

# A Survey of Public Knowledge and Attitude Related to Antibiotic use and Antibiotic Resistance among Saudi People in Northern Region of Saudi Arabia

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## ABSTRACT

**Background:** The antibacterial resistance is emerging problem worldwide. This phenomenon is nowadays affecting public health dramatically on the global level. Public knowledge is considered a prerequisite for appropriate use of antibiotics and limited spread of antibiotic resistance. Our aim was to evaluate the level of knowledge, beliefs, attitude and behaviors toward antibiotic resistance among Saudi public in northern border region of Saudi Arabia. **Methods:** A cross-sectional study was conducted in northern border region of Saudi Arabia using a self-administered questionnaire in Arabic language and all data were analyzed by means of descriptive analysis. **Results:** More than two thirds of study subjects reported that they heard about antibiotic resistance and 35% of them mentioned the social media as the source of information about this issue, only 44% of study subjects were aware that antibiotic resistance means that bacteria would not be killed by antibiotic, 42% were aware that antibiotic resistance bacteria is difficult to eradicate, 58% were aware that indiscriminate use of antibiotics is the cause of bacterial resistance, 34% were aware that use antibiotic when there is no need is a cause for bacterial resistance, 38% were aware that incomplete course of antibiotic lead to bacterial resistance, 43% of

study subjects take antibiotic without prescription, 42% stop antibiotic when symptoms improve and 47% of study subjects believed that influenza and common cold can be treated with antibiotics. **Conclusion:** Our community still has some misconception and insufficient knowledge regarding antibiotic resistance. There is great concern surrounding the development and spread of resistance resulting from poor knowledge about the dangers of self-medication and misuse of antibiotics.

**Key words:** Knowledge, Attitude, Antibiotics, Saudi Arabia, Antibiotic resistance.

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## INTRODUCTION

The antibacterial resistance is an emerging problem worldwide. This phenomenon is nowadays affecting public health dramatically on the global level. It is estimated that at least every 10 min a patient die in the USA or Europe because of fatal infectious diseases caused by antibiotic resistant bacteria.<sup>1</sup> Unfortunately, the current dependence on antibiotics either for treatment or prevention led to increase in resistance. Overuse of antibiotics lead to selective pressure forcing the bacteria to mutate or acquire some traits to help them in sustaining the pressures and to become resistant.<sup>2</sup> Indiscriminate use and misuse of antibiotics lead to antimicrobial resistance (AMR) due to selection pressure faced by bacteria.<sup>3</sup> Despite this known fact, approximately 10 million tons of antibiotics are globally used every ten minutes, which are mostly not related to justified medical use.<sup>4</sup> As a result of the AMR all over the world, common infections, such as urinary tract infections are becoming difficult to treat. This is mainly due to bacteria that are resistant to last line antibiotics or even pan-drug resistant those are not responding to any currently commercial available antibiotics.<sup>2,5</sup> The multidrug resistant (MDR) pathogens are spreading rapidly in many parts of the world causing severe medical and economic consequences.

Resistance to antibiotics can occur anywhere in the world and it is considered a serious global health problem. Antibiotic resistance could greatly affect a country and could affect people of any age, leading to increasing costs and length of stay in the hospital. The WHO has made

the problem of solving antibiotic resistance one of its priorities. The WHO introduced a global campaign to increase the awareness of the public towards antibiotic resistance and also to encourage the public to make appropriate use of antibiotics.<sup>6</sup> To initiate any sort of effective intervention, it is necessary to attain an understanding of the public beliefs, knowledge and behavior pertaining to the use of antibiotics. Several well-documented studies have been conducted to do just that.<sup>7-9</sup> Such studies focused on assessing the use of antibiotics in general or for specific diseases like upper respiratory tract infections (URTIs). The knowledge, beliefs and behavior of the public or patients are multifactorial and differ depending on the population or region. There are only limited number of published studies in Saudi Arabia assessing medication compliance by patients as well as the public's knowledge and belief toward drug use, including antibiotics use and resistance.

The public plays a significant role with regard to reducing the misuse of antibiotics and their excessive use. Therefore, it is necessary to assess the level of knowledge and attitude of the public towards the use of antibiotics in order to find out what education the public may need.<sup>10</sup> Hence the aim of our study was to evaluate the knowledge and beliefs of Saudi in the northern border region of Saudi Arabia toward antibiotics resistance and to evaluate attitudes and behaviors toward antibiotic use and antibacterial resistance.

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## MATERIALS AND METHODS

This cross-sectional study was conducted during a period of three months from November 2018 to January 2019 in northern border region of Saudi Arabia using a validated questionnaire. The questionnaire was distributed online to a random sample of the people living in different regions of northern border region of Saudi Arabia. The questionnaire was divided into four main sections and consisted of 28 questions. The first part of the questionnaire was related to Socio-demographic data such as age, sex, education, nationality and marital status. The second section was composed of questions, which assessed knowledge and beliefs about antibiotic resistance in general. The third section regarding behaviors of antibiotic use and finally fourth section that showed attitude toward antibiotic use and antibacterial resistance among Saudi people of northern region. The Inclusion criteria for this study were Saudi males and females above the age of 16 years, agree to participate in the study and not work in health sector. The questionnaire was tested for its readability and understanding to the public before distribution. All participants were asked to answer all questions and incomplete questionnaires were omitted from the study. All data were analyzed by using SPSS version 20(IBM, Chicago, IL). The suggestive analysis was used to pick the demographic information in rates and percentages. The variations between the two groups are compared with the use of the chi-square test. A  $p$ -value of  $< 0.05$  was considered statistically significant.

## RESULTS

The number of respondents included in the survey was 1095, with the majority, 64% being female. The socio-demographic characteristics of the respondents are presented in Table 1. The largest percentage of the participants (32%) was in the age range of 25-34 years and 27% in the age range of 16-24 years. Most of the participants were university graduates (43%) and married (57%).

The knowledge and beliefs of antibiotics resistance on the part of the study participant was elicited by using twelve statements (Table 2). The majority of the participants (67%) heard about antibiotic resistance and 35% of them mentioned the social media as the source of information about this issue while 17% mentioned the pharmacist as the source of information ( $p < 0.05$ ). Only 44% ( $p < 0.05$ ) of study subjects were aware that antibiotic resistance means that bacteria would not be killed by the antibiotics, 42% ( $p < 0.05$ ) were aware that antibiotic resistance bacteria is difficult to eradicate, 58% ( $p < 0.05$ ) were aware that indiscriminate use of antibiotics is the cause of bacterial resistance, 34% ( $p = 0.009$ ) were aware that use antibiotic when there is no need is a cause for bacterial resistance, 38% ( $p = 0.048$ ) were aware that incomplete course of antibiotic lead to bacterial resistance, 53% ( $p < 0.05$ ) were aware that overuse of antibacterial lead to bacterial resistance, 44% ( $p < 0.05$ ) believed that longer duration of antibiotic increase bacterial resistance, 41% ( $p < 0.05$ ) were aware that resistant bacteria can be transmitted from patient to another, 51% ( $p < 0.05$ ) believed that antibiotic resistance occurs due to resistance in the body not the bacteria, 30% believed that antibiotic can be stopped when the patient feel better.

Figure 1 represents the behavior of study subjects towards antibiotics use. A large percentage (43%) of study subjects take antibiotic without prescription, 63% reported taking antibiotic according to instructions, 42% stop antibiotic when symptoms improve, 39% reported taking advise about antibiotic from pharmacist in private pharmacy.

Attitudes of participant towards antibiotic use and antibacterial resistance are presented in Table 3. Large percentage (47%;  $p < 0.05$ ) of study subjects believed that influenza and common cold can be treated with antibiotics, 48% ( $p < 0.05$ ) believed that antibiotic resistance is a problem can affect them or their family, 44% ( $p < 0.05$ ) believed that

wrong concept of antibiotic resistance is not present here but present in other countries, 48% ( $p < 0.05$ ) believed that antibacterial resistance is a worldwide problem, 39% ( $p < 0.05$ ) believed that antibacterial resistance is only problem for people who regularly take antibiotics and 56% ( $p < 0.05$ ) believed that health care workers can help in limiting bacterial resistance.

## DISCUSSION

The present study conducted with the aim to assess knowledge, belief, attitude and behavior of Saudi population towards overuse of antibiotics and antibiotic resistance in northern border region in Saudi Arabia. Less than half of the study participants (48%;  $p < 0.05$ ) were aware that antibacterial resistance is a worldwide problem and also less than half (48%;  $p < 0.05$ ) were aware that antibiotic resistance is a problem that can affect them or their families. This result is similar to previous studies where most of the participants did not give importance to the prevalence of the antibiotic resistance.<sup>11,12</sup> The insufficient awareness about the antimicrobial resistance indicates the need for education interventions using clinical problems which depicts the hazardous effects of antibiotic resistance, can be used to improve as well as make them alert on present and future consequences, which encourages the correct usage of antibiotics by avoiding the resistance which increased all over the world.<sup>13</sup>

There are some wrong beliefs noticed in the attitude of the respondents lead to inappropriate use of antibiotic. 42% ( $p < 0.05$ ) of study subjects believe that antibiotic can be stopped when symptoms improve. Similar reports were seen in another study.<sup>14</sup> Almost, 47% ( $p < 0.05$ ) of study subjects believed that antibiotics can be taken for common cold and influenza and which is much higher than reported in previous study by Afzal *et al.* 2013 (22.7% were not aware that cold and flu not bacterial diseases).<sup>15</sup> However this result is less than reported in previous studies have shown that about 60% and more of their participants believed that antibiotics should be prescribed during cold of viral etiology.<sup>16</sup> such wrong and mistaken beliefs may lead to indiscriminate use of antibiotic resulting in increased bacterial resistance.<sup>17</sup> Antibiotic treatment is not necessary in otherwise healthy young adults with common cold because common cold is a viral infection and bacterial co-infection are rare.<sup>18</sup>

**Table 1: Demographic characteristics of study subjects (n=1095).**

Variable	Categories	Frequency (n)	Percentage (%)
Sex	Male	398	36%
	Female	697	64%
Age	16-24 years	291	27%
	25-34 years	355	32%
	35-44 years	249	23%
	45-54 years	118	11%
	55-64 years	68	6%
	65 years and older	14	1%
Education	Secondary education	271	25%
	Diploma	219	20%
	University education	473	43%
	Master	63	6%
	Doctorate	17	2%
Social status	Married	629	57%
	Not married	466	43%

**Table 2: Knowledge and beliefs of study subjects about antibiotic resistance. (n=1095).**

Statement	Categories	Frequency	Percentage	*p-Value
Have you ever heard about antibiotic resistance?	Yes	730	67%	<0.05
	No	365	33%	
Your source of information about antibiotic resistance	Social media/ media	385	35%	<0.05
	Friends/ relatives	161	15%	
	Pharmacist	187	17%	
	Physician	180	16%	
Antibiotic resistance means that bacteria would not be killed by antibiotic	Yes	484	44%	<0.05
	No	285	26%	
	Don't know	326	30%	
Antibiotic resistance bacteria is difficult to eradicate	Yes	460	42%	<0.05
	No	326	30%	
	Don't know	309	28%	
Indiscriminate use of antibiotics is the cause of bacterial resistance	Yes	639	58%	<0.05
	No	232	21%	
	Don't know	224	20%	
Use antibiotic when there is no need is a cause for bacterial resistance	Yes	373	34%	0.009
	No	411	37%	
	Don't know	311	29%	
Incomplete course of antibiotic lead to bacterial resistance	Yes	411	38%	0.048
	No	361	29%	
	Don't know	323	33%	
Overuse of antibacterial lead to bacterial resistance	Yes	577	53%	<0.05
	No	266	24%	
	Don't know	252	23%	
Longer duration of antibiotic increase bacterial resistance	Yes	482	44%	<0.05
	No	291	27%	
	Don't know	322	29%	
Resistant bacteria can be transmitted form patient to another	Yes	454	41%	<0.05
	No	309	28%	
	Don't know	323	30%	
Antibiotic resistance occur due to resistance in the body not the bacteria	Yes	558	51%	<0.05
	No	233	21%	
	Don't know	304	28%	
In your opinion, antibiotic can be stopped	After completing the course	561	51%	
	When the patient feel better	331	30%	
	I don't know	203	18%	

\*p-Value Calculated with chi-square test.

\*p-value  $0 \leq 0.05$  consider as significant.

The results of the present study indicate that participants lack sufficient awareness about the bacterial resistance. Less than half (44%;  $p < 0.05$ ) of the participants were aware that antibiotic resistance means that bacteria would not be killed by antibiotic. The present study showed that (43%;  $p < 0.05$ ) of participants take antibiotics without prescription which is similar to another study performed in Saudi Arabia which confirmed that 48% of participants reported using antibiotics without consulting a

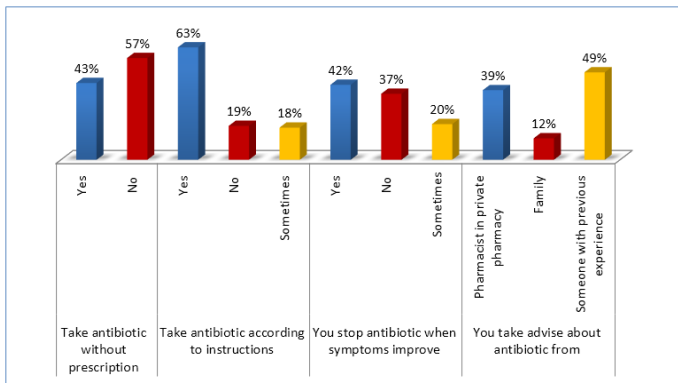
physician.<sup>19</sup> An addition, reports from neighboring countries including Iraq, Egypt, Jordan and Palestine as well as other parts of the globe showed the imprudent, overuse and self-medication with antibiotics.<sup>20-24</sup> Although (38%;  $p < 0.05$ ) of participants were aware that incomplete course of antibiotic lead to bacterial resistance, a large percentage of our study subjects (42%;  $p < 0.05$ ) reported that they would stop antibiotic when symptoms improve. Comparing our results with the previous

**Table 3: Attitudes of study subjects regarding antibiotic use and antibacterial resistance (n=1095).**

Statement	Categories	Frequency	Percentage	*p-Value
Influenza and common cold can be treated with antibiotics	Yes	518	47%	<0.05
	No	341	31%	
	Don't know	236	22%	
Antibiotic resistance is a problem can affect me or my family	Yes	530	48%	<0.05
	No	246	22%	
	Don't know	319	29%	
Wrong concept of antibiotic resistance is not present here but present in other countries	Yes	487	44%	<0.05
	No	269	25%	
	Don't know	339	31%	
Antibacterial resistance is a worldwide problem	Yes	523	48%	<0.05
	No	235	21%	
	Don't know	337	31%	
Antibacterial resistance is only problem for people who regularly take antibiotics	Yes	432	39%	<0.05
	No	327	30%	
	Don't know	336	31%	
Health care workers can help in limiting bacterial resistance	Yes	614	56%	<0.05
	No	218	20%	
	Don't know	263	24%	

\*p-Value Calculated with chi-square test.

\*p-value  $0 \leq 0.05$  consider as significant.



**Figure 1:** Behaviors of study subjects toward antibiotic use.

study of Belkina *et al.* 2014 showed that 38.8% of the respondents stop taking antibiotic if they feel better showing that we have a worse result this means that most of the respondents have insufficient awareness in this issue.<sup>25</sup>

Our study results indicate poor awareness and wrong practice pattern toward antibiotic use among Saudi people which is consistent with many studies in KSA revealed a poor knowledge and wrong practice pattern among most of the Saudi subjects. In Riyadh, about 77.6% ( $p < 0.05$ ) of adult subjects would buy antibiotics without prescriptions.<sup>26</sup> Also, a high incidence of antibiotic misuse was found among 38.7% of pediatric and 57.8% of adult emergency department at the King Abdullah international medical research center.<sup>27</sup> In addition, the antibiotic misuse was associated with a high rate of infection in a community hospital in KSA.<sup>28</sup>

Self-medication is associated with little guidance regarding appropriate antibiotic selection for individual symptoms and safe practices to minimize adverse effects even when provided by a pharmacist.<sup>29,30</sup> In our study, the majority of respondents who self-medicate identified pharmacists in private pharmacy as the main source of information. The potential for adverse events is known. Generally, pharmacy staff didn't inquire about patient's allergies, didn't explain potential side effects and also predispose the patient to drug interactions, super infection and also administration of antibiotic which is not suitable for diagnosis lead to higher bacterial resistance.<sup>31</sup>

## CONCLUSION

Our community still has some misconceptions and insufficient knowledge regarding antibiotic resistance. There is great concern surrounding the development and spread of resistance resulting from poor knowledge about the dangers of self-medication and misuse of antibiotics. Poor knowledge and attitude toward antibiotic use in Saudi community must be corrected. Raising public and medical awareness of AMR is an important element that is urgently needed to tackle AMR in Saudi Arabia. Health education on antimicrobial resistance at all levels is imperative, which can be achieved through health educational campaigns to educate the population regarding the usage of antibiotics and the complications of the misuses and what are the indications of antibiotics to improving the antimicrobial use and to correct false beliefs about antibiotics. Multilevel and nationwide campaign in Saudi Arabia is needed to align with the world antibiotic awareness week. The success of the campaign can be dependent on the tailored and relevant content and key messages that are designed after formative research. The increasing use of social media platform in the country can help to disseminate awareness messages. Large scale future studies are needed to measure

the extent of antibiotic misuse problem in different populations to help authorities to undertake the required action.

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## ABBREVIATIONS

**AMR:** Antimicrobial Resistance; **MDR:** Multidrug Resistant; **URTIs:** Upper Respiratory Tract Infections; **KSA:** Kingdom of Saudi Arabia

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