

Nurses' knowledge regarding children antibiotic use and resistance in Jordan: A cross-sectional study

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ABSTRACT

Purpose: This study aimed at examining nurses' knowledge, attitudes, and practices related to antibiotics use and resistance. A second objective was to identify Jordanian nurses' sources of information about antibiotics.

Method: A cross-sectional design was used for this study. Nurses (n=594) completed an online survey using Google Forms. Google Forms web link was distributed on Facebook, LinkedIn, Twitter, and other social media applications. The study included Jordanian nurses who worked in hospitals and healthcare institutions. The European Center for Diseases Control and Prevention survey was used that took about 15 minutes to complete.

Results: According to the study, 48.2% of nurses prescribed antibiotics to patients daily or multiple times per day in the previous week; 13.3% of nurses offered support for daily or more frequent antibacterial drug use or infection control; and 42.3% of nurses mentioned they did not give antibiotics advice because they did not have a leaflet about their use and because the patients did not receive one.

Conclusion: The study found that the most reported source for antibiotics information was Facebook and Instagram. Nurses need further education on proper use of antibiotics. Antimicrobial stewardship can benefit from the study findings, which can help develop interventions to improve antibiotics proper use.

Keywords: children, antibiotics, antibiotics resistance, antibiotics use

INTRODUCTION

Children all over the world consume massive amounts of antibiotics [1, 2]. This is probably because they are prone to many types of infections, especially upper respiratory tract infection (URTI) (which affect the nose and throat) more than adults [1, 3]. It is worth mentioning that the majority of URIs among children have been shown to have a viral cause and do not require the use of antibiotics [4-6]. Antibiotic resistance (ABR), especially in Jordan, is a worldwide health crisis, and one of the leading reasons for this crisis is the improper use of antibiotics [1]. The increased frequency of infectious illnesses is threatening to the improper use of antibiotics within children [2, 8, 9].

Irrational antibiotic prescribing is a major contributor to the worldwide rise in ABR among children, which in turn can lead to more cases of potentially fatal infections, more complicated medical conditions, and even death in some cases and mostly among children [7, 10, 11]. If no action was taken to decrease the spread of ABR, it is estimated that ABR will kill around 700,000 people each year by 2050 [12]. The global prevalence of ABR could be reduced through standards and proper practices for antibiotic usage [13]. In developing countries, there are high rates of mortality from respiratory infections, especially among children and this is related to

limited resources and inappropriate prescription of antibiotics from health care providers [14, 15]. It is worth to mention, antibiotic treatment is vital and useful for the management of acute and existent respiratory infections among children; thus, preventing inappropriate use of antibiotics is very important.

Nurses are in a prime position to ensure that all patients, especially children patient's care needs are addressed when an antibiotic is administered since they have the most contact with children and their parents and participate in every step of care [16, 17]. However, there is no study regarding the knowledge and practices of antibiotics among children in Jordan or worldwide. Nurses actively participate in avoiding ABR among children [18, 19]. Children patients receive care from bedside nurses, who are also particularly important in ensuring that daily objective of care.

Additionally, nurses can help decrease the worries of children and their parents regarding the use of antibiotics (or a perceived but legitimate "lack" of antibiotic use) [2]. The nurses may also collaborate directly with other healthcare providers to inform practice about using antibiotics. This study aimed at examining nurses' knowledge, attitudes and practices related to antibiotics use and resistance. A second objective was to identify Jordanian nurses' sources of information about antibiotics.

METHOD

Study Design and Setting

We used a cross-sectional study to collect data from a convenience sample. The nurses were encouraged to fill out a self-administered online survey via a link shared across several social media platforms (e.g., Facebook). To increase the response, the link was widely disseminated on Facebook. Nurses were selected based on the following criteria:

- (a) a nurse working on private and governmental sectors,
- (b) is a citizen of Jordan,
- (c) speaks Arabic,
- (d) is fluent in Arabic, and
- (e) is willing to engage in the research.

Software was used to estimate a sample group of 550 people to achieve the desired level of accuracy, based on the assumptions of a 95% level of confidence, a 50% reply allocation, and a 5% error margin. The link was sent to 650 nurses. The nurses were reached by posting a link to the study on social media platforms run by nurses' professional groups, such as Facebook.

The invitation also contained a description of the study and a link to the surveys. Participants in the survey were informed that their responses were confidential and that no personal information about the respondents was collected. Participants were able to discontinue their participation in the study at any time; it was entirely voluntary. Nurses were requested to take part in a survey from June to July 2022.

Instrument

In this study, we used a web-based questionnaire consisting of 47 questions. Nine socio-demographic factors were included at the outset of the questionnaire, including age, gender, domicile, family structure, education level, work position, monthly family income, health insurance, and infection with COVID-19. Male and female participants were sought to participate in the study. The European Center for Diseases Control and Prevention survey [20] was used to collect data on both the prevalence of ABR and nurse's knowledge of alternatives to conventional antibiotic treatment effects of resistance on children's health.

There are scales for evaluating antibiotic knowledge such as when and how to utilize antibiotics and when to use them correctly. Average scores for antibiotics knowledge are calculated based on how many of the 13 questions were answered. A score of one was given for right answers and zero for wrong ones. Familiarity with antibiotic-resistance among children evaluates how much is known about the problem of ABR. Participants' knowledge on how to combat ABR. Participants' knowledge and understanding of respondents' beliefs about whether the issue of ABR among children is significant and will have negative effects on their health. A participants' levels of agreement with a set of statements were determined using a 5-point Likert scale and a total of six items related to claims about the rise of ABR among children.

The study was translated into Arabic language to facilitate the filling of the survey. The translated survey was checked from experts for the fluency and accuracy of the language. The reliability and validity of the instrument were checked.

Table 1. Demographic characteristics of the nurses (n=594)

Variable	Frequency	%
Insurance		
No	42	7.1
Yes	552	92.9
Income		
Less than 400	250	42.1
400 to 800	321	54.0
800 to 1,000	19	3.2
More than 1,000	4	0.7
Gender		
Male	142	23.9
Female	450	75.8
Working place		
Not working	574	96.6
Government	20	3.4
Private	12	2.0
University	357	60.1
Experience		
1 to 5 years	225	37.9
6 to 10	271	45.6
More than 10	222	37.4
Marriage		
Single	101	17.0
Married	227	38.2
Divorced	327	55.1
Education		
Diploma	40	6.7
Bachelor	82	13.8
Master	386	65.0
Doctorate	118	19.9
Others	7	1.2
Type of job		
Clinical practice	540	90.9
Administration	43	7.2
Education	11	1.9
Description		
No	144	24.2
Yes	450	75.8
Smoking		
No	330	55.6
Yes	264	44.4

Statistical Analysis

SPSS version 26 was used to analyze the collected data. The researcher set the level of significance at 0.05 and treated all missing and outliers' data by inspecting descriptive statistics and frequency distribution for all study variables. Descriptive statistics such as frequency tables, means, standard deviation were used.

RESULTS

The number of the participants was 594. The number of females is 450 (75.8%) and males are 142 (23.9%). The mean age is 30.5 (SD=6.3) (**Table 1**).

Respondents who answered questions about ABR honestly obtained higher points (**Table 2**). These questions, "antibiotics are effective against viruses 440 (74.1%)" and "antibiotics are effective against cold illnesses 468 (78.8%)," all produced much lower scores. It was discovered that 80 (14.8%) of antibiotics were used unnecessarily before becoming ineffective.

Table 2. Response of nurses to questions knowledge regarding using of antibiotics and antibiotic resistance

Respeones	Answer	No		Yes	
		Count	Row n %	Count	Row n %
Antibiotics are effective against viruses.	False	440	74.1	154	25.9
Antibiotics are effective against cold infections.	False	468	78.8	126	21.2
Unnecessary use of antibiotics makes them become ineffective.	True	88	14.8	506	85.2
Taking antibiotics has associated side effects or risks such as diarrhea, colitis, & allergies.	True	104	17.5	490	82.5
Every person treated with antibiotics is at an increased risk of antibiotic resistant infection.	True	129	21.7	465	78.3
Antibiotic resistant bacteria can spread from person to person.	True	429	72.2	165	27.8
Healthy people can carry antibiotic resistant bacteria.	True	164	27.6	430	72.4
The use of antibiotics to stimulate growth in farm animals is legal in Jordan.	False	191	32.2	403	67.8

Table 3. Perceived knowledge, opportunity, and motivation of nurses regarding appropriate antibiotic use and resistance

		SA	A	D	SD	N/A	IDU
Perceived knowledge							
I know what antibiotic resistance is	Count	12	9	35	78	352	108
	Row n %	2.0	1.5	5.9	13.1	59.3	18.2
I know there is a connection between my dispensing of antibiotics and emergence and spread of antibiotic resistant bacteria:	Count	23	7	25	80	242	217
	Row n %	3.9	1.2	4.2	13.5	40.7	36.5
I know what information to give to individuals about prudent use of antibiotics and antibiotic resistance:	Count	23	13	132	186	179	61
	Row n %	3.9	2.2	22.2	31.3	30.1	10.3
I have sufficient knowledge about how to use antibiotics appropriately for my current practice:	Count	15	10	35	88	346	100
	Row n %	2.5	1.7	5.9	14.8	58.2	16.8
I have a key role in helping control antibiotic resistance:	Count	22	10	29	82	265	186
	Row n %	3.7	1.7	4.9	13.8	44.6	31.3
Opportunity							
I have easy access to guidelines:	Count	17	8	46	217	241	65
	Row n %	2.9	1.3	7.7	36.5	40.6	10.9
I need to give advice on prudent antibiotic use and antibiotic resistance:	Count	16	69	140	170	143	56
	Row n %	2.7	11.6	23.6	28.6	24.1	9.4
I need information on managing infections:	Count	26	19	117	203	169	60
	Row n %	4.4	3.2	19.7	34.2	28.5	10.1
Motivation							
I have good opportunities to provide advice on prudent antibiotic use to individuals:	Count	15	6	42	154	304	73
	Row n %	2.5	1.0	7.1	25.9	51.2	12.3
Environmental factors such as wastewater in the environment are important in contributing to antibiotic resistance in bacteria from humans?	Count	18	7	19	108	184	258
	Row n %	3.0	1.2	3.2	18.2	31.0	43.4

Table 4. Respondents (%) who received information on avoiding unnecessary prescribing of antibiotics and its impact on changing their views and practice

Question	Yes	No	Unsure
In the last 12 months, did you receive any information about avoiding unnecessary prescribing of antibiotics? (n=594)	372 (62.6%)	97 (16.3%)	125 (21.1%)
Did the information contribute to changing your views about avoiding unnecessary prescribing of antibiotics? (n=372)	372 (100.0%)	0 (0.0%)	0 (0.0%)
Based on information you received, have you changed your practice on prescribing antibiotics? (n=372)	372 (100.0%)	0 (0.0%)	0 (0.0%)

Each participant was given a summated score, which represented the total number of accurate answers to the knowledge-related questions. based on projections. The average nursing knowledge score for antibiotics was .50.

Low level of perceived knowledge was evident in the study population; for instance, just 21 (3.5%) participants agreed with the statement “I know what ABR is.” The statement “I know there is a connection between my dispensing of antibiotics and the establishment and spread of ABR” was accepted by only 30 responders (6.1%) (Table 3).

Regarding the opportunities, 25 (4.2%) of respondents concurred with the statement that they had easy access to the resources they needed to counsel clients on prudent antibiotic use, and 85 (14.3%) of respondents agreed that they had high accessibility to the infectious disease management guidelines they required. In terms of motivation, 21 (3.5%) of the nurses agreed with the statement that they were aware of a

connection between the appearance of ABR and the prescription of antibiotics. Nearly 25 (4.2%) of the participants believed that they are instrumental in lowering ABR (Table 3).

Only 372 people, or 62.6%, responded “yes” when asked if they had received any information in the previous 12 months about preventing the unnecessary prescription of antibiotics for children. When asked if the information had altered their perspectives, all participants responded “yes,” and more than 100% of them had altered their practices (Table 4).

Regarding the sources of information for antibiotics among children of nurses, 365 (61.4) use Facebook, 21(3.5 %) use Twitter, followed by Insta 93 (15.7%), Google 271 (45.6%), LinkedIn (1.8%), and YouTube 108(18.2%). For the first time, resources for antibiotic information were working environment 227 (48.4%), clinical guidelines in the work setting 129 (27.5%), and social media 122 (26%). The most influencers of changing mind about changing practice toward antibiotics

Table 5. The initiatives in the community to prevent overuse of antibiotics

Initiative	n	n %
Television and advertising	254	42.8
Handbook collections and information resources for health care professionals	110	18.5
Local or regional guidelines on infection management	153	14.0
Raising awareness by professional organizations	167	28.1
Conferences/activities focused on addressing antibiotic resistance	99	16.7
Antibiotic awareness posters or flyers	111	18.7
Newspaper articles (local) on antibiotic resistance	77	13.0
local campaigns	93	15.7
World antibiotic awareness week	62	10.4
I am not aware of any initiatives	58	9.8

were the working environment 170 (36.2%) and clinical guidelines in the work setting 110 (23.5%) and colleagues 84(17.9%).

According to the nurses, the most efficient level for preventing ABR among children was global level 236 (39.7%), followed by all levels 231 (37.7%) and individual level 123(20.7%). The initiatives in the community to prevent overuse of antibiotics based on nurse's information were using handbook collections and information resources for health care professionals (29.4) and advertisement in TV and Radio (29%) (**Table 5**).

DISCUSSION

This is the first study in Jordan to look at nurses' attitudes toward antibiotics and ABR for children as well as their understanding of those topics. Studying the preferred information sources utilized by Jordanian nurses for children and their awareness of the data available to support reasonable prescription practices for children in the Jordanian health system were secondary goals. While nurses in Jordan cannot legally write prescriptions, they do contribute significantly to antibiotic management and play a critical part in the antibiotic distribution process. Given their pivotal role [9, 21, 22]. The results showed that Jordanian nursing staff appears not knowledgeable of the causes of ABR among children, which include improper prescription, prolonged antibiotic treatment, and self-medication [16]. Nurses most commonly cite diagnostic ambiguity and parental/patient demand, protocols, and international recommendations as the most effective methods for reducing this practice of improper use of antibiotics among children. Only one-third of nurses had limited understanding of antibiotic usage and ABR, and two-thirds of nurses believed that resistance to antibiotics and irrational prescription were major problems in the healthcare system.

In our study, the study participants exhibited low levels of perceived knowledge regarding ABR regarding children among nurses, for example, 21 (3.5%) of participants agreed with the statement "I know what ABR among children is." Only 30 (6.1%) of respondents agreed on "I know there is a connection between my dispensing of antibiotics and emergence and spread of antibiotic resistant bacteria." In [23], it was found that nurses have significant knowledge deficiency when it comes to using antibiotics appropriately for gram-negative and anaerobic infections. Future education initiatives may need to provide feedback to nurses and health care teams about their antibiotic use. In a study among paramedics, more than 60% of participants in other studies have similarly stated that they

thought antibiotics should be provided for viral diseases among children [24]. Such misunderstanding may result in unreasonably high antibiotic prescription rates, which could exacerbate the already rising ABR.

In [25], nurses were examined regarding antibiotics and ABR and determine the necessity for a web-based module for education on ABR, we conducted a survey of 312 nurse programs across the US and found that 99.3% of participants to that study required a pharmacology course, and 95% required lectures on antibiotic therapy. It is worth mentioning that less than 10 hours of content on antibiotic therapy are typically included in the nurse curriculum, and 52% of the programs did not include a microbiology course. These findings imply that there is an opportunity for improvement in nurses' baseline and ongoing awareness of antibiotic use and ABR.

In a study for paramedics and nurses, regarding attitudes and practices around the use of antibiotics [24], 93% (410) believed that children's ear infections should always be treated with antibiotics, while 66% (291) believed that antibiotics should be provided even for short-term fevers. 44% (193) of participants, or half, reported that their children had taken antibiotics six times in the previous year. Even though 88% (388) thought antibiotics enhance recovery from colds, However, when asked to assess their attitudes regarding antibiotic use, only 66% of respondents said they are against buying antibiotics for children over the counter.

In our study, regarding first time information for antibiotics among children information were working environment 227 (48.4%), clinical guidelines in the work setting 129 (27.5%), and social media 122 (26%). The most influencers of changing mind about changing practice toward antibiotics for children among nurses were the working environment 170 (36.2%) and clinical guidelines in the work setting 110 (23.5%) and colleagues 84(17.9%). Similar to our findings, some studies demonstrated that nurses mostly relied on published guidelines for prescription antibiotics [2, 26, 27]. Boosting the right use of antibiotics requires the introduction of guidelines and antibiotic stewardship efforts to direct antibiotic prescribing for children among nurses.

In our study, regarding the sources of information for antibiotics of nurses among children, 365 (61.4) use Facebook, 21(3.5 %) use Twitter, followed by YouTube 108(18.2%). Similar to our findings, where our practitioners showed the greatest interest in Facebook, it was found that Facebook is the most used networking site for gathering information [28]. Even though both social and professional networks are easily available, there are many risks involved with them, such as unreviewed content, inaccurate statements, and unapproved medical opinion [29, 30].

In our study, according to the nurses, the most effective levels on preventing overuse of antibiotics among children were working on all levels 225 (37.9%), global level 236 (39.7%), and individual level 123(20.7%). The initiatives in the community to prevent overuse of antibiotics among children based on nurse's information were using handbook collections and information resources for health care professionals (29.4%) and advertisements in TV and radio (29%). Most participants were not informed of the national action plan on ABR for children among nurses in Jordan. One of the key initiatives in Italy that focuses on antibiotic awareness and resistance is professional organizations and conferences/events focused on combating ABR [31]. Furthermore, in Russia, the most prevalent source of antibiotic knowledge for children among health care providers who included nurses was training sessions [32]. These results indicate the need for enhanced engagement of nurses specially who work with children in educational campaigns that focus on safe antibiotic usage.

Limitations

This study has many limitations. First, using the cross-sectional design, which limits the cause-effect relationship between variables and limits the generalizability of the study. Another limitation is using a convenience sample, which limits the generalizability of the finding. Lastly, the study used social media, which limits the participants to people who use social media.

Implications for the Study

Results from this and other research suggest that continued efforts to educate the nurses and public health care team about the safe use of antibiotics in children and the need of enhancing health literacy and knowledge behavior are warranted to combat the rise in antibiotic-resistant infections among children. Furthermore, a community-based health education campaign addressing diverse segments of the community would be the most efficient way to educate people about appropriate antibiotic usage among children.

CONCLUSION

In summary, the findings showed that the study sample exhibited low levels of perceived knowledge. Moreover, the study found that the most reported source for antibiotics information was Facebook. Nurses need further education on proper use of antibiotics. Antimicrobial stewardship can benefit from this study findings, which can help develop interventions to improve antibiotics proper use.

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Ethical statement: This study was approved by Hashemite university IRB in May 2022 with reference code: #2022/345. All participants were assured that the participation in this study is voluntary, and they could withdraw from this study at any time. The participants were told about the benefits and the risks of participating in this study.

Declaration of interest: No conflict of interest is declared by authors.

Data sharing statement: Data supporting the findings and conclusions are available upon request from the corresponding author.

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