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The Impact of Educational Intervention on Jordanian Parents' Knowledge and Attitudes Regarding Children's Antibiotic Use

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ABSTRACT

Background: Self-administration of antibiotics is a common health issue that increases antibiotic resistance. Educational interventions can play an important role in tackling the global dilemma of antibiotic resistance, which is aggravated by antibiotic misuse and overuse. For Jordanian parents, better understanding and attitudes toward antibiotic use for their children can lead to more cautious use of these treatments, potentially lowering the risk of antibiotic resistance. ***Purpose*:** This study aims to evaluate the effect of educational intervention on parents' knowledge and attitudes regarding children's antibiotic use. ***Methods*:** One-group pre-posttest was used. An adapted questionnaire was used composed of socio-demographic data, parents' knowledge, and attitudes toward antibiotics. An educational program consisting of a teaching session of 30 minutes covering information about antibiotics and standardized practice to teach community parents about the appropriate use of antibiotics among their children was utilized, where the education session was adopted by the World Health Organization (WHO) and the American Academy of Pediatrics, and a review of many studies that were held in Arabic countries was carried out (Ashour et al., 2022; Magdy et al., 2021; van Buul et al., 2015). The American Academy of Pediatrics and the Jordan Food and Drug Association have reviewed relevant studies with high content validity. Data for this study was collected between March and August 2023. Data was checked for missing and inconsistency. Descriptive statistics of means, frequencies, standard deviations, and percentages were used with categorical and continuous demographics while inferential statistics of the independent t-test were used after checking the normal distribution of data using SPSS, version 25. ***Results*:** A total of 150 parents were recruited in this study. Around one-third of the parents were from 18 to 25 years old (n=50, 33.3%). A paired-sample t-test was used to assess the mean difference in parents' knowledge and practices toward effective usage of antibiotics. It was revealed that introducing an educational program has caused a statistically significant difference that improved parents' knowledge ($t(149) = 10.5$, $P < 0.001$). For practice, the educational program showed a significant mean difference before intervention (15.0 ±1.05) and post-intervention (16.9 ±3.53), where ($t(149) = 6.02$, $P < 0.001$). ***Conclusion***: An educational-program intervention was carried out to raise the study parents' awareness of antibiotics. Antibiotic-related awareness greatly increased after the educational intervention. ***Implications for Nursing*:** Addressing antibiotic misuse and overuse among Jordanian parents through targeted educational interventions necessitates a complex approach that includes healthcare professionals, legislators, educational systems, and the community. Working collaboratively, all of these stakeholders can help reduce antibiotic resistance and keep antibiotics a useful tool for treating bacterial illnesses in children.

Keywords: Antibiotics use, Children, Upper respiratory tract infection, Knowledge, Attitudes, Parents, Educational intervention.

What does this paper add?

1. It was revealed that introducing an educational program resulted in statistically significant differences that improved parents' knowledge.
2. For practice, the educational program showed a significant mean difference pre-intervention (15.0±1.05) and post-intervention (16.9 ±3.53), with ($t(149) = 6.02$, $P < 0.001$).
3. To guarantee that this increased awareness translates into long-term improvements, and essential changes in health-related behaviors, more initiatives should be undertaken, and more research should be conducted.

Introduction

An antibiotic is defined as a sold natural and chemical substance used in the treatment of major and minor infections to control the spread of infection effectively (Wang et al., 2019). Previously, before the discovery of antibiotics, there was an increase in rates of morbidity and mortality, since there was no effective treatment against microorganisms (Ribeiro da Cunha et al., 2019). By effectively addressing a variety of infectious diseases, the effective use of antibiotics improves health status and demonstrates a good attitude toward health care (Lewis, 2020). However, during the past few decades, an international issue known as antimicrobial resistance has emerged, which is a result of antibiotic abuse (Larsson & Flach, 2022). As a result of both natural and excessive antibiotic medication use, antibiotic resistance refers to the ability of microorganisms to survive against antibiotics that do not kill or stop their growth. Put another way, antibiotics are ineffective in controlling microorganisms that have mutations within the microorganism chain (Iskandar et al., 2022). In Jordan, a survey study was conducted by Abdel-Qader et al. (2020) in the capital of Jordan to investigate the awareness, attitude, and knowledge about antibiotic usage and antibiotic resistance in Jordan's affluent and impoverished districts. It was reported that the Jordanian community had limited understanding and awareness of antibiotic use and antibiotic resistance. Additionally, a study conducted by Alkhaldi et al. (2015) examined how mothers of children with upper respiratory tract infections in Irbid governorate perceive and use antibiotics. It was noted that Jordanian women often lack fundamental understanding and a good attitude towards antibiotic usage, which can lead to poor adherence to antibiotic practices. In conclusion, Jordan requires urgent national programs to promote favorable attitudes towards antibiotics at all levels.

Several factors leading to misuse of antibiotics lead to antibiotic resistance, including the ability to reach antibiotics easily without a prescription leading to buying the incorrect antibiotic, incorrect dosage, longer and shorter duration of use (Li et al., 2022), poor knowledge and practice toward using antibiotics (Zaidi et al., 2021), resubmitting old prescriptions to purchase antibiotics, and exchanging information with friends, which are all factors that lead to increased self-administration of antibiotics (Kabir et al., 2022). For instance, a study was performed by Hammour et al. (2019) to assess the knowledge, attitudes, and practices of parents towards antibiotics use for upper respiratory tract infection (URTI) in Jordan. It was noted that the majority of parents believe that antibiotics should always be provided when a child has a fever. They also feel that most URTIs, regardless of their viral origin, require antibiotics to be treated quickly. Furthermore, some parents believed that antibiotics were efficient in treating all sorts of microbiological diseases with no negative effects.

In the current study, an educational intervention was provided, since educational interventions are strategic acts that try to improve learning outcomes, increase teaching effectiveness, and address educational difficulties among Jordanian parents toward the effective use of antibiotics. This is supported by a study performed by Shehadeh et al. (2016) who concluded that adopting an educational intervention focused on antibiotic need and use, with the primary goal of increasing public awareness of antibiotics, can be a useful and realistic technique which serves as the foundation for a larger-scale public educational intervention study and nationwide antibiotic campaign.

World Health Organization (WHO) (2022) defines the self-administration of drugs as treating symptoms of the disease without a prescription by a doctor, buying medication without a prescription, using old prescriptions to buy medicines, sharing medications with relatives and friends, and using medications stored at home. According to estimates, bacterial antimicrobial resistance (AMR) caused 4.95 million fatalities worldwide in 2019 and was directly responsible for 1.27 million deaths. Self-administration of antibiotics is a

global problem that affects not only low-developed countries, but also developed countries, especially for the treatment of cold and upper respiratory tract infection (Bodycot et al., 2021). Antibiotic misuse is a catastrophic phenomenon that affects not only the patients, but also the whole community due to an increase in the bacterial-resistance chain that has occurred in a natural process since the discovery of antibiotics (Durand et al., 2019). A study conducted in the United Kingdom (UK) found that people in deprived areas were less knowledgeable about antibiotic use than those in rich ones (Mason et al., 2018). In Sweden, individuals were unsure about the distinction between viruses and bacteria, and approximately 20% believed that drugs treated ordinary colds (André et al., 2010). In Italy, only 9.8% of the public correctly defined antibiotic resistance, and according to the survey, the predictors for using antibiotics without a prescription were age and the perception that antibiotics are prescribed for treating common cold (Ventola, 2015). In Jordan, the society exhibited a general lack of understanding and awareness regarding antibiotic use and antibiotic resistance (Abdel-Qader et al., 2020).

Economically speaking, resistance is referred to as a negative externality, because it has an unfavorable impact on parties other than the antibiotic's direct user (Lessa & Sievert, 2023). Supported by a review study conducted by Ahmad and Khan (2019), who reported that external costs are temporal in that consumers also bear the costs when the repercussions of their resistance manifest, but they are cross-sectional in that they are placed on numerous parties outside of customers. Beyond educational interventions, tackling antibiotic abuse necessitates a multi-faceted approach that includes policy changes to restrict the use of antibiotics to cases where they are medically necessary, enforce regulations on prescribing antibiotics, and manage the use of antibiotics in agriculture to reduce the spread of antibiotic-resistant bacteria, along with healthcare-provider training to ensure that antibiotics are prescribed only when necessary and in the appropriate dosages, as well as the development and promotion of quick diagnostic tests that can help healthcare providers distinguish between bacterial and viral infections more accurately (Nair et al., 2023; Silva et al., 2019).

The health-belief model (HBM) is the theoretical framework that integrates concepts from health education, behavior change of parents toward antibiotic use, and cultural considerations. The health-belief model is a well-rounded theoretical framework that could explain and guide the educational-intervention design, implementation, and evaluation among parents toward the effective use of antibiotics (Abraham & Sheeran, 2015).

Background

Children were the most vulnerable group who needed special care from their parents during their illness period frequently complaining of upper respiratory tract infections which were usually related to viral infections, such as common cold, rhinitis, pharyngitis, and otitis media (Mustafa et al., 2020). However, poor knowledge, attitudes, and practices toward antibiotic use were found among parents. For instance, a study in Saudi Arabia performed by Mustafa et al. (2020) found that parents have inadequate attitudes, understanding, and practices about antibiotics for their children. These results emphasize the necessity of stricter antibiotic-prescription rules as well as parental education programs about the use of antibiotics. Besides, physicians prescribed antibiotics to treat mild infections and viral infections associated with fever in childhood, especially oral antibiotics (Mutagonda et al., 2022). On the other hand, parents and pediatricians are implementers of appropriate and inappropriate use of antibiotics (Xu et al., 2020). So, adequate parents' knowledge and attitude regarding the use of antibiotics correctly represent the basic factor in preventing increased antibiotic-resistance problems (van Houten et al., 2019). A cross-sectional study conducted in Egypt by Soliman et al. (2020) found that 92% of the participants were unaware of antibiotic resistance, and 40% used antibiotics without a prescription. Several studies found that the prevalence of self-administration of antibiotic drugs in Jordan and developing countries is at a high level (Haddadin et al., 2019; Karasneh et al., 2021). The knowledge and attitude of parents toward antibiotic use in Jordan are poor, since around a half of Jordanian parents use antibiotics to treat common cold, cough, sore throat, and influenza using self-administration (Nusair et al., 2021). Hence, the objectives of this study are to (1) assess the parents' knowledge and practices of using antibiotics among their children, and (2) measure the effectiveness of an educational intervention on parents' knowledge and attitudes towards using antibiotics among their children.

Materials and Methods

Design

One-group pre-posttest was used.

Population and Settings

The accessible population was all Jordanian parents. However, the target population was Jordanian parents who met the inclusion criteria; namely, (1) parents who have children below 14 years of age (2) parents aged between 18 and 50 years, (3) those able to attend an educational program of antibiotic use, (4) those who agree to participate. Parents were recruited conveniently from pediatric hospitals and outpatient clinics. Pediatric hospitals and outpatient clinics are directly relevant settings; in these facilities antibiotics are frequently prescribed, and potential misuse can be observed and measured. Convenience samples provide the researchers with free access to efficiently gather data from readily available participants.

The study started in March 2023 and ended in August 2023. The study was calculated using G*power, which shows that the minimum required sample size was 100 participants based on α =0.05, power =0.80, and moderate effect size =0.30 (Faul et al., 2009). However, a larger number of participants was considered to compensate for the attrition rate that could happen during the data-collection process.

Instrument

The study's instrument was adapted from the WHO and the American Academy of Pediatrics, as well as the review of many studies that were held in Arabic countries (Ashour et al., 2022; Magdy et al., 2021). The questionnaire was composed of three main sections; (1) Socio-demographic data including age, sex, educational level, number of children, child's age, monthly income, and presence of medical insurance, (2) a questionnaire that assesses parents' knowledge composed of 12 items scored as follows (yes=2, no=1, and I don't know=0), and attitudes composed of six items scored using a 5-point Likert scale (5=strongly agree, 4=agree, 3=neither agree nor disagree, 2=disagree, and 1=strongly disagree). The maximum score of knowledge was 24 and the minimum score was 0. A higher score reflected a higher parents' knowledge about antibiotic effective use. For the attitude scores, 30 is the maximum score, while 6 is the minimum score. A higher score indicates a more positive attitude.

An educational program was held in this study, consisting of a teaching session lasting for 30 minutes about the main facts about the effective use of antibiotics that enhance parents' knowledge and attitude toward using antibiotics effectively. The third part was a questionnaire that was used to evaluate the effectiveness of the educational session.

The current validity of the questionnaire was requested by four experts in community-health nursing to assess whether the questionnaire items properly measure the knowledge and practices of parents regarding antibiotic use, and all modifications carried out were based on the experts' advice.

Ethical Considerations

Ethical approval was granted by the Institutional Review Board (IRB) at Al-Balqa Applied University (#.120/2/3/26). The aim, significance, risks, and benefits were fully explained to the participants. All participants' information was treated as strictly confidential. Only the researchers have access to information that is kept in a safe, private place.

Data-collection Procedure

After granting the required approval, the outpatient client centers were contacted to announce the educational intervention. The center's administrators were met to explain the purpose, significance, and possible benefits. A comfortable space was provided to the parents, and consent forms were obtained. Then, an assessment of parents' knowledge and attitude about antibiotic use was carried out. An educational program about the proper use of antibiotics was provided to all parents who attended the session. Appropriate strategies for giving antibiotics were given, focusing on avoiding using antibiotics without a prescription, not sharing antibiotics with others, taking antibiotics even with feeling better and not stopping them abruptly, and not skipping antibiotic dosage. A pilot study was directed to 20 parents to examine the applicability of the questionnaire, and those parents were omitted from the study sample. Parents reported that the questionnaire is simple to read and understand. Therefore, the educational intervention has a positive feedback. Hence, the adopted questionnaire has no modifications. Internal reliability was calculated, and the Cronbach's alpha value was 0.85, indicating satisfactory results.

Statistical Analysis

Statistical Package for Social Sciences, version 28, was used to analyze the collected data. Data was checked for missing and inconsistency. Descriptive statistics of means, frequencies, standard deviations, and percentages were used to describe categorical and continuous demographics. Inferential statistics of the independent sample t-test were used to assess the mean difference between pre-test and post-test educational intervention, after checking the normal distribution of data. P-value was significant at ≤ 0.05.

Results

A total of 200 parents were invited to participate in this study. However, a total of 150 responded to the invitation and participated. The response rate was 75%, indicating a positive response from parents. Around one-third of parents were from 18 to 25 years old (n=50, 33.3%). Female parents were the most targets who attended the educational program (n=106, 70.7%). More than a half of parents had a secondary or primary educational level (n=86, 57.3%). Around two-thirds of parents had less than 500 JOD as monthly income (n=111, 47.0%) with medical insurance (n=113, 75.3%). See Table 1.

Table 1. Demographical characteristics of parents (n=150)

Variables	N (%)
Age (years)	
18-25	50 (33.3)
26-30	35 (23.3)
31-35	25 (16.7)
36-40	20 (13.4)
>40 years	20 (13.3)
Sex	
Male	44 (29.3)
Female	106 (70.7)
Educational level	
Secondary or less	86 (57.3)
Diploma	29 (19.3)
Bachelor	28 (18.7)
Higher education	7 (4.70)
Number of children	
1-4	81 (54.0)
>4	69 (46.0)
Child's age	
Newborn-3 years	53 (35.3)
4-7 years	58 (38.7)
8-14 years	39 (26.0)
Monthly income	
<500 JOD	111 (74.0)
500-1000 JOD	37 (24.7)
>1000 JOD	2 (1.30)
Insurance	
Yes	113 (75.3)
No	37 (24.7)

Notes: N=Number, %=Frequency.

The average of knowledge items was calculated before and after the educational intervention. It was revealed that parents had an average perception that antibiotics should not be sold without a prescription of (1.07 ± 0.26) before education, while it was (2.11 ±0.76) after the educational intervention. A noticeable improvement in knowledge regarding the item "I did not give antibiotics for my child, since my friends advised me to do so" in which it was (1.07 ±0.25) pre-intervention and (2.16 ±0.74) post-intervention. Many parents had an increase in knowledge regarding the item related to antibiotic resistance (1.15 ±0.41), which improved to be (1.69 ±0.77). Total knowledge of all items was (12.8 ±1.01) before introducing the

educational program, while it was (16.2 ±4.06) after the educational program. See Table 2.

Table 2. Knowledge means before and after educational intervention

No.	Items	Pre-knowledge	Post-knowledge
		M ±SD	**M ±SD**
1	Antibiotics should not be sold without a prescription	1.07 (0.26)	2.11 (0.76)
2	Taking the antibiotic completely as described	1.92 (0.29)	1.59 (0.82)
3	Because the doctor has prescribed antibiotics for my child every time, the child should get the same antibiotics	1.88 (0.35)	1.51 (0.75)
4	Buying antibiotics from the pharmacist without a prescription	1.88 (0.33)	1.33 (0.65)
5	I did not give antibiotics to my childs, since my friends advised me to do so	1.07 (0.25)	2.16 (0.74)
6	I do not skip doses when starting giving the antibiotic	1.09 (0.28)	2.15 (0.74)
7	Completing the prescribed treatment course, even when the child begins to feel better	1.87 (0.35)	1.69 (0.69)
8	If the doctor does not give an antibiotic, I change that doctor	1.15 (0.41)	1.55 (0.67)
9	Antibiotics treat certain types of infections, and taking the wrong medications may delay the correct treatment and allow bacteria to increase	1.93 (0.26)	2.14 (0.81)
10	I do not save antibiotics for the next disease	1.95 (0.23)	1.43 (0.66)
11	Antibiotics have side effects, so they should be stopped when symptoms improve	1.87 (0.35)	1.77 (0.72)
12	Repeated use of antibiotics can increase bacterial resistance	1.15 (0.41)	1.69 (0.77)
	Total mean of pre-and post-knowledge score	**12.8 (1.01)**	**16.2 (4.06)**

Notes: M=Mean, SD=Standard Deviation.

A noticeable improvement in the mean of attitudes among parents toward antibiotic use effectively was achieved after introducing the educational program. It was shown that parents had an average of (1.00±0.00) of practicing not using antibiotics against viral infection. However, it reached an average of (1.41 ±0.64) after the educational interventions. A slight improvement in the practices of parents in the item "Antibiotics cause inflammation of viruses at children symptoms of cold and influenza" with (1.94 ±0.22) before and (1.95 ±0.59) after the intervention. The total practice score of parents was (15.0 ±1.05) before the educational intervention and improved to (16.9 ±3.53) after the intervention. See Table 3.

Table 3. Parents' attitudes means before and after educational intervention

No.	Items	Pre-attitude	Post- attitude
		M ±SD	**M ±SD**
1	Antibiotics are not effective against viruses	1.00 (0.00)	1.41 (0.64)
2	Parents give the antibiotic to their children even if it is necessary to wait	1.15 (0.36)	1.50 (0.70)
3	I am not satisfied if the pediatrician assures that the child does not need an antibiotic for the symptoms of inflammation	1.29 (0.26)	1.70 (0.69)
4	Antibiotics cause inflammation of viruses in children with symptoms of cold and influenza	1.94 (0.22)	1.95 (0.59)
5	Antibiotics are always needed for children with infections	1.61 (0.49)	1.83 (0.83)
6	A child with cold and heat symptoms will be sick for a longer period if he/she is not treated with antibiotics	1.12 (0.33)	1.83 (0.82)
	Total mean of pre-and post-attitude score	**15.0 (1.05)**	**16.9 (3.53)**

After checking the distribution of data, it showed normal distribution. A paired-sample t-test was utilized to assess the mean difference among parents' knowledge and attitudes before and after the introduction of the educational intervention. It was revealed that introducing the educational program has caused a

statistically significant difference that improved parents' knowledge (t (149) = 10.5, *P* <0.001). Furthermore, for practices, the educational program has shown a significant mean difference pre-intervention (15.0 ±1.05) and post-intervention (16.9 ±3.53) with (t (149) = 6.02, <0.001). See Table 4.

Table 4. The mean difference in knowledge and attitudes of parents toward using antibiotics (n=150)

Variable	M±SD	t	df	P-value
Knowledge				
Pre-intervention	12.8 (1.01)	10.5	149	0.001*
Post-intervention	16.2 (4.06)			
Attitudes				
Pre-intervention	15.0 (1.05)	6.02	149	0.001*
Post-intervention	16.9 (3.53)			

Note: * is significant at 0.001 level.

Discussion

This study highlights the effect of educational intervention on parents' knowledge and attitude regarding children's antibiotic use, especially those with an upper respiratory infection. Worldwide, enhancing the parents' knowledge about antibiotic use and antibiotic resistance by conducting periodic educational interventions has been strongly advocated (Abd El-Kader & Mohammed, 2021). Misuse and inappropriate use of antibiotics among children is a crucial factor for the development of bacterial resistance that increases the social, economic, and clinical burdens (Mallah et al., 2022).

Applying HBM in the current study can draw a strong argument for the successful implementation of an educational program among parents. Perceived severity and susceptibility can be applied by educating parents about the serious consequences of antibiotic resistance and their children's susceptibility to these consequences might motivate behavior change. Perceived benefits highlight appropriate antibiotic use, such as maintaining the effectiveness of antibiotics for future generations that can encourage adherence to guidelines, as well as perceived barriers through addressing common barriers to proper antibiotic use, such as misconceptions about antibiotics' effectiveness against viral infections which could improve adherence. The educational intervention provides a great opportunity to learn about the essential tips of health (Solhi et al., 2020). Furthermore, it can significantly improve the parents' knowledge and practice regarding the appropriate use of antibiotics (Al-Ayed, 2019). The results of this study revealed a low knowledge of proper statistics regarding antibiotic use and causes of antibiotic resistance before introducing the educational, interventional program. This could be related to a lack of public awareness and education related to insufficient public-health campaigns and gaps in school curricula, in addition to misconceptions and cultural beliefs about the effectiveness of antibiotics. However, the knowledge and attitude of parents about using antibiotics is significantly improved through the educational program. This finding is consistent with studies that were conducted by Shehadeh et al. (2016), and Abd El-Kader and Mohammed (2021), who reported that the overall knowledge about appropriate antibiotic use improved after educational intervention. Moreover, the present finding was in line with a community-based interventional study conducted in the United Arab Emirates by Rabbani et al. (2020) using an awareness survey of the World Health Organization about antibiotic resistance. It was revealed that knowledge about antibiotics of parents was better after the educational intervention.

Educational interventions can have a significant long-term impact on behavior change toward an effective use of antibiotics, affecting both individuals and communities over time. Firstly, improving knowledge and skill can lead to sustained improvements in the effective use of antibiotics and restrict the behaviors that lead to misuse of antibiotics (Rábano-Blanco et al., 2019). Secondly, change of behavior can be achieved through applying effective interventions to alter norms and attitudes and make positive behaviors toward the effective use of antibiotics (Maarouf et al., 2023). This could be sustained through continuous support and reinforcement, community involvement,

incorporation into routine and policy, building self-efficacy, and peer support and social networks (Maarouf et al., 2023; Price et al., 2018).

The results of the current study showed that parents demonstrated favorable behavioral changes intended to address the resistance issue and increased awareness of the phenomenon of antibiotic resistance as well as optimal antibiotic use after receiving a focused educational intervention. Targeted parent-based programs can also greatly assist government efforts in overcoming antibiotic resistance.

This study found that parents' knowledge was poor concerning using antibiotics with viral infections, and based on friends' advice, they use the same antibiotic to treat upper respiratory infections. These findings were consistent with a study performed by Mijović et al. (2022) who found that pediatricians in their practice provided antibiotics daily for about 61.1% of the children. When determining whether to treat their children with antibiotics, the majority of parents surveyed (98.4%) said that their primary source of information is their doctor. Along the same line, in a study conducted in Jordan by Abdel-Qader et al. (2020), it was reported that the society exhibited a general lack of understanding and awareness regarding antibiotic use and antibiotic resistance. Besides, a similar study performed by Sireen et al. (2015) found that the majority of Jordanian mothers lack fundamental understanding and a favorable attitude toward antibiotic use, which is exacerbated by inadequate antibiotic practices.

Regarding parents' practice score towards antibiotic use, the present study revealed a satisfactory practice score of parents regarding antibiotic use after an educational program with a high statistically significant difference due to the effect of educational vision in improving the parents' practice to use antibiotics properly and minimizing the incidence of misuse. Parents give the antibiotic to their children if it is not necessary to wait and a child with cold and heart symptoms will be sick for a longer period if not treated with antibiotics, underscoring the satisfactory improvement in practice when comparing pre-test and post-test. This result is similar with the previous result which found that overall practice's score of parents was unsatisfactory before implementing the educational program, with an improvement of the overall practice score after the implementation of the educational program (Abd El-Kader & Mohammed, 2021).

Implications for Nursing

The effect of educational interventions on Jordanian parents' knowledge and attitudes toward antibiotic use among their children has important implications for nursing practice. Nurses have an important role in patient education, healthcare delivery, and public-health activities, making them critical in combating antimicrobial abuse and resistance. Nurses can participate actively in providing educational intervention and counseling based on their concerns and misconceptions about antibiotic use, reinforcing the messages from broader educational campaigns. Besides, nurses can work with educators to incorporate information on antibiotic usage and resistance into school health programs, utilizing the school setting to reach children and their parents.

Strengths and Limitations

This study is considered a community-based design that targeted a crucial part of society, because of its planned implementation of the intervention, as well as its variety of data. It has been demonstrated that a community-based strategy works well for disseminating knowledge about public-health issues. Our pre-intervention findings about the degree of antibiotic awareness are consistent with those of earlier research conducted in Jordan. Our study has several limitations, such as being limited to the northern part of Jordan, which could limit the generalizability of results, pre-post study design, selection bias because we were unable to select a random sample, lack of information regarding the intervention's long-term effects, lack of a control group, and self-reporting bias. It is recommended in future studies to conduct multi-center studies in different regions in Jordan and use a sample or clustered, random sampling techniques.

Conclusion

The study's parents had a low level of knowledge about antibiotic use and resistance. An educational program was implemented to increase the study parents' understanding of antibiotic use effectively. Antibiotic-related awareness increased significantly following the educational intervention. More activities should be launched to ensure that this increased knowledge leads to long-term, crucial changes in health-related behaviors.

Ethical Approval

Ethical approval was obtained from the Institutional Review Board (IRB) at Al-Balqa Applied University [number (#.120/2/3/26)].

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Conflict of Interests

No conflict of interests is to be declared by the authors.

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