ORIGINAL RESEARCH ARTICLE
pISSN09763325 | eISSN22296816
Open Access Article (CC BY-SA)
www.njcmindia.com
DOI: 10.55489/njcm.131120222498

Public Knowledge and Belief Regarding Antibiotic Use and Antimicrobial Resistance in Qatar

Nesiya Hassan[1], Jibin Kunjavara[2], Kamaruddeen Mannethodi[3], Kalpana Singh[4], Annamma Varghese[5], Bincymary Varughese[6], Jeena Rajan Thomas[7], Hamza Mohammad Salhab[8], Noor Bibi Khial Bad Shah[9], Noreen Chua Vinluan[10], Marivic Arroyo Nonato[11], Raed Hashim Alghazawi[12], Vipin Augusthy[13], Rajvir Singh[14]

[1,2,3,4]Nursing Midwifery Research department, HMC, Qatar
[5,7,8,9,12]Hamad General Hospital, HMC, Qatar
[6,10,11,13]Al- Khor Hospital, HMC, Qatar
[14]Academic Heath System, HMC, Qatar

ABSTRACT

Background: Antibiotics act as a therapeutic weapon in eradicating pathogens. Antibiotics are the most common group of drugs misused for self-medication. This is a global public health concern and is one of the major contributing factors to antibiotic resistance (ABR). This study aimed to assess the knowledge and beliefs of the public in Qatar regarding appropriate antibiotic use and antimicrobial resistance.

Methods: A cross-sectional research design was used to collect the information from the participants based on an adapted questionnaire from the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO) between September – November 2018. The study enrolled 1000 participants who visited two large emergency departments (ED) of public hospitals in Qatar.

Results: The mean knowledge and belief scores were 55.07±15.87 and 66.57±23.13 respectively. 42% of the participants had moderate knowledge regarding antibiotic and antimicrobial resistance. The majority of the participants (64.8%) believed that antibiotics fight against bacteria and viruses. The educational level significantly influences the belief of the participants. Graduates possess a higher belief score of 11.75±12.5 (P=0.001) compared to others.

Conclusion: The key findings of this study highlighted the existing gap in knowledge among the public. A community-based health education program should be launched to promote judicious of use antibiotics.

Keyword: Antibiotic, Antibiotic resistance, Self-medication, Antimicrobial resistance, public knowledge

INTRODUCTION

The invention of antibiotics was a revolution in medical science. Antibiotics make surgery safer for those with immunosuppressive conditions, children and the elderly can quickly recover from bacterial infections[1]. The antibiotics should be accessible with a physician's prescription even though self-medication is prevalent. A systematic review shows that the prevalence of self-medication in the Middle East area ranges from 19% to 82%[2]. Self-medication can be caused by a variety of factors, including poor public knowledge and belief towards antibiotics, easy access to antibiotics in many places, and lack of policies regarding appropriate antibiotic usage[3]. The most common health problems for which people were urged to use antibiotics to treat coughs, colds, and viral respiratory infections, which are self-limiting and caused by viruses[4]. This highlighted the lack of knowledge about the role of antibiotics, which may lead to self-medication and non-compliance with antibiotic treatment[5]. Also, people have a tendency to

How to cite this article: Hassan N, Kunjavara J, Mannethodi K, Singh K, Varghese A, Varughese B, Thomas JR, Salhab HM, Shah NB, Vinluan NC, Nonato MA, Alghazawi RH, Augusthy V, Singh R. Public Knowledge and Belief Regarding Antibiotic Use and Antimicrobial Resistance in Qatar. Natl J Community Med 2022;13(11):788-794. DOI: 10.55489/njcm.131120222498

Financial Support: None declared | **Conflict of Interest:** None declared | **Date of Submission**: 07-10-2022 | **Date of Acceptance**: 10-11-2022 | **Date of Publication**: 30-11-2022

Correspondence: Nesiya Hassan (Email: nesiyahassan@gmail.com)

use leftover medication based on their previous personal experience, which is the foremost cause of resistance[6].

Antibiotic resistance can have a significant impact on increasing mortality among hospitalized patients. The pathogenic bacteria acquire resistance genes to a specific antibiotic, and that antibiotic becomes ineffective in clinical use[3]. Antibiotic resistance enables the bacteria to overcome the virulence necessary to fight against the immune system of the host[7]. According to the Global Antimicrobial Resistance and Use Surveillance System (GLASS) report released by the World Health Organization (WHO), Escherichia coli resistance rates to ciprofloxacin have increased from 8.4% to 92.9% and Klebsiella pneumonia resistance rates have increased from 4.1% to 79.4%[8]. Nowadays, antibiotic resistance is becoming a worldwide problem that requires globally coordinated efforts. Although the WHO has developed a variety of plans worldwide for the fight against antibiotic resistance called the "*Global action plan on antimicrobial resistance"* (GAP), Global Antimicrobial Resistance and Use Surveillance System (GLASS), and Global Antibiotic Research and Development Partnership (GARDP)[8-9]. Recent studies have shown a dramatic increase in antimicrobial resistance, especially in resource-limited countries[10].

A recent study conducted in Qatar revealed that taking antibiotics without consultation (82%), not completing the course of antibiotics (45%), and purchasing antibiotics from the pharmacy without a prescription (23%) are the common inappropriate practices[11]. Similarly, a recent systematic review in Saudi Arabia shows a high prevalence of antibiotic misuse in the country[12]. A national-based study from Japan shows similar findings, 11.7% of the participants agreed about the use of leftover antibiotics, 23.6% of them have adjusted the doses of antibiotics by themselves, and 30% of the participants demanded their physician for antibiotics during episodes of cold[13]. Many studies supported that lack of knowledge about the use of antibiotics is predominant and self-medication with the help of pharmacists is a very common practise[14-15].

Antibiotic misuse results in antibiotic resistance, treatment failure, increased inpatient hospitalization, as well a huge financial burden. Health professionals can play a crucial role in preventing antibiotic resistance because they prescribe antibiotics in routine clinical practice[13]. The community-based educational programs revealed that antibiotic-related knowledge and behaviors including the use, importance of compliance with dose, consequences of self-medication, and antibiotic resistance, had dramatically improved. However, the beliefs remained unchanged[16-17].

The appropriate use of antibiotics is influenced by public knowledge, attitudes, and behaviors. In Qatar, there is a scarcity of information on public awareness, beliefs, and practices regarding the use of antibiotics. Moreover, gaining a better understanding of how the public perceives antibiotic usage, as well as their belief toward them, is crucial in implementing antibiotic stewardship program. In this context, the present study used to explore the knowledge and belief of the diverse population of Qatar regarding antibiotic use and antimicrobial resistance.

METHODS

Study design: The current study adopted a cross-sectional research design to collect information on the knowledge and beliefs of the public regarding the use of antibiotics and antimicrobial resistance from September to November 2018.

Sample Population and recruitment: The study was conducted on patients and visitors in two large emergency departments of public hospitals in Qatar using a purposive sampling method. People who had previously consumed antibiotics were enrolled in the study. The study excluded participants with language barriers during face-to-face interviews. The research team collected the data from the participants after explaining the purpose of the study and provided adequate time to clarify their queries.

Sample Size: Assuming awareness of antibiotics was 65.0% (19) with 5% absolute error, keeping 95% confidence interval (C.I.) and design effect 2 to avoid biases of clustering, the sample size was 728. Sample size (n) was calculated using the formula, n= {Design effect* N(p(1-p)} / {d2/Z2 1—α/2*(N-1) +p*(1-p)}, where N is Qatar general population with awareness of antibiotics, p is proportion of awareness and d is 5% absolute error. Assuming a 35% incomplete survey, the study recruited approximately 1,350 participants while they waited in the emergency room. Finally, a total of 1000 subjects were used to collect the of this study.

The instrument for data collection: The data was collected from the participants through structured interviews using an adapted questionnaire from WHO and CDC[18-19] after obtaining their permission. A similar questionnaire was used in WHO's multi-country public awareness survey and the CDC's tool was used in some other studies[8,20-21].

The questionnaire consists of a three-section in which section A is comprised of eight questions in which demographic characteristics (5 items) and practice of the participants (3 items). Section B covers knowledge assessment items of antibiotics (6 items), and antibiotic resistance (11 items). In this section, a combination of true and false, multiple-choice, and closed-ended questions are included. The participants with correct responses had a score of '1' while those with the wrong answer had a score of '0'. The total score of Knowledge Domain was generated by summing up the scores obtained from sections B. The minimum and maximum possible scores were 0 and 17, respectively, and the knowledge domain was further divided into five subdomains. Section C had

14 items that elicited the responses of the participants on belief towards antibiotic and antimicrobial resistance. The response was marker over five-point Likert's scale in which "Strongly disagree", "Disagree", "Neither agree nor disagree", "Agree" and "Strongly agree" as "-2", "-1", "0", "+1" and "+2", respectively[26]. The lowest and highest possible scores were -28 and +28, respectively, in the belief section. The score was converted to a scale ranging from 0 to 100, in which 0 means the worst possible score and 100 means the best possible score. The total obtained score was categorized as low (<50%), moderate (50-70%), and high (>70%) in knowledge and belief[22-23].

Statistics: Descriptive analyses were used to calculate the prevalence of dichotomous variables and means and standard deviations for continuous variables describing participant background. Knowledge and beliefs regarding antibiotic and antimicrobial resistance were described using mean and SD. Student t-tests and ANOVA were used for continuous variables and Chi-square tests for categorical variables to check the relationship. Internal consistency and reproducibility were performed for the reliability of the questionnaire. Cronbach's α coefficient was used to see the homogeneity of question items in each domain index for internal consistency. Coefficients of 0.7 and above were considered to be internally consistent for the questionnaire[24]. Each domain score in the form of an index variable at pre- and post-level was also calculated using intraclass correlation[25]. P-value 0.05 (two-tailed) is considered a significant level. The STATA 16.0 statistical package is used for the analysis. The scores gained from all items within two domains of the questionnaire, knowledge, and belief in Cronbach's Alpha, were 0.48 and 0.91 respectively. The domain belief (0.91) was under acceptable limits of 0.60 – 1.00[26] in turn indicating good internal consistency, whereas the knowledge domain (0.48) had low internal consistency.

RESULTS

The response was collected from 1000 participants who visited the emergency department during the study period. Table: 1, showing the socio-demographic characteristics of the study participants. Most of the study participants were males (76.4%), and the majority of the participants belong to the age group between 26 and 45 years (66.6%) and were predominantly of Asian ethnicity (75.9%). Less than 40% of the respondents held bachelor's degrees (39.8%) and a large proportion of the study participants (60.6%) were professional workers. Nearly half of the participants (49 %) had taken antibiotics within six months of study period. Interestingly, 77.6% of participants had purchased their antibiotics from the pharmacy as prescribed by the physician (71.2%).

Most respondents (42%) had moderate knowledge about antibiotics, and 36.5% of the participants had a low level of knowledge regarding antibiotics and antimicrobial resistance. The majority of the participants (53.4%) possess positive beliefs regarding antibiotics and antimicrobial resistance (Table 2).

More than 50% of respondents answered correctly in two out of five domains: "Knowledge on antibiotic access" (Q5, Q6), and "Knowledge about antibiotic resistance" (Q7-Q11). In the domain of "knowledge on bacteria",56.9% of respondents answered that bacteria are germs that could cause colds and flu. In "knowledge on antibiotics", more than 58.5% correctly answer the question of when you should stop taking antibiotics once you have begun treatment. In the domain of "knowledge on the effect of antibiotic misuse", the question of antibiotic resistance is an issue in other countries that had the lowest score (42.8%) (Table 3).

Table 1: Socio-demographic characteristics of study participants

Characteristics	Frequency (%)
Gender	
Female	236 (23.6)
Male	764 (76.4)
Age in years	
18-25	142 (14.2)
26-35	382 (38.2)
36-45	284 (28.4)
46-55	148(14.8)
56-65	38(3.8)
>65	6 (0.6)
Ethnic Background	
Africa	198 (19.8)
America	8 (0.8)
Asia	759 (75.9)
Australia	16 (1.6)
Europe	19 (1.9)
Education	
Graduation	398(39.8)
Higher Secondary	219(21.9)
Secondary level	240(24)
Primary level	112(11.2)
No schooling completed	31(3.1)
Occupation	
Professionals	606 (60.6)
Nonprofessional	394 (39.4)

Table 2: The number of items, total score and level of knowledge and belief of the participants

Variable	Number of items	Total responses	Range of score	Total score% mean ± SD	Low (<50%)	Moderate (50-70%)	High (>70%)
Knowledge	17	1000	0-100	55.07±15.87 %	36.5	42	21.5
Belief	14	1000	0-100	66.57±23.13 %	21.1	25.5	53.4

Table 3: The responses of the participants regarding knowledge of antibiotic and antimicrobial resistance

Domain	Item No:	Statements	Respondents' Answer N (%)		
			Expected response	Correct	Incorrect
Knowledge on Bacteria	1	Antibiotics fight infections caused by	Bacteria	35.2	64.8
	2	Bacteria are germs that cause colds and flu.	False	56.9	43.1
Knowledge on antibiotic	3	Which of these illnesses should be treated with antibiotics?	urinary infection	31.6	68.4
	4	When do you think, you should stop taking antibiotics once you've begun treatment?	Take all the antibiotics as directed	58.5	41.5
Knowledge on antibiotic access	5	Use of antibiotics that were given to a friend or family member with same illness.	False	58.8	41.2
	6	Buy or request the same antibiotics from a doctor that helped you get better with same symptoms before.	False	54.2	45.8
Knowledge on antibiotic resistance	7	Bacteria that cause infections can become resistant to antibiotics.	True	71.6	28.4
	8	Overuse of antibiotic can cause resistance.	True	66.4	33.6
	9	Antibiotic resistance occurs when your body becomes resistant to antibiotics, and they no longer work as well.	True	76.5	23.5
	10	Many infections are becoming increasingly resistant to treatment by antibiotics.	True	70.3	29.7
	11	If bacteria are resistant to antibiotics, it can be very difficult or impossible to treat the infections they cause.	True	63.8	36.2
Knowledge on effect of antibiotic misuse	12	Antibiotic resistance is an issue that could affect me or my family.	True	57.1	42.9
	13	Antibiotic resistance is an issue in other countries but not here.	False	42.8	57.2
	14	Antibiotic resistance is only a problem for people who take antibiotics regularly.	False	56.2	43.8
	15	Bacteria which are resistant to antibiotics can be spread from person to person.	True	62.4	37.6
	16	Antibiotic-resistant infections could make medical procedures like surgery, organ transplants and cancer treatment much more dangerous.	True	67.8	32.2
	17	I can prevent antibiotic-resistant infections by avoiding self-medication, saving it for future use and use antibiotics during viral infection.	True	61.0	93.9

Table 4. The overall mean knowledge score of the participants was 55.07±15.87%. This score was significantly higher in participants with ages above 66 years (9.7±1.4) as compared to 18-25 years (8.6±2.7), 26-35 years (9.5±2.5), 36-45 years (9.4 ±2.6), 46-55 years (9.0±2.6) and 56-65 years (9.3 ±3.2) of age (P= 0.014). In terms of the belief regarding antibiotic use and antimicrobial resistance, the overall mean score of belief of the participants was 66.57±23.13, which was significantly lower in males (8.58±12.5) compared with females (11.51±14.0; *P*= 0.002). In terms of education, the belief score is significantly associated with the education level, the higher positive belief score was found among graduates (11.75±12.5) followed by participants with higher secondary school education (10.04±13.2), secondary school level (8.30±11.8), primary level (3.73±13.4) compared with those who had no school education (-0.25±12.6; *P* = <0.001). Professionals (10.7±13.2) have a higher score of beliefs as compared to non-professionals 8.35±12.7; *P*= 0.005). The Australian ethnic group shows a higher belief level (21.93± 4.3) as compared with other ethnic groups (African 7.62 ± 15.5, American 14.5± 4.5, Asian 9.22± 12.3 and European 15.84± 5.0; *P* = 0.001).

Table 5. illustrates the beliefs of the participants regarding the use of antibiotics and antimicrobial resistance. Interestingly, most of the participants agreed with the statements concerning the use of antibiotics and antimicrobial resistance. According to the participant's responses, the following items had a strong agreement, people should use antibiotics only when they are prescribed by a doctor or nurse (mean 1.036 ± 1.3), the importance of vaccination among children (mean 1.031 ± 1.3) and people should wash their hands regularly (mean 1.092 ± 1.3). In general, the participants have positive beliefs (66.57%) towards all dimensions of antibiotic use and antimicrobial resistance.

Table 4. Association of demographic characteristics with Knowledge and belief of the participants

Demographic Characteristics	N	Knowledge		Belief	
		mean (SD)	p value	mean (SD)	p value
Gender					
Female	236	9.4 (2.6)		11.51 (14.0)	
Male	764	9.2 (2.6)	0.50	8.58 (12.5)	0.002
Education					
Graduation	398	9.5 (2.6)		11.75 (12.5)	
Higher secondary	219	9.3 (2.7)		10.04 (13.2)	
No schooling	31	9.7 (2.5)	0.17	-0.25 (12.6)	<0.001
Primary level	112	9.2 (2.5)		3.73 (13.4)	
Secondary level	240	8.9 (2.6)		8.30 (11.8)	
Occupation					
Non professionals	606	9.3 (2.5)		8.35 (12.7)	
Professional	394	9.2 (2.8)	0.49	10.7 (13.2)	0.005
Ethnicity					
African	198	9.4 (2.3)		7.62 (15.5)	
American	8	8.1 (2.5)		14.50 (4.5)	
Asian	759	9.3 (2.7)	0.36	9.22 (12.3)	
Australian	16	8.6 (3.8)		21.93(4.3)	<0.001
European	19	8.6 (2.1)		15.84 (5.0)	
Age					
18-25 yrs	142	8.6 (2.7)		8.22 (13.9)	
26-35 yrs	382	9.5 (2.5)		9.59 (12.7)	
36-45 yrs	284	9.4 (2.6)	0.014	9.47 (12.3)	0.66
46-55 yrs	148	9.0 (2.6)		9.64 (13.5)	
56-65 yrs	38	9.3 (3.2)		8.18 (13.5)	
66+ yrs	6	9.7 (1.4)		2.50 (8.1)	

Table 5: The belief of the participants towards the use of antibiotic and resistance

Item	Response	Mean (SD)
People should use antibiotics only when they are prescribed by a doctor or nurse	1000	1.036 (1.3)
Farmers should give fewer antibiotics to food-producing animals	1000	0.390 (1.4)
People should not keep antibiotics and use them later for other illnesses	1000	0.686 (1.4)
Parents should make sure all of their children's vaccinations are up to date	1000	1.031 (1.3)
People should wash their hands regularly.	1000	1.092 (1.3)
Doctors should only prescribe antibiotics when they are needed	1000	0.959 (1.3)
Governments should reward the development of new antibiotics	1000	0.584 (1.3)
Pharmaceutical companies should develop new antibiotics	1000	0.497 (1.4)
Antibiotic resistance is one of the biggest problems the world faces	1000	0.477 (1.3)
Medical experts will solve the problem of antibiotic resistance before it becomes too serious	1000	0.551 (1.2)
Everyone needs to take responsibility for using antibiotics responsibly	1000	0.790 (1.3)
There are not much people like me can do to stop antibiotic resistance	1000	0.298 (1.2)
I am worried about the impact that antibiotic resistance will have on my health, and that of my family	1000	0.450 (1.2)
I am not at risk of getting an antibiotic-resistant infection, as long as I take my antibiotics correctly.	1000	0.439 (1.3)

DISCUSSION

Antibiotic resistance is a growing public health concern all over the world. The general public's knowledge is a crucial element in combating antimicrobial resistance. The current study assesses the knowledge and beliefs regarding antibiotics and antimicrobial resistance among the general population of Qatar. The National Action Plan of Qatar was established to improve antimicrobial stewardship in all healthcare settings across the country. Qatar has a strong antibiotic policy, and it is impossible to obtain antibiotics without a physician's prescription. However, the study is relevant as the Qatar population consists of a large number of expatriates communities[27] and there is a possibility of not completing prescribed course and saving medicine for future use.

Many international studies focused on public knowledge of antibiotic use and antimicrobial resistance, which indicates that a wide range of knowledge gaps exist on the effectiveness of antibiotics for viral infections [5-6,15-16,28-29]. According to the present study, a high percentage of respondents do not understand the difference between viral and bacterial infections as well as the indications for antibiotic treatment. The participants (64.8%) believed that the antibiotic was effective against viral infections. This misconception may be due to patients not being informed whether their infection is bacterial or viral.

The present study shows that only 13.2% of the participants had good knowledge of the proper use of antibiotics and the consequences of antimicrobial re-

sistance, which is in line with the previous studies conducted in Malaysia[29] . The literature supported the factors influencing self-medication, such as the use of leftover medication, over-the-counter purchases, and the use of antibiotics offered by friends and family[30]. The majority of our study participants (71.2%) took antibiotics prescribed by their doctors, which is consistent with another study[31]. However, this will not exclude the possibility of self-medication with the left-over antibiotics from previous therapy, which is supported by a Eurobarometer survey in Poland[32]. According to studies conducted in the Middle East, antibiotics are often shared among family and friends or administered based on recommendations from relatives[5,16]. A promising finding of the present study was that the majority of participants (60%) stated that they were not keeping the remaining antibiotics for future use.

Antibiotic resistance is an emerging health concern among the general public. The most important factor that promotes antimicrobial resistance (AMR) is the inappropriate usage of antibiotics, which has been supported by several international studies[31,33]. Our study found a similar result, with 52.1% expressing concern regarding antimicrobial resistance. The literature has widely discussed the importance of following a physician's antibiotic regimen. The present study revealed that more than half of respondents (58.5%) completed their prescribed antibiotic regimen and mostly young adults (47.8%) which was consistent with the Jordanian study[16]. The study found that 61% of participants consented to complete the antibiotic course that was prescribed to them. However, these results are not comparable to the findings of many other studies[29,32,34]. Consequently, this kind of behavior can result in the development of resistant strains and complications during their future treatment.

Education programs can improve the public's knowledge of, belief, and adherence to antibiotics. In the long term, multifaceted approaches and constant reinforcement are necessary to reduce misinformation regarding antibiotics and their proper use. The government can initiate the campaign with the support of healthcare professionals through various platforms such as social media, television, and newspapers to disseminate information on the correct use of antibiotics. An awareness camp should be provided on a community basis to strengthen the knowledge that everyone has the power to influence through their actions, thus helping them understand their role in preventing bacterial resistance. Notably, ongoing research is focused on developing new antimicrobial drugs to combat resistant bacteria. Despite these efforts, it is essential to ensure that existing antibiotics remain effective.

STRENGTHS AND LIMITATIONS

To our knowledge, the present research is the first study to assess the public knowledge and belief regarding antibiotic use and antimicrobial resistance in Qatar. However, the study has certain limitations. The random selection of participants within the study population was not feasible in our research settings. The study's generalizability is restricted because the purposive sampling method was used to collect the data from the participants. Qatar has a multi-ethnic culture with more than 45 different nationalities. Hence, a design effect was applied to adjust for clustering in the sample data. The research team was unable to understand more than five common languages in Qatar. People who were unable to deal with the interview due to language barriers or illiteracy were excluded from the research. Finally, we excluded all the participants who had never heard of antibiotics in their lifetime.

CONCLUSION

Our study showed that the public knowledge regarding the appropriate use of antibiotics and antimicrobial resistance is still a concern, especially the scope of antibiotics in the treatment of mild illnesses like the flu and cold. These misconceptions may contribute to self-medication and inappropriate use of antibiotics. Even though Qatar has a strong antibiotic policy and a National Action Plan for Qatar, which were established to improve antimicrobial stewardship in all healthcare settings across the country, more active interventions are needed to tackle the issues raised by the inappropriate usage of antibiotics. Moreover, this study suggested constructive engagement of healthcare professionals especially physicians, nurses, and pharmacists to encourage their patients about the judicious use of antibiotics.

RECOMMENDATIONS

Our study recommended a public awareness program to influence the knowledge and practice of the people regarding antibiotic use and the consequences of misuse. Further studies are required to determine whether public awareness programs can enhance knowledge and beliefs about antibiotic use and antimicrobial resistance.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The Ethical approval was obtained from the IRB of the Medical Research Center (MRC), protocol #17129/17 from 28 November 2017 to 2018 period. Participation in the study was voluntary, and the identity & confidentiality of the subjects was maintained throughout the study.

ACKNOWLEDGEMENT

We would like to thank the nursing administration of HGH ED and Al Khor ED for their support, Dr. Badriya Al Lenjawi, the Executive director of nursing research, Dr. Sameer Pathan, and Mr. Bejoy Chacko from the administration of HGH ED for their guidance and support during the study period.

AUTHORS CONTRIBUTIONS

This work was carried out in collaboration among all authors. Author NH provided literature search, survey, data collection, analysis, and manuscript writing. Author RS and KS provided data analysis and manuscript drafting. Author KM and JK provided data collection and manuscript writing. All other authors (AV, BV, JR, HM, NB, NC, MA, RH, VP) provided recruitment of participants and data collection. All authors read and approved the final manuscript.

REFERENCES

1. Letek M. Alexander Fleming, The discoverer of the antibiotic effects of penicillin. Front. Young Minds. 2020 Jan;7:159.
2. Alhomoud F, Aljamea Z, Almahasnah R, et al. Self-medication and self-prescription with antibiotics in the Middle East—do they really happen? A systematic review of the prevalence, possible reasons, and outcomes. International journal of infectious diseases. 2017 Apr 1;57:3-12.
3. Jairoun A, Hassan N, Ali A, et al. Knowledge, attitude and practice of antibiotic use among university students: a cross sectional study in UAE. BMC public health. 2019 Dec;19(1):1-8.
4. Jamhour A, El-Kheir A, Salameh P, et al. Antibiotic knowledge and self-medication practices in a developing country: A cross-sectional study. American journal of infection control. 2017 Apr 1;45(4):384-8.
5. Awad AI, Aboud EA. Knowledge, attitude and practice towards antibiotic use among the public in Kuwait. PloS one. 2015 Feb 12;10(2):e0117910.
6. Bhardwaj K, Shenoy MS, Baliga S, et al. A cross-sectional survey of community pharmacist's knowledge, behavior and attitude toward antibiotic dispensation, Southern Karnataka, India. Journal of Datta Meghe Institute of Medical Sciences University. 2021 Jan 1;16(1):175.
7. Aslam B, Wang W, Arshad MI, et al. Antibiotic resistance: a rundown of a global crisis. Infection and drug resistance. 2018;11:1645.
8. WHO Antibiotic resistance Available at: https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance Accessed December 20th, 2021.
9. Jinks T, Lee N, Sharland M, et al. A time for action: antimicrobial resistance needs global response. Bulletin of the World Health Organization. 2016 Aug 8;94(8):558.
10. Amann S, Neef K, Kohl S. Antimicrobial resistance (AMR). European J Hospital Pharmacy. 2019 May 1;26(3):175-7.
11. Aljayyousi GF, Abdel-Rahman ME, El-Heneidy A, et al. Public practices on antibiotic use: A cross-sectional study among Qatar University students and their family members. PloS one. 2019 Nov 26;14(11):e0225499.
12. Alnemri AR, Almaghrabi RH, Alonazi N, et al. Misuse of antibiotic: A systemic review of Saudi published studies. Current Pediatric Research. 2016.
13. Kamata K, Tokuda Y, Gu Y, et al. Public knowledge and perception about antimicrobials and antimicrobial resistance in Japan: A national questionnaire survey in 2017. PLoS One. 2018 Nov 5;13(11):e0207017.
14. Almohammed RA, Bird EL. Public knowledge and behaviours relating to antibiotic use in Gulf Cooperation Council countries: A systematic review. Journal of infection and public health. 2019 Mar 1;12(2):159-66.
15. Al Omari S, Al Mir H, Wrayde S, et al. First Lebanese Antibiotic Awareness Week campaign: knowledge, attitudes and practices towards antibiotics. Journal of Hospital Infection. 2019 Apr 1;101(4):475-9.
16. Abdelmalek S, AlEjielat R, Rayyan WA, et al. Changes in public knowledge and perceptions about antibiotic use and resistance in Jordan: a cross-sectional eight-year comparative study. BMC public health. 2021 Dec;21(1):1-2.
17. Rabbani SA, Sridhar SB, Abazer D, et al. Impact of community-based educational intervention on antibiotic use and resistance awareness among the people living in Ras Al Khaimah, United Arab Emirates. Journal of Pharmaceutical Health Services Research. 2020 Sep;11(3):197-204.
18. WHO antibiotic awareness campaigns Available at : https://www.who.int/selection_medicines/committees/expert/21/applications/s6_antibiotic_awareness_campaigns.pdf. Accessed December 20th, 2021.
19. Centers for Disease Control and Prevention. Available at: https://www.cdc.gov/antibiotic-use/q-a.html. Accessed December 20th, 2021.
20. Zajmi D, Berisha M, Begolli I, et al. Public knowledge, attitudes and practices regarding antibiotic use in Kosovo. Pharmacy Practice (Granada). 2017 Mar;15(1).
21. Huttner B, Saam M, Moja L, et al. How to improve antibiotic awareness campaigns: findings of a WHO global survey. BMJ global health. 2019 May 1;4(3):e001239.
22. Shehadeh M, Suaifan G, Darwish RM, et al. Knowledge, attitudes and behavior regarding antibiotics use and misuse among adults in the community of Jordan. A pilot study. Saudi Pharmaceutical Journal. 2012 Apr 1;20(2):125-33.
23. Higuita-Gutiérrez LF, Roncancio Villamil GE, Jiménez Quiceno JN. Knowledge, attitude, and practice regarding antibiotic use and resistance among medical students in Colombia: a cross-sectional descriptive study. BMC public health. 2020 Dec;20(1):1-2.
24. Polit DF, Beck CT. The content validity index: are you sure you know what's being reported? Critique and recommendations. Research in nursing & health. 2006 Oct;29(5):489-97
25. DeVon HA, Block ME, Moyle-Wright P, et al. A psychometric toolbox for testing validity and reliability. Journal of Nursing scholarship. 2007 Jun;39(2):155-64.
26. Singh R, Agarwal TM, Al-Thani H, et al. Validation of a survey questionnaire on organ donation: An Arabic world scenario. Journal of transplantation. 2018 Feb 8;2018.
27. Qatar statistics, Qatar population Available at: www.psa.gov.qa. Accessed December 20th, 2021.
28. Karuniawati H, Hassali MA, Suryawati S, et al. Assessment of knowledge, attitude, and practice of antibiotic use among the population of Boyolali, Indonesia: a cross-sectional study. International journal of environmental research and public health. 2021 Aug 4;18(16):8258.
29. SNELL B. Factors That Get in the Way of Appropriate Use of Antimicrobial Medicines in Humans.
30. Wang X, Lin L, Xuan Z, et al. Keeping antibiotics at home promotes self-medication with antibiotics among Chinese university students. International journal of environmental research and public health. 2018 Apr;15(4):687.
31. Special Eurobarometer 445. Report: antimicrobial resistance. Brussels: TNS Opinion & Social, European Commission; 2016
32. Mazińska B, Strużycka I, Hryniewicz W. Surveys of public knowledge and attitudes with regard to antibiotics in Poland: Did the European Antibiotic Awareness Day campaigns change attitudes?. PloS one. 2017 Feb 17;12(2):e0172146.
33. Karimy M, Rezaee-Momtaz M, Tavousi M, et al. Risk factors associated with self-medication among women in Iran. BMC public health. 2019 Dec;19(1):1-7.
34. Mason T, Trochez C, Thomas R, et al. Knowledge and awareness of the general public and perception of pharmacists about antibiotic resistance. BMC public health. 2018 Dec;18(1):1-0.