

## ORIGINAL ARTICLE

# A Cross-Sectional Study of Public Awareness of Antibiotic Resistance among Jordanian Population

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## Abstract

**Background:** Antibiotic resistance is a serious global concern. It contributes to increasing the morbidity and mortality rates associated with infections. In the Middle East and countries such as Jordan resistance levels are escalating due to practices such as self-medication, irrational prescribing, and lack of public awareness. Assessing and establishing the awareness towards resistance can inform the way forward.

**Aims:** The study aimed to assess the awareness of antibiotic resistance in Jordan and to find if certain factors were related to the level of awareness.

**Materials and Methods:** A cross-sectional study utilizing the WHO multi-country public awareness questionnaire was used to survey people in Jordan using a convenience sampling method. The survey was distributed through online platforms. Several factors were considered (gender, urbanizations, education, and working in health sector). The association was studied using Chi-squared and Fischer's exact tests.

**Results:** A total of 469 participants completed the questionnaire. Several misconceptions were detected. For example, 85.1% were unable to correctly define antibiotic resistance and 45.6% believed colds could be treated with antibiotics. Working in the health sector and educational level affected the responses of the participants the most regarding the knowledge and seriousness of antibiotic resistance. Gender and urbanization were less significant.

**Conclusion:** Educational campaigns targeting which conditions require antibiotics and further studies are needed to enhance public awareness and to correct misconceptions.

**Keywords:** antibiotic resistance, Jordan, general public awareness, type of health care

## INTRODUCTION

Ever since their introduction, antibiotics became a critical part of healthcare systems around the world [1]. Antibiotics have

significantly reduced the mortality and morbidity rates of infectious diseases [2].

Antibiotic resistance, whether inherent or acquired, can be defined as the ability of

microorganisms to evolve over time and become resistant to therapeutic doses of antimicrobial therapies such as antibiotics [3,4]. Nowadays, antibiotic resistance is considered a serious health concern locally and worldwide [5,6]. In 2019, the World Health Organization (WHO) declared antibiotic resistance as one of 10 predominant public health threats facing humankind [6,7].

Irrational prescriptions have played a role in increasing antibiotic resistance. Other factors include the availability of information and advertisements about antibiotics on websites, the advice of friends and family members, and poor knowledge [6].

Antibiotic resistance is expected to cause 25,000 deaths in the European Union alone, and cost more than 1.5 billion US dollars annually, with higher resistance frequency reported in Eastern and Southern Europe [6,8]. The severity of the crisis and its global escalation have encouraged the WHO and the European Union (EU) to adopt several surveillance systems [8]. In the Eastern Mediterranean Region (EMR), however, reports indicate that antibiotic resistance has reached threatening levels both in healthcare settings and the community, jeopardizing advances in healthcare development, and the sustainability of public health response to many communicable diseases [9]. Previous research on the topic demonstrated the prevalence of this crisis not only in developing countries, but also in the developed areas of the world. Examples include countries like Sudan, Egypt, Syria, Pakistan, Brazil, Spain, and the USA [10-13].

Jordan is no exception to this problem with the prevalence of self-medication, and with the presence of different forms of unsuitable prescription and dispensing of antibiotics. The prescribing practices of

physicians and pharmacists are not controlled properly [13]. The first study to describe the prescribing behaviors of doctors in the country was published in 2002, which evaluated the prescribing attitudes in 21 primary healthcare centers in the northern area of Jordan. The study emphasized the importance of rational and appropriate prescriptions of antibiotics [14]. Subsequently in 2014, Al-Azayzih et al. evaluated the use of antibiotics prescribed by physicians in a number of outpatient clinics in Jordan. Results of the study indicated a higher percentage of prescribed self-medication drugs than the ideal WHO recommendations [15]. Also, about 67% of Jordanian adults believe that antibiotics are vital for the treatment of common cold and cough [16]. The concern with increasing resistance in one country and across the globe is a potential return to the pre-antibiotic age [1].

In an effort to fight antibiotic resistance O'Neill, 2016 laid out a ten-point plan with public awareness being the first point [17]. Jordan, being a country that does not require prescriptions for buying antibiotics, can play a crucial part in developing resistance, making it an important place to start combating it by establishing a sufficient level of awareness.

Investigating previous literature on the topic, little is found about the general publics' awareness and knowledge of antibiotic use and resistance in different governorates of Jordan because previous studies focused on the capital of Jordan and on specific communities in Jordan. This emphasizes the importance of conducting more research. It is important to assess whether certain factors, such as the type of healthcare sector, influence the level of awareness. Therefore, it is crucial for

healthcare professionals and health policy makers to evaluate public awareness related to antibiotic use and resistance.

The aims of this research were to assess public knowledge, attitudes, and awareness of antibiotic use and resistance in different Jordanian Governorates, to compare the awareness between healthcare workers and non-healthcare workers, and between participants based on which hospital they access healthcare.

## MATERIALS AND METHODS

This research was a cross-sectional study in which data was collected through online surveys using Microsoft Forms. The sample included participants from all regions in Jordan. The collected data was saved by using online forms and internet clouds and analyzed using IBM SPSS (version 26.0). Frequency and percentages were used to describe the data. Associations were studied using the Chi-squared test and Fischer's exact test.

The questionnaire was taken from a WHO-validated study used to assess awareness of antibiotic resistance in multiple countries [18]. It was translated into Arabic by two native Arabic and fluent English speakers and further assessed for clarity. The questionnaire consisted of four main parts. The first part, made of seven questions, was designed to identify socio-demographic factors which may influence the answers of the participants. The second part consisted of seven questions about antibiotic use. The third part was four questions regarding knowledge about antibiotics. The last part was about antibiotic resistance awareness,

consisting of four main questions, one of the questions asked participants to answer eight true or false statements, and two main questions with fourteen parts in total asked participants if they agreed or disagreed with statements regarding resistance.

Using Raosoft Sample Size Calculator (<http://www.raosoft.com/samplesize.html>), a sample size of 385 individuals was estimated following a 95% confidence level, a 5% margin of error, and a response distribution of 50%.

According to a study that used a modified form of the original WHO questionnaire, the content validity was assessed by a microbiologist and pharmacoeconomist, and the reliability was confirmed by a pilot study done on 30 people [19]. The Hashemite University Institutional Review Board granted the study ethical approval (No.14/2/2022/2023). Participants aged 18 and older and living in Jordan were allowed to participate. A consent form was sent with the online questionnaire on a separate page, only those who agreed to the consent form gained access to the study. The information provided by participants in the questionnaire was used for research purposes only. Only research personnel had access to the data so the records from this study were kept as confidential as possible and the participants' confidentiality was ensured.

## RESULTS

### Participants and Sociodemographic Characteristics

A total of 469 respondents completed the survey during the data collection period. The sociodemographic data is shown in Table 1.

**Table 1: Sociodemographic characteristics of the participants.**

Factor	Category	Frequency (%)	Factor	Category	Frequency (%)
Gender	Female	359 (76.5%)	What is the highest degree or level of school you have completed?	Primary and secondary	30 (6.4%)
	Male	110 (23.5%)		Tertiary	439 (93.6%)
Age (Years)	< 20	25 (5.3%)	Do you work in the health sector?	Yes	132 (28.1%)
	20 - 29	231 (49.3%)		No	337 (71.9%)
	30 - 39	54 (11.5%)			
	40 - 49	93 (19.8%)			
	50 - 59	59 (12.6%)			
	60 - 69	6 (1.3%)			
	70+	1 (0.2%)			
Which of these best describes where you live?	Rural	133 (28.4%)	Which hospital do you go to when you need to seek health care?	Private hospital	242 (51.6%)
	Urban	336 (71.6%)		Military hospital	107 (22.8%)
				Public hospital	178 (38%)
				Others	14 (3%)

### Use of Antibiotics

Within the 6 months preceding the study, 70.4% of respondents took their last course of antibiotics, 73.8% obtained a prescription from a doctor/nurse for them, and 84.9% took their antibiotics from a pharmacy or medical store. 8.1% had their antibiotics saved up from a previous time.

Regarding the appropriate use of antibiotics

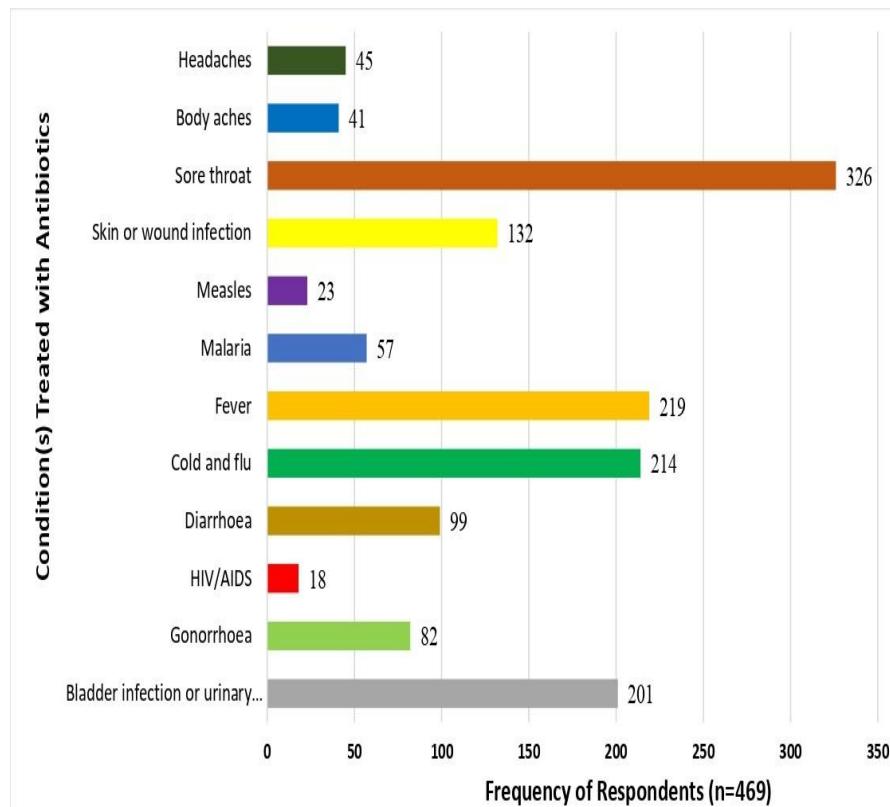
(Table 2), about 76% of participants thought that they should stop taking antibiotics when they have completed the course as directed, 85% thought that it was wrong to take antibiotic prescribed previously to a friend/family even if they had the same symptoms, and 65% thought it was wrong to take antibiotics they used previously to treat similar symptoms.

**Table 2: Knowledge about the appropriate use of antibiotics.**

Variables	Categories	Frequency (%), n=469
When do you think you should stop taking antibiotics once you've begun treatment?	When you've taken all of the antibiotics as directed	355 (75.7%)
	When you feel better	108 (23.0%)
	Don't know	6 (1.2%)
It's okay to use antibiotics that were given to a friend or family member, as long as they were used to treat the same illness	True	48 (10.2%)
	False	399 (85.0%)
	Don't know	22 (4.6%)
It's okay to buy the same antibiotics, or request these from a doctor, if you're sick and they helped you get better when you had the same symptoms before	True	133 (28.3%)
	False	307 (65.4%)
	Don't know	29 (6.1%)

Participants were asked to choose which health conditions can be treated with antibiotics and the results can be found in

Figure 1. The three highest conditions chosen were sore throat (326, 70%), fever (219, 47%), and cold/flu (214, 46%).



**Figure 1: Health conditions that can be treated with antibiotics.**

### Knowledge of Antibiotic Resistance

Participants were asked if they have heard about terms related to antibiotic resistance. The term “antibiotic resistance” had been heard previously by 77.4% of participants, the term “superbugs” by 65.2%, “antibiotic-resistant bacteria” by 57.4%, “drug resistance” by 50.5%, and “antimicrobial resistance” by 43.5% of participants.

A list of statements about knowledge of antibiotic resistance was presented to the participants as True/False questions. The effect of the various sociodemographic categories on the response was analyzed using Chi-square/Fischer’s exact tests (Table

3). Only one significant difference was found according to gender where 43 (12%) of females identified the statement “Antibiotic resistance occurs when your body becomes resistant to antibiotics, and they no longer work as well” as false, compared to 27 (24.5%) of male participants ( $p = .001$ ). Significantly more participants from urban areas considered the two statements “Antibiotic resistance is an issue in other countries but not in Jordan” and “Antibiotic resistance is only a problem for people who take antibiotics regularly” as false (78.9%,  $p < .001$ , and 65.5%,  $p = .004$ , respectively. Table 3). Working in the health sector

significantly affected the response to all questions, except one, in which a higher percentage of participants working in health sector gave the correct answer (Table 3). Education significantly affected the response

to 4 (out of the 8) statements (Table 3), with higher percentage of participants with tertiary level of education identifying the correct answer.

**Table 3: The association between sociodemographic factors of the participants and their knowledge of antibiotic resistance. Percentage is from the category.**

Statement	Answer	Urbanization			Working in health sector			Educational level		
		Rural n (%)	Urban n (%)	p value	Yes n (%)	No n (%)	p value	Primary / Secondary n (%)	Tertiary n (%)	p value
Antibiotic resistance occurs when your body becomes resistant to antibiotics, and they no longer work as well	True	119 (89.5)	280 (83.3)	0.093	104 (78.8)	295 (87.5)	0.017	28 (93.3)	371 (84.5)	0.288
	False (correct answer)	14 (10.5)	56 (16.7)		28 (21.2)	42 (12.5)		2 (6.7)	68 (15.5)	
Many infections are becoming increasingly resistant to treatment by antibiotics	True (correct answer)	114 (85.7)	296 (88.1)	0.483	126 (95.5)	284 (84.3)	0.001	20 (66.7)	390 (88.8)	0.002
	False	19 (14.3)	40 (11.9)		6 (4.5)	53 (15.7)		10 (33.3)	49 (11.2)	
If bacteria are resistant to antibiotics, it can be very difficult or impossible to treat the infections they cause	True (correct answer)	95 (71.4)	236 (70.2)	0.799	102 (77.3)	229 (68)	0.046	19 (63.3)	312 (71.1)	0.368
	False	38 (28.6)	100 (29.8)		30 (22.7)	108 (32)		11 (36.7)	127 (28.9)	
Antibiotic resistance is an issue that could affect me or my family	True (correct answer)	98 (73.7)	243 (72.3)	0.765	109 (82.6)	232 (68.8)	0.003	17 (56.7)	324 (73.8)	0.041
	False	35 (26.3)	93 (27.7)		23 (17.4)	105 (31.2)		13 (43.3)	115 (26.2)	
Antibiotic resistance is an issue in other countries but not in Jordan	True	52 (39.1)	71 (21.1)	< 0.001	22 (16.7)	101 (30)	0.003	13 (43.3)	110 (25.1)	0.028
	False (correct answer)	81 (60.9)	265 (78.9)		110 (83.3)	236 (70)		17 (56.7)	329 (74.9)	
Antibiotic resistance is only a problem for people who take antibiotics regularly	True	65 (48.9)	116 (34.5)	0.004	33 (25)	148 (43.9)	< 0.001	12 (40)	169 (38.5)	0.870
	False (correct answer)	68 (51.1)	220 (65.5)		99 (75)	189 (56.1)		18 (60)	270 (61.5)	
Bacteria which are resistant to antibiotics can be spread from person to person	True (correct answer)	78 (58.6)	194 (57.7)	0.857	98 (74.2)	174 (51.6)	< 0.001	14 (46.7)	258 (58.8)	0.194
	False	55 (41.4)	142 (42.3)		34 (25.8)	163 (48.4)		16 (53.3)	181 (41.2)	

Statement	Answer	Urbanization			Working in health sector			Educational level		
		Rural n (%)	Urban n (%)	p value	Yes n (%)	No n (%)	p value	Primary / Secondary n (%)	Tertiary n (%)	p value
Antibiotic-resistant infections could make medical procedures like surgery, organ transplants and cancer treatment much more dangerous	True (correct answer)	113 (85)	296 (88.1)	0.360	121 (91.7)	288 (85.5)	0.070	20 (66.7)	389 (88.6)	<b>0.002</b>
	False	20 (15)	40 (11.9)		11 (8.3)	49 (14.5)		10 (33.3)	50 (11.4)	

Participants showed a high level of agreement on statements about how to address the problem of antibiotic resistance. As 94.4% of participants agreed that people should only take antibiotics when they are prescribed by a doctor/nurse, 95.1% of participants agreed that people should wash their hands regularly, 94% agreed that doctors should prescribe antibiotics only when needed, 92.8% agreed that people should make sure that children are up to date with vaccinations, and 89.8% agreed that pharmaceutical companies should develop new antibiotics. The least agreed upon statement with 68.2% of participants was concerning farmers giving fewer antibiotics to food producing animals. However, 15.8% of participants disagreed with the statement “People should not keep antibiotics and use them later for other illnesses”.

### Seriousness of Antibiotic Resistance

A list of statements was used to assess the participants’ opinions on the seriousness of antibiotic resistance (Table 4). In this study, 72.5% agreed that antibiotic resistance is one of the biggest problems facing the world. There was a significant difference in choosing this statement, according to the type

of healthcare of the participants ( $p = 0.044$ ) with participants who went to military hospitals for healthcare agreeing to it more (83). No other significant differences were found regarding the type of healthcare. Regarding this sentence, a significant difference was also found when considering gender ( $p = 0.016$ ) and working in the health sector ( $p < 0.001$ , Table 4). The opinion regarding the statement ‘I am worried about the impact that antibiotic resistance will have on my health, and that of my family’ also differed significantly according to gender ( $p = 0.012$ ) and working in the health sector ( $p = 0.007$ ). On the other hand, working in the health sector and educational level affected the opinion regarding the statement ‘Medical experts will solve the problem of antibiotic resistance before it becomes too serious’ ( $p = 0.008$ ,  $p = 0.002$ , respectively) and the statement ‘I am not at risk of getting an antibiotic-resistant infection, as long as I take my antibiotics correctly’ ( $p = 0.006$ ,  $p < 0.001$ , respectively). No significant difference was found for the other statements. Urbanization had no significant difference on the responses for all the sentences.

**Table 4: The association between sociodemographic factors of the participants and their opinions on the seriousness of antibiotic resistance.**

Attitudes Toward Antibiotic Resistance	Answer (n)	Gender			Working in health sector			Educational level		
		Female n	Male n	p-Value	Yes n	No n	p-Value	Primary / Secondary n	Tertiary n	p-Value
Antibiotic resistance is one of the biggest problems the world faces	Disagree (59)	39	20	0.016	6	53	< 0.001	6	53	0.281
	Neither agree nor disagree (70)	48	22		9	61		4	66	
	Agree (340)	272	68		117	223		20	320	
Medical experts will solve the problem of antibiotic resistance before it becomes too serious	Disagree (105)	81	24	0.225	34	71	0.008	1	104	0.002
	Neither agree nor disagree (169)	136	33		58	111		8	161	
	Agree (195)	142	53		40	155		21	174	
Everyone needs to take responsibility for using antibiotics responsibly	Disagree (19)	13	6	0.518	3	16	0.471	0	19	0.956
	Neither agree nor disagree (10)	7	3		3	7		0	10	
	Agree (440)	339	101		126	314		30	410	
There is not much people like me can do to stop antibiotic resistance	Disagree (82)	64	18	0.918	18	64	0.248	7	75	0.423
	Neither agree nor disagree (83)	64	19		21	62		3	80	
	Agree (304)	231	73		93	211		20	284	
I am worried about the impact that antibiotic resistance will have on my health, and that of my family	Disagree (73)	50	23	0.012	12	61	0.007	5	68	0.404
	Neither agree nor disagree (37)	23	14		6	31		4	33	
	Agree (359)	286	73		114	245		21	338	
I am not at risk of getting an antibiotic-resistant infection, as long as I take my antibiotics correctly.	Disagree (104)	78	26	0.17	42	62	0.006	1	103	< 0.001
	Neither agree nor disagree (74)	51	23		16	58		0	74	
	Agree (291)	230	61		74	217		29	262	

## DISCUSSION

The present survey provided some insight into the understanding and knowledge of the Jordanian population regarding the use of antibiotics and antibiotic resistance. This information could help establish a baseline for the topic and highlight possible areas for future research and awareness campaigns. The results of this study showed that despite exhibiting awareness about the use of antibiotics and having basic knowledge and understanding about the topic of antibiotic resistance, the participants showed some misconceptions such as the definition of antibiotic resistance and which conditions can be treated with antibiotics.

In terms of prescribed antibiotics, 73.8% of respondents obtained a prescription for their last antibiotic course. A percentage similar to a previous study in Jordan [20], as well as Egypt, but less than in Sudan (91%) and India (90%) in the multi-country WHO study [18]. This could be attributed to the use of over-the-counter antibiotics highlighting an area for improvement in the future.

In comparison with the WHO multi-country study, Jordanians showed higher rates of knowledge on the appropriate use of antibiotics. For example, just 10.2% of Jordanians thought 'It's okay to use antibiotics that were given to a friend or family member, as long as they were used to treat the same illness,' and 28.3% incorrectly chose true for the statement 'It's okay to buy the same antibiotics, or request these from a doctor, if you're sick and they helped you get better when you had the same symptoms before,'. Whereas the multi-country percentages of 25% and 43%, respectively, were cited [18]. However, these percentages still show that some Jordanians are prone to use antibiotics that worked previously for similar symptoms that could have been from

a different diagnosis, which is a concern.

When participants were asked to choose which health conditions can be treated with antibiotics, certain gaps in knowledge and misconceptions were detected. About 43% were able to correctly identify urinary tract infections. This was less than the 72% reported in Cyprus and the WHO multi-country report, and the 75.4% in Jordan [18-20]. In addition, 28.1% correctly chose skin infections, which is less than the 66.4% previously reported in Jordan. While only 17.5% correctly identified gonorrhea, which was similar to findings previously reported in Jordan [20]. But this is less than the WHO multi-country study where 51% were able to identify gonorrhea; signifying a few gaps related to the proper indications of antibiotic treatment [18]. Furthermore, 69.5% incorrectly chose sore throats which are usually viral. This is similar to the WHO multi-country study and shows a decrease from the 84.2% in Jordan previously [18,20]. About 46% incorrectly chose cold/flu, which is more than the 28% reported in Italy but better than the 64% reported in the WHO multi-country study [8,18]. The incorrect belief that sore throats and colds can be treated with antibiotics is a common one. This could be explained by the presence of beliefs that are present in one household and then later shared between family and friends as the correct method of treatment. This is an area to tackle by offering educational programs, such as free online videos, about antibiotics and when to use them for caregivers and the general public. The perception of the appropriate use of antibiotics for viral infections was also reported in a study on the Iraqi community in Jordan [5] and in a study about knowledge of viral diseases in Jordan, where only 34% of participants correctly answered that viruses

are not sensitive to antibiotics [21]. The differences detected between different countries may be due to different campaigns being implemented and different policies in each country, as well as some medical conditions being labeled as taboo and some common misconceptions being spread between the community. This places an emphasis on the importance of the doctor-patient encounter and the role of pharmacists in educating patients on the appropriate use of antibiotics.

Antibiotic resistance was heard previously by 77.4% of participants, showing that a majority was familiar with the topic. Similar findings were reported in the WHO multi-country study [18]. In addition, 87.2% correctly believed that antibiotic-resistant infections would make medical procedures more dangerous, which is higher than the 68.6% previously reported in Jordan [20]. Despite hearing about the term, participants were not fully aware about the definition as 85.1% falsely believed that 'Antibiotic resistance occurs when your body becomes resistant to antibiotics and they no longer work as well.' A false belief that is shared by 81.4% of participants from Saudi Arabia [22]. This suggested that despite basic awareness of the term and correctly identifying some statements, there was a misunderstanding in some aspects about the topic. Participants might have heard about the topic but did not receive any details about it, showing an area for future campaigns to tackle.

When asked about possible ways to address antibiotic resistance, the majority of participants agreed to all of the statements given. For example, 94.9% of participants agreed they should only take antibiotics when prescribed and 95.1% agreed that people should wash their hands regularly. The least

agreed upon statement was about farmers giving fewer antibiotics to food-producing animals where 68.2% agreed. These findings were all similar to the multi-country average reported [18].

The participants' opinions on the seriousness of antibiotic resistance were assessed and 64.8% believed there was not much they can do to stop antibiotic resistance, which was similar to the WHO study [18]. This could be interpreted as the public not being aware of the role they play in solving this problem. However, 93.8% of participants agreed that everyone should be responsible for the proper use of antibiotics and 76.5% were worried about the impact it may have on them and their families. Altogether indicating that antibiotic resistance is indeed a topic of concern for the Jordanian population and a potential readiness to help solve it was present should future campaigns and policies highlight the role each individual plays.

Education had good effect on the response of participants. Participants with tertiary education exhibited better understanding of antibiotic resistance. This was similar to studies in Cyprus and Malaysia about antibiotic resistance [23,24]. This was expected as those with higher educational levels are more likely to have come across more information about the topic than their counterparts. This further supported the role and importance of education in improving awareness and understanding of antibiotic resistance. A study found that a majority of university students in Saudi Arabi were aware of antibiotic resistance [6]. However, this finding was in contrast to a previous study in Jordan which found that the role of education was not significant [16], and another study which found no consistent association between antibiotic knowledge

and general education [25]. In the future, other research projects could explore this further to assess the difference in awareness between different study programs. Educational programs should start as early as possible to improve the awareness about this topic at an earlier educational level.

In our study, gender had minimal effect on the responses with most statements about knowledge and seriousness of antibiotic resistance showing no significant difference between males and females, despite having larger number of females in our study. This was similar to studies in Jordan and Ecuador which found no statistical difference between males and females [16,26]. Women, in this society, tend to take on more responsibility regarding their family's well-being; therefore, educational programs directed at women should be considered as they can affect the entire family.

Unsurprisingly, the factor that affected the results the most was working in the health sector. Those who worked in the health sector were more knowledgeable about the topic and its seriousness. This was in line with a study in Jordan which found that participants that are working in the medical field were more likely to have adequate knowledge about antibiotic resistance [20]. A finding that can be explained by an increased exposure to antibiotics and possible exposure to antibiotic resistant infections in the healthcare setting, as well as having knowledge about antibiotics, the principles of their functions, and how resistance develops from their academic studies. This highlights the value of professional exposure in shaping knowledge and health-related information. However, there are still some workers in the health sector who did not show good knowledge and who did not appreciate the seriousness of antibiotic resistance. A previous study in

Jordan reported that of the antibiotics administered, only 28.8% were considered medically necessary [27]. In Jordan all health professionals require continuous professional development to renew their licenses. With conferences and online learning being the most favored form [28]. To stay updated about the latest updates regarding antibiotics, healthcare professionals should be required to attend learning activities about antibiotic resistance every five years in order to renew their licenses. This solution could help decrease unnecessary prescriptions.

In our study, minimal difference was found between participants living in urban and rural areas. This was in contrast to a study in Amman, Jordan, which found participants in affluent regions more knowledgeable than those in deprived regions [29], and another study which found lack of knowledge to be associated with living in rural areas [20]. However, those living in rural areas were more likely to agree that experts will solve the problem of antibiotic resistance before it became too serious. This could be explained by a high level of trust in medical experts or a lack of knowledge about how serious antibiotic resistance is and can be. In our study, those who identified as living in rural areas were much fewer than those living in urban areas. This could have affected the results.

The type of healthcare sought by the participants also had minimum effect on the responses. This may require further studies to establish any difference between the public and private hospitals.

The results of our study should be interpreted with certain limitations in mind. The survey contained many statements where participants were asked if they agreed or not. As a result, there could be some acquiescence bias where participants are more likely to

agree. Some participants may have answered based on what is expected of them, and not what they actually believe, which could lead to response bias. The potential nonresponse bias, where characteristics of people who did not respond might differ from those who did, was minimized by repeatedly sending and posting the survey online. Furthermore, participants who are already concerned about the topic could be more likely to respond to the survey leading to self-selection. Nonetheless, with a paucity of studies in Jordan, ours addressed an important topic with a notable sample size and participants from different parts of the country.

## CONCLUSION

This study provided important information about awareness and knowledge of antibiotic resistance in Jordan. The results

offered a baseline level for future studies to build on and compare with. Despite a high degree of knowledge and understanding about antibiotic resistance, there is a gap in bridging this knowledge with the population's practice towards the use of antibiotics. Outpatient prescription policies is an area to review. Other areas to target are which conditions can be treated with antibiotics and the mechanism of antibiotic resistance. Audits focusing on the use of antibiotics in hospitals as well as online lectures about the definition of antibiotic resistance and when to prescribe them are also recommended. As well as offering easier access to health-related information for the general population. These areas should be kept in mind for future studies, policies, and campaigns to improve the quality of healthcare in Jordan.

## REFERENCES

1. Aslam, B., Wang, W., Arshad, M. I., Khurshid, M., Muzammil, S., Rasool, M. H., Nisar, M. A., Alvi, R. F., Aslam, M. A., Qamar, M. U., Salamat, M. K. F., & Baloch, Z. Antibiotic resistance: A rundown of a global crisis. *Infection and Drug Resistance* 2018; 11: 1645–1658.
2. Jarab, A., Mukattash, T., L., Nusairat, B., Shawaqfeh, M., Abu Farha R. Patterns of antibiotic use and administration in hospitalized patients in Jordan. *Saudi Pharmaceutical Journal* 2018; 26: 764–770.
3. Orubu, E.S.F., Albeik, S., Ching, C., Hussein, R., Mousa, A., Horino, M., Naqa, R., Elayyan, M., Saadeh, R., Zaman, M.H. A survey assessing antimicrobial prescribing at United Nations Relief and Works Agency primary health care centers in Jordan. *Am J Trop Med Hyg.* 2022; 107(2): 474-483.
4. Anderson, M.; M. Cecchini and E. Mossialos (eds.). *Challenges to Tackling Antimicrobial Resistance: Economic and Policy Responses.* Cambridge University Press, Cambridge 2020.
5. Darwish, D. A., Abdelmalek, S., l Abu Dayyih, W., Hamadi, S. Awareness of antibiotic use and antimicrobial resistance in the Iraqi community in Jordan. *J Infect Dev Ctries* 2014; 8(5); 616-623.
6. Bu-Khamsin, A. Y., Fabella, E., Al Abdullah, A. H., Albather, M., R., Al-Hassan, Y. T., Alramadan, H. A., Al Moweshy, A. A., Al Abdullah, A. J., & Al Hassan, H. I. Association between awareness on antibiotic resistance and antibiotic misuse among Saudi university students. *The Open Public Health Journal* 2021; 14: 545-554.
7. Bassetti, S., Tschudin-Sutter, S., Egli, A., Osthoff, M. Optimizing antibiotic therapies to reduce the risk of bacterial resistance. *European Journal of Internal Medicine* 2022; 99: 7–12.
8. Prigitano, A., Romanò, L., Auxilia, F., Castaldi, S., Tortorano A. M. Antibiotic resistance: Italian awareness survey 2016. *Journal of Infection and*

Public Health 2018; 11: 30–34.

9. Hajjeh, R., Mafi, A. The growing threat of antibiotic resistance in the Eastern Mediterranean Region - what does it take to control it? Eastern Mediterranean Health Journal 2016; 22(9); 701-702.
10. Al-Azzam, S. I., Al-Husein, B. A., Alzoubi, F., Masadeh, M. M., & Al-Horani, M. A. S. Self-Medication with antibiotics in Jordanian population. *International Journal of Occupational Medicine and Environmental Health* 2007; 20,(4): 373-380.
11. M'Aiber, S., Maamari, K., Williams, A., Albakrye, Z., Taher, A., Q., Hossaina, F., Flitif, S., Repettog, E., Moussally K. The challenge of antibiotic resistance in post-war Mosul, Iraq: An analysis of 20 months of microbiological samples from a tertiary orthopaedic care center. *Journal of Global Antimicrobial Resistance* 2022; 30: 311–318.
12. Abdelaziz, A. I., Tawfik, A. G., Rabie, K. A., Omran, M., Hussein, M., Abou-Ali, A., & Ahmed, A. S. F. Quality of community pharmacy practice in antibiotic self-medication encounters: A simulated patient study in upper Egypt. *Antibiotics* 2019; 8(2): 35.
13. Alsayed, A. R., Darwish El Hajji, F., D., Al-Najjar, M. A. A., Abazid, H., & Al-Dulaimi, A. Patterns of antibiotic use, knowledge, and perceptions among different population categories: A comprehensive study based in Arabic countries. *Saudi Pharmaceutical Journal* 2022; 30: 317–328.
14. Otoom S, Batieha A, Hadidi H, Hasan M, Al-Saudi K. Evaluation of drug use in Jordan using WHO prescribing indicators. *Eastern Mediterranean Health Journal* 2002; 8: 537-543.
15. Al-Azayzih, A., Al-Azzam, S., I., Alzoubi, K., H., Shawaqfeh, M., Masadeh, M., M. Evaluation of drug-prescribing patterns based on the WHO prescribing indicators at outpatient clinics of five hospitals in Jordan: A cross-sectional study. *International Journal of Clinical Pharmacology and Therapeutics* 2017; 55: 1-8
16. Shehadeh, M., Suaifan, G., Darwish, R., M., Wazaify, M., Zaru, L., Alja'fari S. Knowledge, attitudes and behavior regarding antibiotics use and misuse among adults in the community of Jordan. A pilot study. *SPJ* 2012; 20: 125 – 133.
17. O'Neill, J. Tackling drug-resistant infections globally: Final report and recommendations. Government of the United Nations 2016.
18. Antibiotic Resistance: Multi-country public awareness survey. World Health Organization 2015. [www.who.int](http://www.who.int)
19. Ilktac, M., Tarabishi, M. T., Ozbiran, P., Gulcan, C., & Celik, G. A public awareness study about antibiotic consumption habits and antibacterial resistance in north-eastern region of Cyprus. *Journal of Infection in Developing Countries* 2020; 14(5): 463–470.
20. Muflih, S. M., Al-Azzam, S., Karasneh, R. A., Conway, B. R., & Aldeyab, M. A. Public health literacy, knowledge, and awareness regarding antibiotic use and antimicrobial resistance during the covid-19 pandemic: A cross-sectional study *Antibiotics* 2021; 10(9):1107.
21. Jarrar B, Abu-Shqueir M, Jarrar Y, Jarrar Q. Knowledge and Awareness toward Viral Diseases among University Students in Jordan: Spring 2020. *Jordan Med. J.* 2022; 56(4).
22. Eltom EH, Alanazi AL, Alenezi JF, Alruwaili GM, Alanazi AM, Hamayun R. Self-medication with antibiotics and awareness of antibiotic resistance among population in Arar city, Saudi Arabia. *J Infect Dev Ctries.* 2022 ;16(11): 1762-1767.
23. Michaelidou, M., Karageorgos, S. A., & Tsiotis, C. Antibiotic Use and Antibiotic Resistance: Public Awareness Survey in the Republic of Cyprus. *Antibiotics* 2020; 9(11): 759.
24. Bhatt, V., Ponnampalavanar, S. S. L. S., Chong, C. W., Tang, L. Y., Krishnasamy, K., Goh, S. S. L., & Teh, C. S. J. Socio-Demographic Factors and Public Knowledge of Antibiotic Resistance. *Healthcare* 2023; 11(16): 2284.
25. Wall, S. Prevention of antibiotic resistance– an epidemiological scoping review to identify research categories and knowledge gaps. *Global*

Health Action 2019; 12(1).

26. Ortega-Paredes, D., Larrea-Álvarez, C. M., Torres-Elizalde, L., de Janon, S., Vinuela-Burgos, C., Hidalgo-Arellano, L., Šefcová, M. A., Molina-Cuasapaz, G., Fernandez-Moreira, E., & Larrea-Álvarez, M. Antibiotic Resistance Awareness among Undergraduate Students in Quito, Ecuador. *Antibiotics* 2022; 11(2): 197.

27. Al-magableh M, Eldos B, Aldughmi S, Bani Hamad L, Abdel Karim R, Damseh R, Khloouf M. A Systematic Review of Misuse of Antibiotics in Jordan. *Jordan Med. J.* 2024; 58(3).

28. Younes NA, Ababneh A, Qanno O, Alshraideh H, AbuAlRub R, Gharaibeh M. How Do Healthcare Professionals Perceive Continuous Professional Development? A Cross-Sectional National Study from Jordan. *Jordan Med. J.* 2025; 59(2).

29. Abdel-Qader, D. H., Albassam, A., Ismael, N. S., El-Shara', A. A., Shehri, A., Almutairi, F. S., Al-Harbi, D. M., Al Zahrani, M. M., Chen, L.-C., Al Mazrouei, N., & Mohamed Ibrahim, O. Awareness of Antibiotic Use and Resistance in Jordanian Community. *Journal of Primary Care & Community Health* 2020; 11.

## دراسة مقطعة لوعي العام بمقاومة المضادات الحيوية بين السكان الأردن

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### الملخص

**الخالفة:** تُعد مقاومة المضادات الحيوية مصدر قلق عالمي خطير، إذ شُئهم في زيادة معدلات الاعتلال والوفيات المرتبطة بالعدوى. في الشرق الأوسط ودول مثل الأردن، تتزايد مستويات مقاومة بسبب ممارسات مثل التطبيب الذاتي، ووصف الأدوية غير العقلاني، ونقص الوعي العام. ويمكن لتقدير وتعزيز الوعي بمقاومة المضادات الحيوية أن يُسهم في تحديد مسار العمل المستقبلي.

**الهدف:** هدفت الدراسة إلى تقدير الوعي بمقاومة المضادات الحيوية في الأردن ومعرفة ما إذا كانت بعض العوامل مرتبطة بمستوى الوعي.

**المواد والطرق:** استُخدمت دراسة مقطعة باستخدام استبيان منظمة الصحة العالمية للتوعية العامة متعدد البلدان لاستطلاع آراء السكان في الأردن باستخدام أسلوبأخذ العينات المريحة. قُرئ الاستبيان عبر منصات إلكترونية. وُضعت في الاعتبار عدة عوامل (الجنس، والتحضر، والتعليم، والعمل في القطاع الصحي). وُدرست العلاقة باستخدام اختباري مربع كاي وفيشر الدقيق.

**النتائج:** أُكمل 469 مشاركاً في الاستبيان. وُجدت العديد من المفاهيم الخاطئة. على سبيل المثال، لم يتمكن 85.1% من المشاركون من تعريف مقاومة المضادات الحيوية بشكل صحيح، بينما اعتقد 45.6% منهم أن علاج نزلات البرد ممكن بالمضادات الحيوية. كان للعمل في القطاع الصحي والمستوى التعليمي تأثير أكبر على إجابات المشاركون فيما يتعلق بمعرفة وخطورة مقاومة المضادات الحيوية. وكان الجنس والتحضر أقل تأثيراً.

**النتيجة:** هناك حاجة إلى حملات تثقيفية تستهدف الحالات التي تتطلب المضادات الحيوية وإجراء المزيد من الدراسات لتعزيز وعي الجمهور وتصحيح بعض المفاهيم الخاطئة.

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