Case Study

Knowledge and Awareness Level of Antibiotic Resistance Resulting from Self-Medication Use among Populations in KSA

Abdulrahman Ahmed Bin Alamir[1], Asyah Almurashi[2]*, Salma Alshelali[3], Amasi Alomairi[4], Khaireyah Alshammri[5], Amjad Alshammri[5], Raghad Alshammri[5], Esraa Nawawi[6], Khames Alzahrani[7]

[1]Department of Pediatrics, College of Medicine, Majmaah University, Majmaah, Saudi Arabia. [2]Department of Pharmacy, Al Mouwasat Hospital, Al Madinah, Saudi Arabia. [3]College of Pharmacy, King of Abdulaziz University, Jeddah, Saudi Arabia. [4]College of Pharmacy, Umm-Alqura University, Makkah, Saudi Arabia. [5]College of Pharmacy, Hail University, Hail, Saudi Arabia. [6]College of Pharmacy, Jazan University, Jazan, Saudi Arabia. [7]Saudi Board of Endodontic SR, King Faisal Specialist Hospital & Research Centre, Riyadh, Saudi Arabia.

Abstract

Self-medication involves using drugs, herbs, or remedies on personal initiative or advice without seeking advice or guidance from a health care professional. One issue affecting the health system is the Self-medication use of antibiotics. This study aims to assess the knowledge and awareness level of antibiotic resistance resulting from self-medication use among populations in KSA. This observational study was conducted in KSA; the data gatherers created an online questionnaire to gather information from randomly selected Saudi Arabian patients. The Statistical Package of Social-Science Software (SPSS) application, version 20, was then brought in the data. To go through statistical analysis. The study included 1,071 participants; the majority of respondents were between 20 and 40 years old. The data indicates a slightly higher representation of females (58.7%) compared to males (41.3%). The majority of the group, 75.3%, have a low level of knowledge on the topic, while 19.5% have a medium level, and only 5.2% have a good level of knowledge. There is a lack of awareness of antibiotic resistance resulting from self-medication. Knowledge and awareness scores were significantly associated with the occupation and monthly income of participants. The knowledge and awareness level of antibiotic resistance resulting from self-medication is a pressing issue that needs to be addressed urgently. The lack of understanding about appropriate antibiotic use, combined with unrestricted access to antibiotics and the proliferation of inaccurate information, contributes to the development of antibiotic resistance.

Keywords: Antibiotic, Antibiotic resistance, Antibiotic awareness, Self-medication

Introduction

Self-medication involves using drugs, herbs, or remedies on personal initiative or advice [1] to treat symptoms or disorders without seeking the advice or guidance of a healthcare professional, including antibiotics [2]. Antibiotics are manufactured to kill or stop the growth of bacteria only and cannot be used to eradicate viruses [3]. One issue affecting the health system is the self-medication of antibiotics [4]. It's considered to be the leading cause of antibiotic resistance, which is a serious medical problem [5]. As the number of cases of infections such as pneumonia, tuberculosis (TB), gonorrhea, and salmonellosis rises, it is getting harder to treat them [6]. Consequently, the disease's progression is extended since infections brought on by resistant microbes do not react to treatment [7]. That leads to a rise in morbidity, mortality, and monetary costs [8]. The 'golden age' of the 1950s to 1970s was when many antibiotic classes were discovered [9]. At least 700,000 deaths per year globally are attributed to drug-resistant illnesses, and by 2050, it is predicted that 10 million deaths will result from these disorders [10]. Locally, Saudi Arabia has made some attempts to lessen the overuse of antibiotics, which is one of the major contributors to AMR. An action plan for antibiotic stewardship was suggested by the Ministry of Health (MOH) in 2014 [11]. The MOH's new enforcement law took effect in May 2018 and restricts the sale of any antibiotic without a prescription in pharmacies [12]. A study on knowledge and attitudes toward antibiotic use in Western Saudi Arabia was conducted in 2021, with a sample size of 384, and the findings revealed that 30.5% of participants had poor knowledge of

Address for correspondence: Asyah Almurashi, Department of Pharmacy, Al Mouwasat Hospital, Al Madinah, Saudi Arabia.
asyah.almarashi@gmail.com

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antibiotics, 51.0% consumed antibiotics without a prescription, 54.6% believed that antibiotics were being used to treat viral infections, as well as 55.1% believed that stopping antibiotic use if symptoms began to improve was acceptable [13]. According to Jali and Abdulaziz's report, out of the 543 participants who gave their responses, 280 (or 75% of them) said they used Abs on a prescription. Only bacteria, not viruses, may be treated by ABS, as around 40% of participants correctly identified, while 44% disagreed. Abs cannot be used to cure common illnesses like coughs. Then, in terms of participants' resistance knowledge, we discovered that those who had heard of Abs resistance made up more than half (56%), and they had a stronger understanding of how to utilize Abs [14]. In 2022, 350 participants in an Al Mandine papulation cross-sectional survey were asked about their perceptions of the main causes of excessive use of ABs. The results showed that 76 participants (18.4%) believed it was difficult to get the necessary medical care, 107 participants (26%) believed it was due to their prior experiences, and 193 participants (46.8%) believed it was due to both factors. It was due to other factors, according to 36 people (8.7%). Since most participants were aware of AB use, they also had negative opinions toward it, understood the risks of self-medication and misuse, and lacked sufficient knowledge of AB resistance [15]. Previous research focused primarily on one area of Saudi Arabia, making it impossible to extrapolate its findings to the whole country. Additionally, there is a lack of correlating important variables (such as gender, age, and educational level) to the knowledge of AB resistance and the proper use of ABs in the general population. There have been a few Saudi studies investigating AMR and side effects, but they only assessed the participants' awareness regarding the proper use of ABs.

Objectives

This study aimed to assess the knowledge and awareness level of antibiotic resistance resulting from self-medication use among populations in KSA.

Materials and Methods

This is an observational cross-sectional study. The study was conducted in 2023 using an electronic questionnaire that was shared via social media platforms. The target sample for this study consisted of adults from the general population residing in the Kingdom of Saudi Arabia. They were selected through a random selection procedure.

Inclusion and Exclusion Criteria

Included in the admission requirements were Saudi Arabian citizens who were currently residing in the country and were over the age of 18. Children under the age of 18, people who supplied insufficient information, and anyone who chose not to participate in the study were all excluded.

Sample Size

The sample size for this investigation was determined using the Raosoft sample size calculator (Raosoft Inc., Seattle, WA, USA). Over 32 million people live in Saudi Arabia. The sample size has been calculated based on a 5% margin of error, a 50% response rate, and a 95% confidence interval. As a result, it was decided that a sample size of 385 replies was adequate for this investigation. However, we increased the sample size to include about 500 people to minimize sampling bias in our method as an online study.

Method for Data Collection and Instrument (Data Collection Technique and Tools)

In our study, we used a validated questionnaire done by Abdulaziz Jali [14] to assess Abs resistance, and the used questionnaire is in the appendix. The data gatherers were disseminated to gather information from randomly selected Saudi Arabian patients. The questionnaire asked questions on the sociodemographic characteristics of the patient and evaluated their knowledge about uses, antibiotic resistance, and side effects.

Scoring System

The original Bloom's cut-off points, 80.0%-100.0%, 60.0%-79.0%, and <or= 59%, were adapted and modified from the cross-sectional study conducted on antibiotic resistance resulting from the self-medication use among Populations in KSA in 2023.

Overall, twenty-one statements were used to assess the level of knowledge and awareness.

Knowledge Score

Thirteen statements are for knowledge scoring, one point is given for correct answers, and zero points are given for incorrect answers, or I don't know. The scoring system was divided as follows:

The second section is to determine the level of awareness of antibiotic resistance resulting from self-medication use among the population. Subsequently, respondents' awareness was divided into three categories: low knowledge (0-4), average knowledge (5-6), and good knowledge (7-8).

Analyzes and Entry Method

Data was input using the Microsoft Excel application for Windows (2016) after its gathering. The Statistical Package of Social-Science Software (SPSS) application, version 20, was then brought in the data. To go through statistical analysis.

Results and Discussion

The study included 1,071 participants; the majority of respondents were between 20 and 40 years old, with the highest percentage falling in the 20-30 age range (36.1%). The proportion of respondents decreased as the age increased, with only 2.0% of respondents being over 60 years old. Regarding gender, the data indicates a slightly higher representation of females (58.7%) compared to males

(41.3%). In terms of residence, the vast majority of respondents (87.5%) reported living in a city, while 12.5% resided in rural areas or other parts of the country. When it comes to education levels, the majority of respondents (67.8%) reported having a university education, while 21.2% had only completed elementary or high school. A smaller percentage had pursued postgraduate studies (6.4%), and a few respondents (4.6%) reported being uneducated. In terms of occupation, the largest proportion of respondents were students (26.1%), followed by non-health employees (33.8%) and housewives (24.7%). Health workers represented 8.7% of the respondents, while a smaller percentage reported being engaged in free work (6.6%). Concerning monthly income, the data shows that the majority of respondents had an income below 10,000 Saudi Riyals (71.1%), with the highest percentage falling in the range of less than 3,000 Saudi Riyals (41.0%). A small proportion of respondents (4.5%) reported having a monthly income exceeding 20,000 Saudi Riyals. In terms of marital status, the majority of respondents were married (57.7%), followed by single individuals (37.0%). Divorced and widowed individuals represented smaller percentages (4.4% and 0.9% respectively). Regarding chronic diseases, the majority of respondents (77.4%) reported not having any chronic diseases. Among those who did, diabetes was the most prevalent (9.1%), followed by hypertension (7.4%). Other chronic diseases such as anemia, kidney disease, heart disease, asthma, and others represented smaller percentages. Lastly, in terms of antibiotic usage, the data indicates that a significant proportion of respondents had used antibiotics in the previous 12 months. The highest percentage (28.8%) reported using antibiotics 6 months ago, followed closely by those who used them in the previous month (23.9%). A smaller percentage reported using antibiotics 12 months ago (23.0%), while 24.4% of respondents reported never having used antibiotics **(Table 1)**.

Table 1. Sociodemographic characteristics of participants (n=1071)

Parameter		No.	Percent
Age	less than 20	75	7.0
	20 - 30	387	36.1
	31 - 40	262	24.5
	41- 50	238	22.2
	51 - 60	88	8.2
	more than 60	21	2.0
Gender	Male	442	41.3
	Female	629	58.7
Residence	City	937	87.5
	Country	134	12.5
Education Level	Uneducated	49	4.6
	Elementary or high school	227	21.2
	University	726	67.8
	Postgraduate studies	69	6.4
Occupation	Student	280	26.1
	free work	71	6.6
	Housewife	265	24.7
	health worker	93	8.7
	Non-health employee	362	33.8
Monthly **Income (in Saudi Riyals)**	Less than 3000	439	41.0
	From 3000 to 5000	35	3.3
	From 5000 to 10,000	279	26.1
	From 10,000 to 20,000	270	25.2
	More than 20,000	48	4.5
Marital Status	Married	618	57.7
	Single	396	37.0
	Divorced	47	4.4
	Widowed	10	.9
Chronic diseases	There is non	829	77.4
	Diabetes	97	9.1
	Hypertension	79	7.4
	Anemia	21	2.0
	Kidney disease	6	0.6
	Heart disease	16	1.5
	Asthma	44	4.1
	Etc.	66	6.2
Antibiotics use in the previous 12 months	Previous month	256	23.9
	6 months ago	308	28.8
	12 months ago	246	23.0
	Never used antibiotics	261	24.4

As shown in **Figure 1**, Just 15% of the participants use antibiotics with a prescription, whereas 85% of participants use antibiotics without.

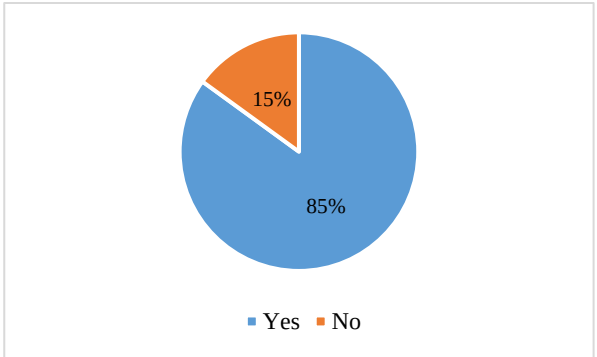

Figure 1. Antibiotic previous use without prescription among participants

According to the data provided in **Table 2**, a majority of respondents (85.0%) reported previous use of antibiotics without prescription. Additionally, a significant proportion (85.2%) claimed to have received advice from healthcare professionals on how to take antibiotics correctly, highlighting the importance of proper guidance. When it comes to the source of antibiotics, the majority (91.5%) obtained them from a drugstore, while a small percentage (4.6%) reported using leftover medication from previous packages. It is worth noting that a non-negligible number of individuals (3.5%) acquired antibiotics from friends or family members, which raises concerns about the potential misuse or sharing of medication. Regarding the reasons for discontinuing antibiotic use, the most common cause cited was completing the full prescribed dosage (58.9%), followed by improvement in symptoms (37.1%). However, a small percentage (4.0%) reported not knowing the reason for stopping antibiotic usage.

The survey also sheds light on the reasons for using antibiotics without a prescription. Nasal congestion (18.4%) and runny nose with cough (25.9%) were the most frequently reported symptoms leading to self-medication. Interestingly, a significant proportion of respondents (27.8%) mentioned a preference for not seeing a doctor, indicating a possible reluctance to seek professional medical advice. Moreover, a considerable number of respondents (16.2%) admitted to intentionally changing the type or dose of antibiotics during treatment, which can have serious implications for patient health and the development of antibiotic resistance. In terms of information-seeking behavior, around two-thirds of respondents (66.2%) reported reading the leaflet that comes with the antibiotic package. However, a significant portion (33.8%) indicated that they did not read the leaflet, potentially missing important instructions and precautions. Among those surveyed, 23.5% reported experiencing side effects while taking antibiotics. The most commonly reported symptoms were diarrhea (10.2%) and nausea and vomiting (6.8%), emphasizing the importance of monitoring and managing potential adverse effects. Lastly, a similar percentage of respondents (23.8%) reported stopping antibiotic use due to side effects, while the majority (76.2%) did not discontinue treatment for this reason.

Table 2. Antibiotic self-medication use and experienced side effects among the participants (N=1071).

Parameter		No.	%
Antibiotic previous use without prescription	Yes	910	85.0
	No	161	15.0
Had advice from the doctor, nurse, or pharmacist about how to take antibiotics in previous use	Yes	912	85.2
	No	159	14.8
Source of antibiotic when used	Internet	5	.5
	drugstore	980	91.5
	I have left from previous packages	49	4.6
	From a friend or family member	37	3.5
Cause of antibiotic stoppage	Full doses of the anti-dosed were completed as prescribed	631	58.9
	I felt better, and the symptoms improved	397	37.1
	I do not know	43	4.0
The reason for using an antibiotic without a prescription	Nasal congestion	197	18.4
	Runny nose with cough	277	25.9
	Nausea	111	10.4
	Non-severe fever (less than 39 degrees)	105	9.8
	Vomiting or diarrhea	111	10.4
	Body pain with fever	246	23.0
	Wounds to the skin	73	6.8
	Sore throat with fever	468	43.7
	Other	286	26.7
Reasons for taking antibiotics without a prescription	Save money	126	11.8
	Save effort and time	393	36.7
	I don't prefer to see a doctor	298	27.8
	Other	413	38.6

Intentionally changed the type or dose of antibiotic during treatment	Yes	173	16.2
	No	898	83.8
Read the leaflet that comes with the antibiotic package	Yes	709	66.2
	No	362	33.8
Experienced any side effects while taking an antibiotic	Yes	252	23.5
	No	819	76.5
If yes, what are the symptoms experienced? (Bias risk)	diarrhoea	109	10.2
	Nausea and vomiting	73	6.8
	Fungal infection	9	.8
	Dizziness.	58	5.4
	Rash.	27	2.5
	non	795	74.2
Stopped using an antibiotic because of its side effects	Yes	255	23.8
	No	816	76.2

Based on the data provided in **Table 3**, it is evident that there is a significant percentage of individuals who believe that antibiotics can treat diseases caused by bacteria. Approximately 88.7% of respondents agreed with this statement, while only 11.3% disagreed. Similarly, 55.0% of respondents believed that antibiotics can treat diseases caused by viruses, while 45.0% disagreed. Furthermore, there seems to be a lack of awareness regarding the limitations of antibiotics in treating cough and cold symptoms. While 43.6% of respondents believed that antibiotics can treat all cases of cough and cold, a larger percentage of 56.4% disagreed with this statement. It is encouraging to note that a majority of respondents, 62.2%, have heard of bacterial resistance to antibiotics. This indicates a level of awareness regarding this important issue. However, it is concerning that 37.8% of respondents claimed to have no knowledge of bacterial resistance. Regarding the sensitivity test of bacteria to antibiotics, it is important to clarify its purpose. According to the data, 16.9% of respondents believe that the test ensures the safety of the antibiotic and its toxicity, while 24.2% believe it ensures the antibiotic's effectiveness against a specific type of bacteria. Additionally, 13.5% of respondents believe it measures the effect of an antibiotic on a specific type of body cell, while 45.4% admitted to not knowing the purpose of this test. Lastly, it is noteworthy that only 7.9% of respondents have been informed by a doctor or pharmacist that they have developed bacterial resistance due to the misuse of antibiotics. The majority, 66.9%, claimed not to have received such information, while 25.1% were uncertain.

Table 3. Knowledge of the participants regarding uses of antibiotics and antibiotic resistance (N=1071).

Parameter		No.	%
Antibiotics treat diseases caused by bacteria	Yes	950	88.7
	No	121	11.3
Antibiotics treat diseases that are caused by viruses	Yes	589	55.0
	No	482	45.0
Antibiotics treat all cases of cough and cold	Yes	467	43.6
	No	604	56.4
Heard of bacterial resistance to antibiotics	Yes	666	62.2
	No	405	37.8
What is the sensitivity test of bacteria to antibiotics	To ensure the safety of the antibiotic and its toxicity	181	16.9
	To ensure that the antibiotic is effective against a specific type of bacteria	259	24.2
	To measure the effect of an antibiotic on a specific type of body cell	145	13.5
	I do not know	486	45.4
Doctor or pharmacist told you that you have developed bacterial resistance due to the misuse of antibiotics before	Yes	85	7.9
	No	717	66.9

I don't know	269	25.1

Antibiotic resistance is a phenomenon where the body becomes resistant to the effects of antibiotics, leading to reduced effectiveness in treating infections. According to the provided data, 46.6% of respondents agree with this statement, while 7.7% disagree and 45.7% are unsure. The data also indicates that many infections are becoming increasingly resistant to antibiotic therapy, with 48.3% of respondents agreeing, 6.9% disagreeing, and 44.8% being unsure. Furthermore, if bacteria are resistant to antibiotics, it can be challenging or even impossible to treat the infection they cause. This statement is supported by 40.7% of respondents, while 14.2% disagree and 45.1% are unsure. It is important to note that antibiotic resistance is a problem that can affect individuals and their families, as highlighted by 48.4% of respondents who agree with this statement. Conversely, 8.3% disagree, and 43.3% are unsure. Contrary to the belief that antibiotic resistance is not present in Saudi Arabia, 15.3% of respondents agree that it exists, while 29.6% disagree, and 55.1% are unsure. Lastly, antibiotic-resistant bacteria can spread from person to person, as indicated by 31.3% of respondents who agree, while 17.7% disagree and 51.0% are unsure.

Table 4. Knowledge of participants of online nutritional applications and tele-dietetics (n=1071).

	True	False	I don't know
Antibiotic resistance occurs when the body becomes resistant to antibiotics and, therefore, no longer works well	499 46.6%	83 7.7%	489 45.7%
Many infections are becoming increasingly resistant to antibiotic therapy	517 48.3%	74 6.9%	480 44.8%
If the bacteria are resistant to antibiotics, it may be difficult or impossible to treat the infection they cause.	436 40.7%	152 14.2%	483 45.1%
Antibiotic resistance is a problem that can affect me or my family.	518 48.4%	89 8.3%	464 43.3%
Antibiotic resistance is a problem that exists in many countries of the world, but we do not have it in Saudi Arabia	164 15.3%	317 29.6%	590 55.1%
Antibiotic-resistant bacteria can spread from person to person	335 31.3%	190 17.7%	546 51.0%
Antibiotic resistance occurs when the body becomes resistant to antibiotics and, therefore, no longer works well	482 45.0%	36 3.4%	553 51.6%

The data presented in **Figure 2** shows the distribution of knowledge levels among a certain group of individuals. The majority of the group, 75.3%, have a low level of knowledge on the topic, while 19.5% have a medium level, and only 5.2% have a good level of knowledge.

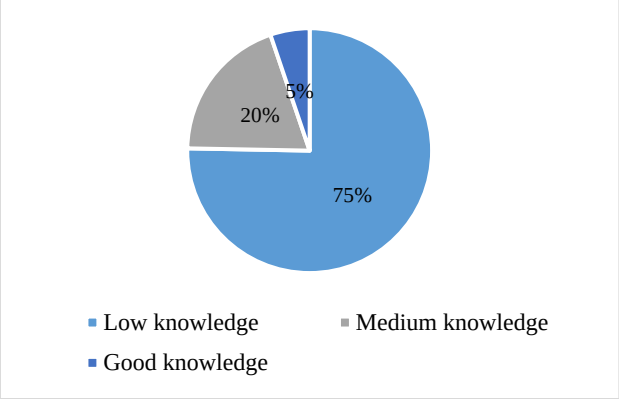

Figure 2. Knowledge levels among participants.

Table 5 shows an association between participants' knowledge scores and their sociodemographic characteristics. In terms of age, data shows that individuals aged 20-30 have the highest knowledge scores, followed by those aged 31-40 and 41-50. The lowest knowledge scores are observed in individuals less than 20 and those above 60 years old. As for marital status, there seems to be no significant difference in knowledge scores based on marital status. However, married individuals have the highest knowledge scores, followed by single individuals. Regarding gender, similar to marital status, there is no significant difference in knowledge scores between males and females. As expected, individuals with higher education levels, such as university graduates, have higher knowledge scores compared to learners or those with intermediate or secondary education. Students have the highest knowledge scores, followed by unhealthy employees and health officers. Freelancers and individuals who don't know their occupation have lower knowledge scores. Individuals with monthly incomes of less than 3000 Saudi Riyals have the highest knowledge scores, followed by those with incomes from 5001 to 10000 Riyals. The lowest knowledge scores are observed in individuals with incomes from 3000 to 5000 Riyals. The data shows no significant difference in knowledge scores based on the recency of antibiotic usage. However, individuals who have never used antibiotics have slightly higher knowledge scores.

Table 5. Association between participants knowledge scores with their sociodemographic characters (n=1071).

		Knowledge score			Total (N=1071)	P value
		Good	Medium	Low		
Age	less than 20	2	11	62	75	**0.756**
		0.2%	1.0%	5.8%	7.0%	
	20- 30	22	83	282	387	
		2.1%	7.7%	26.3%	36.1%	
	31- 40	14	51	197	262	
		1.3%	4.8%	18.4%	24.5%	
	41- 50	14	39	185	238	
		1.3%	3.6%	17.3%	22.2%	
	51 - 60	3	21	64	88	
		0.3%	2.0%	6.0%	8.2%	
	more than 60	1	4	16	21	
		0.1%	0.4%	1.5%	2.0%	
marital status	Single	18	85	293	396	**0.615**
		1.7%	7.9%	27.4%	37.0%	
	Married	36	112	470	618	
		3.4%	10.5%	43.9%	57.7%	
	Divorced	1	11	35	47	
		0.1%	1.0%	3.3%	4.4%	
	widow	1	1	8	10	
		0.1%	0.1%	0.7%	0.9%	
Gender	Male	26	87	329	442	0.707
		2.4%	8.1%	30.7%	41.3%	
	Female	30	122	477	629	
		2.8%	11.4%	44.5%	58.7%	
Residence	City	48	188	701	937	**0.469**
		4.5%	17.6%	65.5%	87.5%	
	Village	8	21	105	134	
		0.7%	2.0%	9.8%	12.5%	
Education Level	Learner	1	14	34	49	**0.173**
		0.1%	1.3%	3.2%	4.6%	
	Intermediate or secondary	13	34	180	227	
		1.2%	3.2%	16.8%	21.2%	
	University	37	143	546	726	
		3.5%	13.4%	51.0%	67.8%	
	Graduate	5	18	46	69	
		0.5%	1.7%	4.3%	6.4%	
Occupation	Student	14	63	203	280	**0.002**
		1.3%	5.9%	19.0%	26.1%	
	Freelance	3	11	57	71	
		0.3%	1.0%	5.3%	6.6%	
	Health Officer	7	32	54	93	
		0.7%	3.0%	5.0%	8.7%	
	Unhealthy employee	21	65	276	362	
		2.0%	6.1%	25.8%	33.8%	
	I don't know.	11	38	216	265	
		1.0%	3.5%	20.2%	24.7%	
Monthly Income (in Saudi Riyals)	Less than 3000	22	74	343	439	**0.008**
		2.1%	6.9%	32.0%	41.0%	

	From 3000 to 5000	2 0.2%	5 0.5%	28 2.6%	35 3.3%	
	from 5001 to 10000	15 1.4%	64 6.0%	200 18.7%	279 26.1%	
	From 10001 to 20000	15 1.4%	55 5.1%	200 18.7%	270 25.2%	
	More than 20,000	2 0.2%	11 1.0%	35 3.3%	48 4.5%	
Used an antibiotic in the last 12 months	At the end of the month	16 1.5%	50 4.7%	190 17.7%	256 23.9%	**0.734**
	6 months ago	14 1.3%	68 6.3%	226 21.1%	308 28.8%	
	12 months ago	11 1.0%	47 4.4%	188 17.6%	246 23.0%	
	I never used an antibiotic.	15 1.4%	44 4.1%	202 18.9%	261 24.4%	

The knowledge and awareness level of antibiotic resistance resulting from self-medication is a matter of great concern in Saudi society. As self-medication practices become increasingly prevalent, it is crucial for individuals to understand the potential consequences of their actions and the role they play in the development of antibiotic resistance [2]. One of the primary reasons behind the knowledge gap regarding antibiotic resistance resulting from self-medication is the lack of awareness about the appropriate use of antibiotics. Many people are unaware that antibiotics are only effective against bacterial infections and are ineffective against viral infections, such as the common cold or flu. Consequently, they may resort to self-medication with antibiotics for viral illnesses, leading to unnecessary antibiotic use and the development of resistance [16]. Moreover, the ease of access to antibiotics without a prescription in some countries further exacerbates the problem. In these regions, individuals can purchase antibiotics over the counter without the need for a doctor's prescription. This unrestricted access, combined with the lack of knowledge about appropriate antibiotic use, encourages self-medication practices and increases the risk of antibiotic resistance [17]. Another critical factor contributing to the lack of knowledge and awareness is the widespread availability of information on the internet. While the internet can be a valuable source of information, it is also rife with misleading and inaccurate content. Many individuals turn to online sources for self-diagnosis and self-medication, often guided by incomplete or incorrect information. This reliance on unreliable sources further perpetuates the problem of antibiotic resistance resulting from self-medication [2].

In our study, 75.3% have a low level of knowledge on the topic, while 19.5% have a medium level, and only 5.2% have a good level of knowledge. According to a recent Saudi survey, around one-third of the respondents, primarily those in the medical field, highly educated individuals, and those who practice safe self-medication and have a positive attitude, were aware of this topic [18]. Higuita-Gutiérrez *et al*. showed a greater level of awareness in Colombia, finding that 69.3% of people were aware that empiric antibiotic therapy contributes to antibiotic resistance [19]. Additionally, Okedo-Alex discovered that 64.7% of respondents in Nigeria knew a good deal about the usage and resistance to antibiotics [20]. Comparable results were found in the Romanian population, where 33.3% of respondents indicated that they knew enough about antibiotic resistance and the World Health Organization's projections about it [21].

In our study, the majority of respondents (85.0%) reported previous use of antibiotics without prescription. The percentage of people who self-medicated with antibiotics (77.5%) was greater than that of a previous Saudi study [22]. The reasons for self-medication with antibiotics were cost savings (24.8%) and ease of use (54.6%), respectively. This was greater than what El Zowalaty *et al*. [23] had found, as 63.6% of individuals said they had used antibiotics from pharmacies without a prescription. A study by Jorgji *et al*. [22] found that 78.14% of the individuals had taken antibiotics without a prescription, which is consistent with our findings. In contrast to the incidence of antibiotic self-medication among healthcare providers, a recent Ethiopian study found that, within a one-month recall period, it was 22.7%. The study also showed that the primary motivation for this practice was familiarity with the treatment options [24].

Regarding the reasons for discontinuing antibiotic use, the most common cause cited was completing the full prescribed dosage (58.9%), followed by improvement in symptoms (37.1%). However, a small percentage (4.0%) reported not knowing the reason for stopping antibiotic usage, indicating a potential lack of awareness or understanding. While another study found that 18.9% stopped the antibiotics upon completion of the course (treatment course), 32.8% stopped the antibiotics after symptoms disappeared, and 13.8% stopped the antibiotics after a few days of recovery, El

Zowalaty *et al*. reported that 71.1% did not finish the antibiotic course because they felt better [22, 23]. Jorgji *et al*. [22] note that 29.05% of patients stopped taking their antibiotics early when their symptoms subsided, 18.9% stopped taking them after their therapy ended, and 32.8% stopped taking them after their symptoms subsided. Pechere [24] claims that as patients begin to feel better, they frequently quit taking antibiotics, which could be the precise reason for their leftover supply of medicines.

The study also sheds light on the reasons for using antibiotics without a prescription. Nasal congestion (18.4%) and runny nose with cough (25.9%) were the most frequently reported symptoms leading to self-medication. A different study discovered that the most common reasons people self-medicate were sore throats, runny noses, skin wounds, fever, aches and pains, vomiting, and diarrhea. A study by Jorgji *et al*. [22] found that the most common reasons for self-administration of antibiotics were fever (172 patients, 29.05%), sore throat (172 patients, 29.05%), cough (87 patients, 14.70%), and runny nose (42 patients, 7.09%). The fight against antibiotic resistance (AR) has recently gained international attention.

Previous studies have shown that there is a lack of knowledge and awareness about antibiotic resistance resulting from self-medication in Saudi Arabia. The studies have highlighted the need for education and training programs to improve the knowledge and awareness level of antibiotic resistance among the general population and healthcare professionals in Saudi Arabia. It is important to address this issue to prevent the development of antibiotic resistance and to ensure the effectiveness of antibiotics in the treatment of infections [2]. To address this issue, it is imperative to implement comprehensive educational campaigns and initiatives to raise awareness about antibiotic resistance and the dangers of self-medication. These awareness programs should target not only the general public but also healthcare professionals who play a crucial role in prescribing antibiotics. By educating both the public and healthcare providers, we can ensure that accurate information is disseminated, leading to informed decision-making regarding antibiotic use [16]. Furthermore, stricter regulations and enforcement regarding the sale of antibiotics without a prescription are necessary. Governments and regulatory bodies should collaborate to implement policies that restrict the availability of antibiotics and promote responsible antibiotic use. By doing so, we can minimize the misuse and overuse of antibiotics, thereby reducing the development of antibiotic resistance resulting from self-medication [4].

Conclusion

In conclusion, there is a lack of awareness of antibiotic resistance resulting from self-medication. Knowledge and awareness scores were significantly associated with the occupation and monthly income of participants. The knowledge and awareness level of antibiotic resistance resulting from self-medication is a pressing issue that needs to be addressed urgently. The lack of understanding about appropriate antibiotic use, combined with unrestricted access to antibiotics and the proliferation of inaccurate information, contributes to the development of antibiotic resistance. By implementing educational campaigns, stricter regulations, and fostering responsible antibiotic use, we can mitigate the risks associated with self-medication and combat antibiotic resistance effectively.

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