King Abdulaziz University Hospital, Jeddah, Saudi Arabia
[5] Infectious Disease and Medicine Department King Abdulaziz University, Jeddah, Saudi Arabia
[6] Faculty of Pharmacy, Cairo University, Cairo, Egypt
khaled_gsk@hotmail.com

Abstract: Background: One of the major health problems is inappropriate use of antibiotics that may be affected by several factors. The improper use of antibiotic may cause a serious problem of emerging multidrug resistance organisms (MDRO) without the public realizing it. **Objectives:** The study was carried out to assess knowledge, attitude and practice towards antibiotic use among patients and relatives attending to King Abdulaziz University Hospital, Jeddah, Saudi Arabia, and to investigate the factors that associated with knowledge, attitude and practice towards antibiotic use. **Methods:** A cross sectional survey was conducted at King Abdulaziz University Hospital in the outpatient clinics. **Results:** four hundred and seventy nine participants completed the study, with mean age 37.24±12.17, 75.78% were married, 39.87% were holding a bachelor degree, and 27.14% have insurance coverage. Three quarters of the participants were earning less than 10,000 SR and around 46% of the participants reported to have co-morbidities. Participants consuming antibiotics in the past yearknew the type of antibiotic and consult their physician for medication had a higher mean knowledge towards the use of antibiotics. Females, Saudis, married, living with families of five members or less, with an income more than ten thousand S.R and administer antibiotics properly by physician prescription have a positive attitude towards antibiotic use. **Conclusion:** knowledge towards antibiotic use was greatly affected by marital status, educational level and antibiotic used in the past year.
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1. Introduction

Alexander Fleming discovered penicillin in **1982**, the first commercialized antibiotic. It was used in World War II for surgical and wound infections; it wasn't dispensed to the general public until 1945. It was claimed to be a "miracle drug" and thought to create a future free of infectious diseases. This discovery won Alexander Fleming the Nobel Prize, he warned in his acceptance speech of bacteria becoming resistant to penicillin.[1]

World Health Organization (WHO) issued a global surveillance antimicrobial resistance report in 2014, disclosed that antibiotic resistance is a problem all over the world, it is jeopardizing the treatment of common infections in the community and hospitals. Common infections and injuries, that have been treatable for decades, will be able to kill again, indicating we are heading to a post-antibiotic period.[2]

Antibiotic resistance has been shown to increase with duration of treatment; therefore, as long as a clinically effective lower limit is observed (dependent upon the organism and antibiotic in question), the use by the medical community of shorter courses of antibiotics is likely to decrease rates of resistance, reduce cost, and improve outcomes due to fewer complications such as Clostridium *C. difficile* infection and diarrhea. [3]

Several studies suggested a causal relationship between antimicrobial usages in hospitals and antimicrobial resistance. They observed that changes in antimicrobial usage are paralleled by changes in the prevalence of resistance. Also, they reported that antimicrobial resistance is more prevalent in nosocomial bacterial strains than those from community-acquired infection and during outbreaks of nosocomial infections, patients infected with resistant strains are more likely than control patients to have received prior antimicrobial therapy. Moreover increasing duration of patients' exposure to antimicrobials increases the likelihood of colonization with resistant organisms.[4]

Furthermore, the Center of Disease Prevention and Control (CDC) reported that antibiotic adverse drug events (ADEs) cause one out of five emergency department visits and this is most frequently among children. They also reported that seven antibiotics are

considered among the top fifteen medications involved in ADEs.[5]

One of the world's most pressing public health problems is misuse of antimicrobials. Such inappropriate use not only does diminish the therapeutic benefit of essential medications, but also it is associated with the development and spread of MDROs. Rises in MDROs globally is associated with increased morbidity and mortality.[6]

The current study was conducted based on the fact that, few studies have been conducted in Saudi Arabia regarding knowledge attitude and practice towards antibiotic use, to our knowledge; no studies have been done in Jeddah.

2. Materials and methods

Study design and population

A cross- sectional study was conducted at a tertiary hospital in an ambulatory care setting outpatient clinic affiliated to the ministry of higher education at King Abdulaziz University Hospital in Jeddah city, Saudi Arabia, during the period from January until October, 2015.

The sample size was calculated using Stata Version 13.0 by one-sample comparison of proportions to hypothesized values. The value of proportions is taken from other studies; the proportional hypothesized knowledge was 47% and postulated 55%.[7, 8] Calculation of the sample will be based on the assumption of 90% power and 0.05 α level. The minimum sample size is calculated to be 408, but we extended it to 550 to allow for sake of stratification and non-responses.

Five hundred and fifty participants were recruited using proportional stratified random sample and four hundred seventy nine completed the study, questionnaires were obtained from each clinic by using systematic random sample.

Study Questionnaire

A structured valid reliable self-administered questionnaire was used; which was adopted from a previous study originally developed in English by Shehadeh *et al.*[7] It was translated into Arabic, using forward-backward translation.[9]

Statistical analysis

The questionnaires were checked manually and the data was coded before data entry. The data was entered by double entry method into Stata software version 13.1 (Stata Corp, College Station, Texas USA). Once data entry was completed, the continuous variable "age" was categorized into five groups from 18 to 25, >25-35, >35-45, >45-55, and older than 55. Also, the continuous variable "family members" was categorized into two groups: five members or less and more than five members (five was the mean of family members). In addition, the variable "occupation status" was categorized into two groups: working or ever worked and not working. Furthermore the variable "type of antibiotic used" was labeled into penicillin, others, and don't know. Also, the variable "comorbidities" was categorized to having co-morbidities or not. To simplify the results knowledge towards antibiotic use was defined as correct or incorrect, and practice was classified into compliant and non-compliant. The descriptive analysis of the quantitative data was presented using frequencies and percentages. The bivariate association between the dependent variables (knowledge, attitude, and practice) and other variables were done using independent t-test for the difference between two means, and one-way Anova for the difference between more than two means. Linear regression were used to identify the predictors of; knowledge and attitude. *P*-value of less than 0.05, two-tail probability was considered to be statistically significant with a 95% confidence interval (95% CI).

3. Results:

The sample included 479 participants with a response rate of 87%. The average age was 37.24±12.17 years with a range between 18 and 79 years and 33.61% were from the age of 25-35 years old. Nearly half of the participants were patients attending to the four major clinics respectively, there were 26.30% attending the Medical clinic, 25.89% were attending the Surgical clinic, in the Pediatric clinic 22.13% attended and 25.68% Obstetric/ Gynecology clinic. 56.58% of the participants were of Saudi nationality. Most of the participants 98.54% attended to KAUH outpatient department were from urban origin. Around two thirds of participants were females. The majority of participants 75.78% were married. 59.29% of participants have family members of five or less. 54.7% of participants are below bachelor degree, 39.87% are with a bachelor degree and only 5.43% hold a postgraduate degree. More than half of the study sample was either working or ever worked. Concerning the family income three quarters were earning less than 10000S.R. Most of the participants 94.57% do not work in a healthcare sector and less than half of participants have relatives who are healthcare providers. Around 27.14% have insurance coverage, 17.33% of them have insurance that cover medication expenses (Table 1).

There was a substantial misunderstanding when asked about the aim of using antibiotic for treatment, only 24.44% correctly answered the indication of antibiotic use. When asked about the cause of antibiotic resistance 52.82% thought it was regarding not completing the full course of antibiotic. When

asked about an antibiotic will always be effective in the treatment of the same infection in the future or if they can be harmful for children's teeth and if antibiotics might develop allergy reaction that may lead to death, most of the participants either did not know the answers regarding knowledge towards antibiotics use or answered incorrectly. However, 63.67% and 53.65% of participants know that females should not take antibiotics during pregnancy or while they are breastfeeding (Figure 1).

In general, majority of participants were not supportive for using antibiotic of a sibling 71.13%, or as a prophylaxis 72.44%, even if advised by a relative 62.63% and 62.84% of the participants would not use leftover antibiotic without physician consultation. Almost eighty four percent would sometimes or never ask their physician to take an antibiotic allergy test. More than half of participants keep emergency antibiotic at home for their children (Figure 2).

Around 5.58% the participants consume antibiotics before a meal, approximately ninety seven percent ingest their antibiotics with water and whereas 35.28% store oral antibiotics in medicine cabinets (Figure 3).

Knowledge toward antibiotic use varied significantly depending on the marital status, where married participants had significantly the highest mean knowledge score 2.36±1.58 compared to others. Participants with a postgraduate degree significantly demonstrated higher knowledge 3.23±(1.88) compared to the others. Furthermore, the families with the lowest income had the least mean knowledge 1.99±1.49 compared to the middle class 2.17±1.52 and high income 2.60±1.73. Participants consuming antibiotics in the past year had a higher mean knowledge towards the use of antibiotics 2.29±1.58. Participants who knew the type of antibiotic showed significantly higher knowledge score. Self-medication consumption is linked to lower mean knowledge score. A higher mean of knowledge is showed when participants consult their physician for medication. Participants who have relatives working as healthcare providers have a higher mean knowledge level than those who don't. Also, participants with medication insurance have a higher knowledge score 2.48±1.58 (Table 2).

Females, Saudis, married, living with families of 5 members or less, with an income more than ten thousand S.R and administer antibiotics properly by physician prescription have a positive attitude towards antibiotic use. Furthermore, individuals who used antibiotic in the past year with frequency more than 6 times, and was self-administered or through a pharmacist had a negative attitude towards antibiotic use (Table 3).

Participants with co-morbidities showed significant higher compliance 1.38±0.57 toward antibiotic use compared to their counterparts 1.27±0.59. Participants who have taken penicillin displayed higher compliance towards use of antibiotic 1.5±0.66 compared to individuals who took other antibiotic 1.43±0.60 (Table 4).

There was a weak positive correlation between knowledge and attitude towards antibiotic use (Pearson's $r = 0.19$, $p < 0.001$). This indicates that participants with higher knowledge had more positive attitude towards antibiotic use.

By building linear regression models for prediction of knowledge and attitude, regarding knowledge; marital status, education level and history of antibiotic use in the past year were found to be the significant predictors. Controlling for other variables, knowledge level of married participants were 0.51 times higher than single participants. The knowledge towards antibiotic use of participants who had a post graduate degree was 1.39 times higher than participants who had an elementary degree. Participants who were not using antibiotics for the past year were 0.40 times lower in knowledge level than those who have taken antibiotics in the past year. For each unit increase in attitude score the knowledge score increases by 0.16 units. According to attitude gender, marital status, family income frequency of antibiotic use and medication administration by physician prescription was significantly associated with the attitude towards antibiotic use. Controlling for other variables, attitude level of female participants was 0.35 times higher than male. Married participants were 0.60 units better than single participants. When consuming antibiotics 3-5 times in the past year participants have a negative attitude by 0.37 towards antibiotic use compared to those consumed antibiotics 1-2 times. Consequently participants who administered antibiotics more than 6 times in the past year had an even lower level of 0.69 than those who took antibiotics only 1-2 times. Logically participants that administer antibiotics with a physician prescription had 0.97 units higher in attitude level towards the use of antibiotics. For each unit increase in knowledge score the attitude score increases by 0.14 units (Table 5).

Table 1: Basic characteristics of the study participants

Variables	N=479	%
Gender		
Male	205	42.80
Female	274	57.20
Age		
18-25	65	13.57
>25-35	161	33.61
>35-45	130	27.14
>45-55	71	14.82
>55	52	10.86
Marital status		
Single	95	19.83
Married	363	75.78
Widowed	10	2.09
Divorced	11	2.30
Nationality		
Saudi	271	56.58
Non-Saudi	208	43.42
Residence		
City	472	98.54
Village	7	1.46
Education		
Elementary	24	5.01
Intermediate	50	10.44
High school	188	39.25
Bachelor	191	39.87
Postgraduate	26	5.43
Family members		
Less than 5 members	284	59.29
More than 5 members	195	40.71
Occupation		
Working or ever worked	252	52.61
Not working	227	47.39
Family income per month (Saudi Riyals)	188	39.25
< 5000 SR	172	35.91
5000-10000 SR	119	24.84
> 10000 SR		
Work in health sector		
Yes	26	5.43
No	453	94.57
Relative works a healthcare provider	211	44.05
Yes	268	55.95
No		
Insurance		
Yes	130	27.14
No	349	72.86
Insurance cover medication	83	17.33
Yes	47	9.81
No		
Co-morbidities		
Yes	218	45.51
No	261	54.49

Table 2: Distribution of mean knowledge score towards the use of antibiotic among the study participants

Variables	Mean (± S	P
Gender		
Male	2.12 (1.68)	0.28!
Female	2.27 (1.50)	
Nationality		
Saudi	2.32 (1.61)	0.08!
Non-Saudi	2.06 (1.53)	
Residence		
Urban	2.20 (1.57)	0.39!
Rural	2.71 (2.13)	
Age		
18-25	1.88 (1.58)	0.14†
>25-35	2.23 (1.55)	
>35-45	2.41 (1.51)	
>45-55	2.29 (1.62)	
>55	1.92 (1.74)	
Marital status		
Single	1.68 (1.50)	0.001†
Married	2.36 (1.58)	
Widow	1.5 (1.08)	
Divorced	2.36 (1.50)	
Family members		
5 members & less	2.27 (1.56)	0.31!
More than 5 members	2.12 (1.60)	
Educational level		
Elementary	1.83 (1.37)	0.001†
Intermediate	1.82 (1.27)	
High school	2.07 (1.52)	
Bachelor	2.35 (1.63)	
Postgraduate	3.23 (1.88)	
Family income (SR)		
< 5000 SR	1.99 (1.49)	0.004†
5000-10000 SR	2.17 (1.52)	
> 10000 SR	2.60 (1.73)	
Occupation		
Working or everworked	2.18 (1.65)	0.68!
Not working	2.24 (1.50)	
Co-morbidities		
Yes	2.15 (1.59)	0.48!
No	2.25 (1.57)	
Antibiotic use in the past year:		
Yes	2.29 (1.58)	0.038!
No	1.92 (1.53)	
Type of antibiotics used:		
Penicillin	2.70 (1.47)	0.03†
Others	2.59 (1.49)	
Don't know	2.15 (1.60)	
Frequency of antibiotic use in the past year	2.33 (1.52)	0.46†
1-2 times	2.13 (1.59)	
3-5 times	2.40 (1.76)	
More than 6 times		
Proper Medication administration*		
Self administered	1.83 (1.44)	0.007!
Yes	2.39 (1.60)	
No		
Physician Prescription	2.44 (1.58)	0.0008!
Yes	1.80 (1.49)	
No		
Prescribed by pharmacist	2.11 (1.54)	0.27!
Yes	2.33 (1.59)	
No		
Working in the healthcare setting		
Yes	2.69 (1.89)	0.11!
No	2.18 (1.56)	
Relative works a healthcare provider	2.42 (1.65)	0.008!
Yes	2.04 (1.50)	
No		
Have insurance		
Yes	2.29 (1.51)	0.47!
No	2.17 (1.60)	
Medication insurance		
Yes	2.48 (1.58)	0.03!
No	1.89 (1.33)	

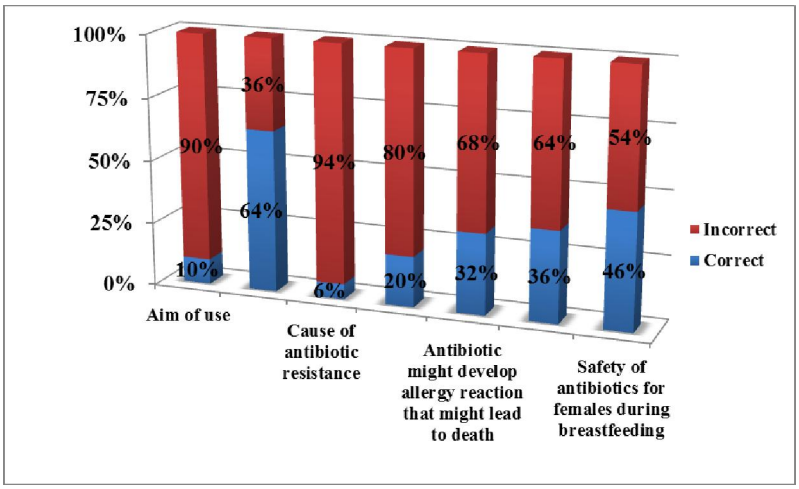

Figure 1: Knowledge towards the use of antibiotics among the study participants

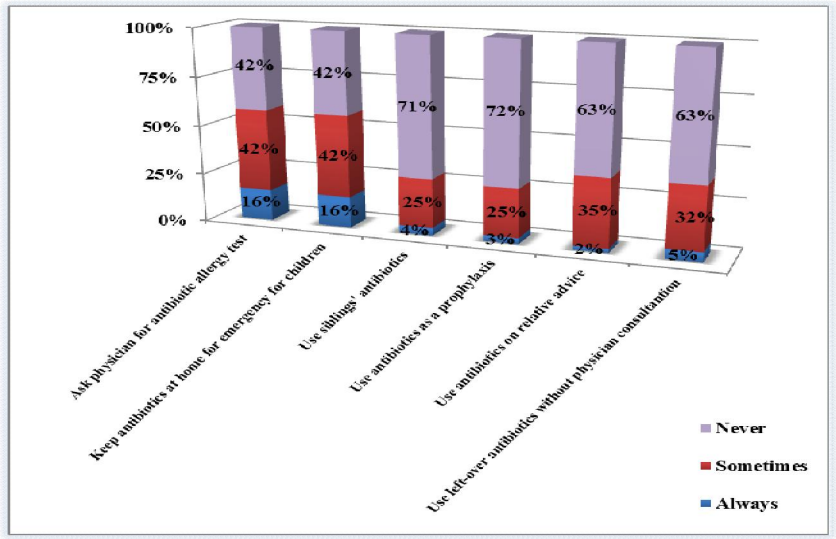

Figure 2: Attitude towards the use of antibiotic among the study participants

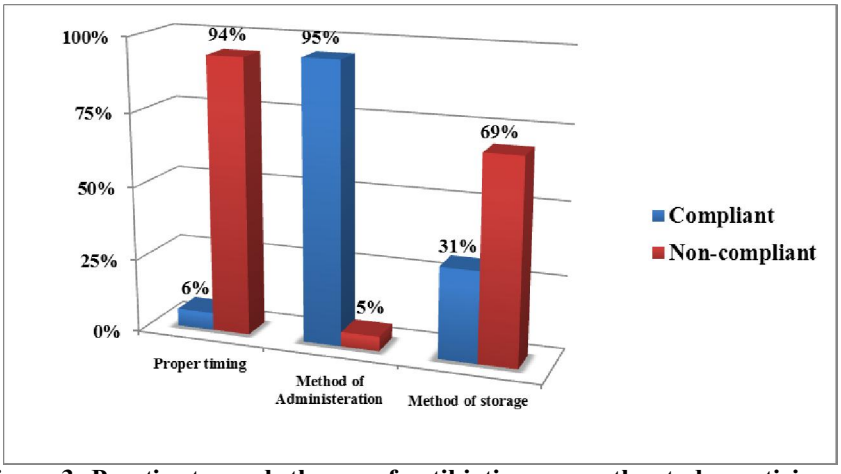

Figure 3: Practice towards the use of antibiotics among the study participants

Table 3: Distribution of mean attitude towards the use of antibiotic among the study participants

Variables		Mean (± SD)	P
Gender			
	Male	3.03 (1.66)	0.006!
	Female	3.45 (1.58)	
Nationality			
	Saudi	3.41 (1.66)	0.03!
	Non-Saudi	3.09 (1.57)	
Residence			
	Urban	3.26 (1.63)	0.15!
	Rural	4.14 (0.90)	
Age			
	18-25	3.26 (1.73)	0.96†
	>25-35	3.20 (1.71)	
	>35-45	3.35 (1.48)	
	>45-55	3.28 (1.61)	
	>55	3.25 (1.67)	
Marital status			
	Single	2.75(1.62)	0.0045†
	Married	3.42(1.60)	
	Widow	3.1(1.73)	
	Divorced	3.09 (1.64)	
Family members			
	5 members & less	3.38(1.62)	0.06!
	More than 5 members	3.10 (1.62)	
Educational level			
	Elementary	3.46(1.82)	0.57†
	Intermediate	3.14(1.73)	
	High school	3.21(1.59)	
	Bachelor	3.27(1.67)	
	Postgraduate	3.73(1.15)	
Family income(SR)			
	< 5000 SR	3.04 (1.64)	0.028†
	5000-10000 SR	3.35 (1.59)	
	> 10000 SR	3.52 (1.64)	
Occupation			
	Working or ever worked	3.17 (1.66)	0.16!
	Not working	3.38 (1.58)	
Co-morbidities			
	Yes	3.25 (1.65)	0.83!
	No	3.28 (1.61)	
Antibiotic use in the past year			
	Yes	3.18 (1.62)	0.026!
	No	3.58 (1.62)	
Type of antibiotics used			
	Penicillin	3.24 (1.37)	0.58†
	Others	3.38 (1.57)	
	Don't know	3.13 (1.67)	
Frequency of antibiotic use in the past year		3.41 (1.59)	0.009†
	1-2 times	3.04 (1.58)	
	3-5 times	2.76 (1.69)	
	More than 6 times		
Proper Medication administration*			
Self administered			
	Yes	2.31 (1.46)	0.000!
	No	3.39 (1.60)	
Physician Prescription			
	Yes	3.44 (1.57)	0.000!
	No	2.35 (1.49)	
Prescribed by pharmacist			
	Yes	2.68 (1.63)	0.0015!
	No	3.18 (1.60)	
Working in the healthcare setting			
	Yes	3.54 (1.56)	0.39!
	No	3.25 (1.63)	
Relative works a healthcare provider			
	Yes	3.36 (1.69)	0.25!
	No	3.19 (1.58)	
Have insurance			
	Yes	3.35 (1.76)	0.53!
	No	3.24 (1.58)	
Medication insurance			
	Yes	3.54 (1.78)	0.12!
	No	3.04 (1.59)	

Table 4: Distribution of mean practice towards the use of antibiotic among the study participants

Variables		Mean (±SD)	P
Gender			
	Male	1.29 (0.60)	0.35!
	Female	1.34 (0.57)	
Nationality			
	Saudi	1.28 (0.57)	0.11!
	Non-Saudi	1.37 (0.60)	
Residence			
	Urban	1.32 (0.58)	0.87!
	Rural	1.29 (0.49)	
Age			
	18-25	1.35 (0.57)	0.89†
	>25-35	1.29 (0.57)	
	>35-45	1.31 (0.59)	
	>45-55	1.32 (0.63)	
	>55	1.38 (0.57)	
Marital status			
	Single	1.35 (0.59)	0.91†
	Married	1.3 (0.58)	
	Widow	1.4 (0.52	
	Divorced	1.36 (0.50)	
Family members			
	5 members & less	1.29 (1.22)	0.10!
	More than 5 members	1.37 (1.29)	
Educational level			
	Elementary	1.21 (0.66)	0.56†
	Intermediate	1.34 (0.63)	
	High school	1.37 (0.58)	
	Bachelor	1.28 (0.56)	
	Postgraduate	1.35 (0.63)	
Family income (SR)			
	< 5000 SR	1.34 (0.59)	0.63†
	5000-10000 SR	1.33 (0.60)	
	> 10000 SR	1.28 (0.55)	
Occupation			
	Working or ever worked	1.32 (0.59)	0.87!
	Not working	1.33 (0.58)	
Co-morbidities			
	Yes	1.38 (0.57)	0.04!
	No	1.27 (0.59)	
Antibiotic use in the past year:			
	Yes	1.33 (0.57)	0.37!
	No	1.27 (0.61)	
Type of antibiotics used:			
	Penicillin	1.5 (0.66)	0.027†
	Others	1.43 (0.60)	
	Don't know	1.29 (0.55)	
Frequency of antibiotic use in the past year		1.32 (0.55)	0.88†
	1-2 times	1.36 (0.61)	
	3-5 times	1.33 (0.59)	
	More than 6 times		
Proper Medication administration*			
Self administered			
	Yes	1.43 (0.59)	0.10!
	No	1.31 (0.57)	
Physician Prescription			
	Yes	1.33 (0.59)	0.79!
	No	1.35 (0.52)	
Prescribed by pharmacist			
	Yes	1.21 (0.57)	-2.15!
	No	1.37 (0.57)	
Working in the healthcare setting			
	Yes	1.5 (0.51)	0.11!
	No	1.31 (0.59)	
Relative works a healthcare provider			
	Yes	1.31(0.59)	0.77!
	No	1.33(0.58)	
Have insurance			
	Yes	1.35 (0.59)	0.57!
	No	1.31 (0.58)	
Medication insurance			
	Yes	1.31 (0.64)	0.52!
	No	1.38 (0.49)	

Table 5: Predictor variables of knowledge and attitude towards the use of antibiotic among study participants

Knowledge	β	SE	95% CI	P-value
Marital Status (single=ref)				
Married	0.51	0.18	0.16 to 0.87	0.004
Widow	-0.15	0.52	-1.17 to 0.86	0.77
Divorced	0.49	0.48	-0.46 to 1.44	0.32
Education (elementary=ref)				
Intermediate	0.09	0.38	-0.66 to 0.83	0.82
High school	0.39	0.33	-0.26 to 1.04	0.24
Bachelor degree	0.59	0.33	-0.05 to 2.23	0.07
Higher education	1.39	0.43	0.55 to 2.23	0.001
Antibiotic use in the past year (yes=ref)				
No	-0.40	0.17	-0.073 to -0.06	0.023
Attitude Score	0.16	0.04	0.08 to 0.25	0.000
Attitude	**β**	**SE**	**95% CI**	**P-value**
Gender (male=ref)				
Female	0.35	0.16	0.02 to 0.66	0.032
Marital status (single=ref)				
Married	0.60	0.21	0.19 to 1.01	0.004
Widow	0.49	0.53	-0.56 to 1.55	0.36
Divorced	0.19	0.53	-0.85 to 1.24	0.72
Income (less than 5000=ref)				
From 5000 to 10000	0.40	0.18	0.04 to 0.75	0.028
More than 10000	0.28	0.20	-0.12 to 0.68	0.17
Frequency of antibiotic use (1-2times=ref)				
3-5 times	-0.37	0.18	-0.72 to -0.02	0.038
More than 6 times	-0.69	0.21	-1.11 to -0.28	0.001
Proper medication administration				
Physician prescription (no=ref)				
Yes	0.97	0.19	0.61 to 1.34	0.000
Knowledge Score	0.14	0.05	0.04 to 0.24	0.008

4. Discussion

This cross sectional study showed there was a substantial misunderstanding regarding the aim for antibiotic treatment, it revealed that nearly half of participants thought it is for the treatment of sore throat, and this is similar to a study conducted by Napolitano et al., in Italy (2013). [10] Whereas less than half declared it is for common cold, cough and nasal congestion, this is consistent to the results of Ling *et al.* (2011) reported that 38% of the participants took antibiotics for a cold.[11] Aligned closely with a study conducted by Alzoubi et al., in Jordan (2013), participants incorrectly thought that it was for treatment of common cold, sore throat and the other minor ailments.[12] Increasingly in recent studies conducted by Awad and Aboud and Mouhieddine et al., and in Kuwait and Lebanon (2015) reported that more than half of the participants thought to take antibiotics for coughs and cold.[8,13] Also in agreement with the current study conducted in Yemen, Saudi Arabia and Uzbekistan that revealed poor knowledge regarding the aim of treatment. [14] Contradicting to the reported results, conducted by André et al., in Sweden (2010) participants showed good knowledge, but only one-fifth of them approved that antibiotics should be used for common colds, this higher level in knowledge can be due to the multiple campaigns conducted.[15,16] Furthermore, only 24.44% responded relatively correct antibiotics should be used to treat bacterial infections, which is a misconception supported by studies of Belkina et al., and André et al.,[14,17]

In terms of antibiotic resistance Napolitano *et al.* discovered that tenth of participants knew the correct definition of antibiotic resistance[10]. Unlike Wun *et al.* conducted a qualitative study showed that 91.0% of participants heard about antibiotic resistance, out of those about more than half agreed that not completing a course of antibiotic or obtaining it without a physician prescription would lead to unwanted results.[3] The present study more than half of participants thought it was resulted from not completing the full course of antibiotic, showed a quarter believed that it was when they are not necessary or using antibiotic without physician prescription (self medication), however less than tenth blamed the using antibiotic in febrile illness, this is near to other results.[7] In Sweden (2010), André *et al.* stated that there was a misperception concerning resistance, people believed that humans can become resistant to antibiotics not the bacteria.[15] Despite the poor knowledge demonstrated when using antibiotics in Lebanon (2015), it was published only around half of the participants have knowledge concerning completing the full course of antibiotic even if symptoms have improved.[13] In contrast to a study

conducted in Jordan (2014) on Iraqi citizens, demonstrated good knowledge on antibiotic use, following physician instructions and knowledge about resistance. Subsequently, having leftover antibiotics and knowledge of antimicrobial resistance were associated with low misuse.[18]

Distressingly out of the participants who have taken antibiotics, nearly three quarters did not know the type of antibiotics they have acquired. Tenth out of those who knew the name of antibiotic they received, consumed penicillin. Aligned to the present results, a study conducted in Riyadh reported penicillin the most frequently prescribed antibiotic for cases of sore throat, acute sinusitis, acute bronchitis, and otitis media.[19]Ling *et al.* revealed that there was a clear knowledge deficit in the distinction between generally used medication and antibiotics.[11] Whereas Mouhieddine *et al.* noted that the most people recognized the trade names of antibiotics than generic names and 36.0% were uncertain or didn't know that antibiotics might have reactions.[13]

Concerning safety of antibiotics more than half of participants requested from their physician to take antibiotic allergy test, although only one third of participants knew that by administering antibiotics an allergic reaction might develop which may lead to death, this was contradicting to what was reported by Shehadeh *et al.* [7] Furthermore a study conducted in Riyadh where researcher simulated a case scenario none of the interviewed pharmacists asked or mentioned allergy history or gave information about possible drug interactions that may result in terrible consequences.[19]Less than a quarter of our participants knew that certain antibiotics were harmful on children's teeth contradicting the results in Jordan showed that participants had more knowledge about antibiotic harmful effect on children's teeth. [7] Also, Pavydė *et al.* found that parents consider their children's health issues seriously and responsibly.[17]

Many studies showed that young age group participants and gender (male gender) have significantly associated with poor knowledge and negative attitude towards antibiotics use.[17,18] The current research proved better attitude between female participants but there was no significant relation with age. However a study in Lithuania stated that positive attitude was noticed among participants younger than forty years old.[17] Belkina *et al.* disclosed that women were more likely to use self-medication and had poor knowledge associated with the hazard on antibiotic use.[14,]

The present study showed higher mean knowledge score amongst participants frequently consuming antibiotics in the past year and when consulted by a physician.[15] Expectedly those demonstrated self-medication had a lower mean knowledge score compared to those who prescribed medication by physician or a pharmacist. Supporting the results, current studies concluded that participants with high educational levels there was a significant positive effect regarding knowledge and attitude towards antibiotic use.[7,] [12]Nevertheless Alghanim *et al.* noticed that the level of education was a significant factor when linked with the antibiotic knowledge but was not a significant predictor of self-medication and Pavydė *et al.* did not find an association between them. [20,17] It is shown that having patients exhibit knowledge of appropriate antibiotic use can reduce this abuse.[21]

Obviously negative attitude was noticed among participants who use antibiotics for the past year in our study; furthermore it was reported among those who self-medicated on the other hand positive attitude was seen among participants that acquired antibiotics through prescription from their physicians. Differing to participants in Malaysia, who usually go to physicians were more probably to take self-medication.[10]In Lithuania (2015), place of residence and absence of children was significantly associated with attitude towards antibiotic use.[17] Although in our study the number of family members did not have a significant effect on the attitude towards antibiotic use, the marital status on the other hand was significantly linked with positive attitude among married participants compared to single participants. However a study carried out by Awad and Aboud, in Kuwait (2015), there were no significant associations between basic characteristics and attitude regarding self-medication.[8] In addition, the current study reported no significant association between attitude and level of education this is contradicting to what was reported by Shehadeh *et al.*[7]

In conclusion, the current study showed inadequate knowledge and attitude towards antibiotic use in KAUH, Jeddah. Also participants with higher knowledge had more positive attitude towards antibiotic use.

Therefore, more education awareness campaigns towards antibiotic use should be conducted in the community. Beside, integrating information on antibiotic use and resistance among the curriculum of undergraduates. Also, physicians should have antibiotic stewardship programs for inpatients and outpatients settings for antibiotic prescription. Further studies should be conducted among physicians and pharmacists to discover knowledge, attitude and practice towards antibiotic prescribing behavior.

Future researches should be conducted to investigate knowledge, attitude and practice towards antibiotic use in rural regions in the Kingdom of Saudi Arabia.

Functioning of the law passed in 1978 that

regulated that the profession of pharmacists in Saudi Arabia, which prohibited the dispensing of drugs without prescription except for those defined as OTC drugs.[22]

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