

HOSTED BY



Contents lists available at ScienceDirect

Saudi Pharmaceutical Journal

journal homepage: www.sciencedirect.com

Original article

Parental health-seeking behavior on self-medication, antibiotic use, and antimicrobial resistance in children



Premalatha Paulsamy^a, Krishnaraju Venkatesan^{b,*}, Shadia Hamoud Alshahrani^a, Maha Hamed Mohamed Ali^c, Kousalya Prabahar^{d,e}, Vinoth Prabhu Veeramani^d, Nahid Khalil Elfaki^f, Rasha Elsayed Ahmed^{g,h}, Hala Ahmed Elsayes^{i,j}, Yahya Hussein Ahmed Abdalla^f, Osman Babiker Osmn Mohammed^k, Absar Ahmed Qureshi^l, Friyal Alqahtani^m, Sirajudeen Shaik Alavudeenⁿ

^a College of Nursing, Mahala Branch for Girls, King Khalid University, Asir, Saudi Arabia^b Department of Pharmacology, College of Pharmacy, King Khalid University, Abha, Asir, Saudi Arabia^c Faculty of Medical and Applied Science, Public Health Department, King Khalid University, Asir, Saudi Arabia^d Department of Pharmacy Practice, Faculty of Pharmacy, University of Tabuk, Tabuk, Saudi Arabia^e Department of Pharmacy Practice, Faculty of Pharmacy, Dr. M.G.R. Educational and Research Institute, Velappanchavadi, Chennai, Tamil Nadu, India^f College of Nursing, Najran University, Najran, Saudi Arabia^g Medical-Surgical Nursing, College of Nursing, Tanta University, Egypt^h College of Nursing, Mahala Branch for Girls King Khalid University, Asir, Saudi Arabiaⁱ Psychiatric and Mental Health Nursing, Faculty of Nursing, Tanta University, Egypt^j Psychiatric and Mental Health Nursing, Faculty of Nursing, King Abdul Aziz University, Saudi Arabia^k Public Health, Al-Baha University, Saudi Arabia^l Department of Pharmacology, College of Pharmacy, King Khalid University, Abha, Asir Province, Saudi Arabia^m Department of Community Nursing, College of Nursing, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabiaⁿ Department of Clinical Pharmacy, College of Pharmacy, King Khalid University, Abha, Saudi Arabia

ARTICLE INFO

Article history:

Received 20 March 2023

Accepted 22 July 2023

Available online 2 August 2023

Keywords:

Health seeking behavior

Self-medication

Antimicrobial resistance

Antibiotics

Knowledge

Attitude

Children

Parents

ABSTRACT

Aim and Objectives: The study sought to identify parental trends in children's self-medication, health-seeking behavior, knowledge of self-medication, antibiotic use, and antimicrobial resistance in Asir, Saudi Arabia.

Methods: A web-based cross-sectional study was carried out by a survey questionnaire. Snow Ball sampling technique was used to select the Eight hundred and sixteen parents with children in the Asir region by WhatsApp and email, and 650 participants who met the inclusion criteria consented to participate in the study.

Results: There were 1809 episodes of childhood illnesses reported during the study period. The mean scores are on knowledge at 8.11 ± 2.43 , favorable attitude at 17.60 ± 1.17 , and practice was 7.72 ± 1.72 , and a significant correlation was found between knowledge, attitude, and practice (KAP) at $p = 0.01$. Out of 624, the majority of parents showed strong knowledge and proficiency in antibiotics. However, the attitude scores of over 50% towards the usage of antibiotics were subpar. Around 54% of parents were self-medicating their children and 43% were unaware that skipping doses contributes to anti-microbial resistance (AMR). The facilitators for self-medication were male gender (aOR: 2.13; 95% CI: 1.26–3.98, $p < 0.05$), having more children (aOR: 2.78; 95% CI: 1.27–4.12 $p < 0.01$), professional qualification

* Corresponding author.

E-mail addresses: pbonnuthai@kku.edu.sa (P. Paulsamy), kvenkatesan@kku.edu.sa (K. Venkatesan), shalshrani@kku.edu.sa (S. Hamoud Alshahrani), drmahah734@gmail.com (M. Hamed Mohamed Ali), kgopal@ut.edu.sa (K. Prabahar), vveeramani@ut.edu.sa (V. Prabhu Veeramani), nkidrees@nu.edu.sa (N. Khalil Elfaki), raelsalem@kku.edu.sa (R. Elsayed Ahmed), hala.elsayas1@nursing.tanta.edu.eg, halsayas@kau.edu.sa (H. Ahmed Elsayes), yhabdulla@nu.edu.sa (Y. Hussein Ahmed Abdalla), Obabiker@bu.edu.sa (O. Babiker Osmn Mohammed), aqureshi@kku.edu.sa (A. Ahmed Qureshi), Fmalqahtani@iau.edu.sa (F. Alqahtani), sshaik@kku.edu.sa (S. Shaik Alavudeen), sshaik@kku.edu.sa (S. Shaik Alavudeen).

Peer review under responsibility of King Saud University.



Production and hosting by Elsevier

<https://doi.org/10.1016/j.jsps.2023.101712>

1319-0164/© 2023 The Author(s). Published by Elsevier B.V. on behalf of King Saud University.

This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

(aOR:3.07; 95% CI 1.57– 4.68; $p < 0.01$), residing in urban area (aOR: 3.17; 95% CI: 2.13–5.61, $p < 0.05$), working in health care (aOR: 5.99; 95% CI: 1.78–18.2, $p < 0.01$) and high income (aOR: 3.57; 95% CI: 2.08–6.34, $p < 0.05$).

Conclusions: The findings indicated that the majority of parents had unfavorable views and improper practices of antibiotic usage. Strategic education programs to the targeted population, especially to the parents about side effects of antibiotics, dangerous consequences of self-medication, and crucial AMR concerns must be addressed immediately.

© 2023 The Author(s). Published by Elsevier B.V. on behalf of King Saud University. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Drug utilization in children is a key global concern. Most parents self-medicate their kids when they are ill as a first resort, which may lead to potential serious consequences such as antimicrobial resistance (AMR). AMR causes more than 1.27 million deaths worldwide each year and indirectly causes an additional 4.95 million (Murray et al., 2022), leading WHO to name AMR as a part of the top ten health hazards to the world population in 2019 (Thangaraju and Venkatesan, 2019). Antibiotic misuse and overuse are among the most significant factors in the rise of antibiotic resistance in humans among the causes examined. For instance, self-medication or poor therapeutic compliance might result in the misuse of antimicrobial medicines (Kardas, 2005). Hence, Worldwide, initiatives are being made to measure public awareness and knowledge of antibiotic usage and antimicrobial resistance. The WHO's Global Action Plan on Antimicrobial Resistance (AMR) lists five important priority areas: increasing public knowledge of AMR and antibiotics to encourage successful behavioral changes in population-level antibiotic usage.

As a result, there are continuing multi-country surveys to evaluate parents' knowledge, behaviors, and awareness linked to antibiotic usage (WHO Organization, 2017; European Commission, 2016). These studies on the use of antibiotics in many nations reveal widespread misunderstandings about the proper usage of antibiotics and the emergence of antibiotic resistance (Jamhour et al., 2017). This erroneous "inappropriate" usage of antibiotics is frequently linked to unfavorable antibiotic use behaviors, such as sharing leftover medicines with others or self-medication (Jamhour et al., 2017). Additionally, a recent World Health Organization study revealed that the majority of participants in underdeveloped nations thought antibiotics might be used to treat viral illnesses (WHO Organization, 2017) which leads to AMR.

The prevalence related to self-medication among children is relatively significant, according to numerous research done to assess the patterns of self-medication in children. Parents, both in developing and developed nations, mostly choose to handle their child's common illnesses including fever, cough/cold, and diarrhea at home rather than seeing a doctor (Sontakke et al., 2017). Among the most popular self-medications, antipyretics, analgesics, cough and cold remedies, and anti-inflammatory drugs are all used (Alele et al., 2015).

If significant steps are not taken to eradicate this developing hazard by 2050, it is predicted that AMR would cause more than 10 million fatalities and cost \$100 trillion (WHO Organization, 2017; Founou et al., 2016; Verraes et al, 2016). There have been earlier descriptions of population knowledge, attitude, and practice (KAP) about AB usage in Arab nations, and Saudi Arabia in particular (Bin Nafisah et al., 2017; Yusef et al, 2018; Khan et al, 2021; Almeleebia., 2021; Yagoub et al, 2019; Hijazi et al., 2021; Alqarni et al., 2019). Since Saudi Arabia recently enacted stringent laws and limits on dispensing antibiotics and created a MOH Emergency Call Center (also known as the 937 Service), to enable people to

speaking with a doctor and obtain an e-prescription over the phone or online (<https://moh.gov.sa/en/937/pages/default.aspx>, Accessed on 11/05/2022; <https://www.moh.gov.sa/en/Ministry/MediaCenter/News/Pages/news-2018-05-06-001.aspx>, Assessed on 10/07/23), an evaluation has not yet been carried out in the Asir region, despite the fact that it is crucial to ascertain how people especially parents feel about the use of antibiotics. Therefore, the purpose of our study is to identify parental trends in children's self-medication, health-seeking behavior, knowledge of self-medication, antibiotic use, and antimicrobial resistance in Asir, Saudi Arabia.

2. Methods

2.1. Design

Through different social media platforms, a web-based cross-sectional study was carried out utilizing a survey questionnaire to the parents in the Asir region of Saudi Arabia.

2.2. Population, sample, and setting

Between November 2021 and January 2022, recruitment took place. The study samples were parents with children who were willing to join and lived in the Asir region. The Raosoft calculator (http://www.raosoft.com/sample_size.html, Assessed on 05/07/23) was used to determine the sample size and it was determined as 650 as minimum. Participants without children and those residing outside of Saudi Arabia were disqualified. Snow Ball sampling technique was used to collect the samples. The parents referred their friends and family members. The survey tool was sent through email and WhatsApp to the university email groups and requested to forward as many people as they could. Eight hundred and sixteen participants were contacted in which 650 participants who met the inclusion criteria were signed up for the research after getting consent. Among the selected samples, only 624 had the complete information which was taken for analysis (Fig. 1). This study was approved by the Research Ethics Committee of King Khalid University, K.S.A.

2.3. Data collection instruments

Google Forms was used to develop a self-administered questionnaire for gathering the data. The questionnaire was translated into Arabic after the content validity and Google forms were prepared both in English and Arabic. The U.S. Agency for International Development, Management Sciences for Health, Macro International Inc. Antimicrobial resistance module (https://www.dhsprogram.com/What-We-Do/Survey-Types/upload/AMR_Mod_8_5_8_FINAL.pdf, Assessed on 05/07/23) was used after needed modifications, to create a survey instrument that covers the demographic data, knowledge, attitude, and practice on self-medication, antibiotic use, and antimicrobial resistance. The

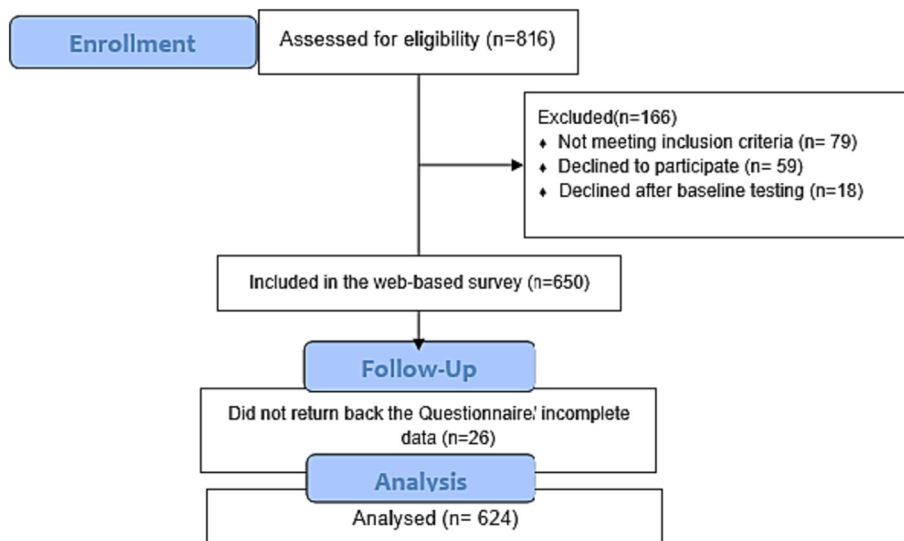


Fig. 1. Flow Diagram showing the process of sample selection.

health-seeking behavior was assessed to know the number of illnesses encountered in their children, the parent's actions/responses related to that, and the most common drugs used for self-medication. Pretesting was done among 20 randomly selected individuals for clarity, relevance, and acceptability and the created draft survey instrument was sent to 10 randomly chosen faculty members to evaluate the readability and validity. The questionnaire comprised 5 parts. The first part was on demographic information of the parents such as age, sex, and occupation (10 items). The second part included a checklist of common drugs used for Self medication and the types of solutions taken by parents when their children were sick. The third part identified various aspects of d knowledge with 20 items (Identification of antibiotics, knowledge of antibiotics, side-effects, self-medication, AMR). The fourth part assessed the attitude and practices of the parents. The 5th part was on the health-seeking behavior of the parents. The survey instrument took approximately 10–15 min to complete.

2.4. Statistical analysis

The data was examined using Microsoft Excel 2016 and the Statistical Package for Social Sciences (SPSS) version 23. Continuous data and categorical data were analyzed using Chi-square, one-way ANOVA, and Fisher Exact tests, respectively. For demographic variables, a descriptive statistical analysis was done. While categorical data were reported as a number (n) or a percentage (%), continuous data were presented as mean and Standard Deviation (SD). In order to identify the variables associated with sufficient knowledge, a favorable attitude, and appropriate practice, binary logistic regression analyses were also executed. The associations were stated as adjusted odds ratios (aOR) and 95% confidence intervals (CI). Finally, the statistical significance was defined as a P-value of 0.05 or lower.

3. Results

3.1. Demographic characteristics of the study sample

The distribution of demographic features of the study participants shows that 60% of the participants were male, the median age was 36 ± 5.8, and 49.4% were having two children. Around

50% had Bachelor's and above degrees and 27% had a professional qualification. Regarding the area of residence, 68% were from urban areas, and around 24% were working in the healthcare sector. Around 37% of the study participants had an average monthly income of 10000--20000 SAR. (Table 1).

Fig. 2 shows the common drugs used for self-medication in which painkillers (35.3%), fever medications (30.3%), and antibiotics (29%) were the most common with antacids as the least common medication taken without prescription. Regarding the illnesses faced by the children, there were 1809 instances of diseases documented throughout the data collection period as part to learn more about how people sought out health care. The average number of episodes of illness per household during a two-month period was 2.9 in both rural and urban areas. Acute illnesses with a shorter duration and chronic illnesses with a much longer duration are among the ailments that were recorded during this time. Fever (30.5%), upper and lower respiratory tract infections (17.4%), including pneumonia (2.9%), gastroenteritis (3.5%), skin conditions (6.6%), and aches and pains across all therapeutic categories (17.9%) were the most prevalent short-term diseases. More than 250 parents said that they gave medications without prescriptions, plant extracts, or tried home remedies, and 172 parents said that they used previous prescriptions (Fig. 3).

3.2. Knowledge of the study sample on antibiotic self-medication, its' usage, and AMR

Table 2 depicts the participant's knowledge of antibiotic self-medication, its' usage, and AMR. The mean score of knowledge was 8.11 ± 2.43. Regarding the identification of antibiotics, the majority of the participants (88%) correctly identified the antibiotics, 86% had adequate knowledge of the role of antibiotics and only 56% had adequate knowledge of the side effects of antibiotics. On antibiotic self-medication, 48% had an opinion that they can take self-medication without a prescription and 72% said that they can stop the course of antibiotics if their symptoms reduce and 96% expressed the need for the public campaign on rational use of antibiotics. Around 66% do not know that antibiotics can create life-threatening side effects among children and 41% of the parents denied that children with incomplete or improper antibiotic dosage may develop AMR.

Table 1
Distribution of demographic variables of the Participants.

Variables	N (n = 624)	%
Gender		
Male	377	60.4
Female	247	39.6
Age		
Median age	36	5.8
Education		
Below secondary	24	3.8
Secondary	124	19.9
Professional Qualification	167	26.8
Bachelors and above	309	49.5
Area of residence		
Urban	426	68.3
Rural	198	31.7
Occupation		
Student	116	18.6
Non-Health care	74	11.9
Health care	148	23.7
Own business	178	28.5
Others	108	17.3
No. of Children		
One	201	32.2
Two	308	49.4
More than two	115	18.4
Average monthly family income		
5000---10000 SAR	207	33.2
10000---20000 SAR	232	37.2
More than 20,000 SAR	185	29.6
Recent hospital visits in the past 1 year		
Within past 6 months	456	73.1
>6 months ago	141	22.7
Not visited	27	4.2
Are you getting advice on how to use antibiotics while getting antibiotic prescription for your child from any health care professionals?		
Yes	549	88
No	75	12
Do you know the MOH 937 Service and its role on AB prescriptions?		
Yes	233	37.3
No	391	62.7

3.3. Attitude of the study sample on antibiotic self-medication, its usage, and AMR

Regarding the participants’ attitudes toward various aspects of antibiotics (Table 3), the majority of the participants had a favorable attitude towards taking antibiotics to reduce the severity of illness. Antibiotic resistance and safety, around 30% of the participants only had the correct attitude and nearly 30% were uncertain about antibiotic resistance and safety. Regarding the attitude towards the doctor’s prescribing of antibiotics, 80% were willing

to learn about AMR while 32% expressed that they may change the doctor if they don’t get the prescription of antibiotics. Around 76% expressed the feeling of dissatisfaction if they do not get antibiotics from their doctor.

3.4. Association between KAP on self-medication, antibiotic use, and AMR

The association between participants’ knowledge, attitudes, and practices was examined using a Pearson correlation analysis (Table 4). In this study, overall average knowledge was 8.11 ± 2.43 , favorable attitude was 17.60 ± 1.17 , and practice was 7.72 ± 1.72 regarding antibiotics among participants. At the level of $p = 0.01$, Pearson correlation analysis revealed a substantial link between knowledge, attitude, and practice.

3.5. Logistic regression analysis

Logistic Regression Analysis of antibiotic self-medication practice and the demographic variables are shown in Table 5. The factors significantly related with self-medication were male gender (aOR: 2.13; 95% CI: 1.26–3.98, $p < 0.05$), having more children (aOR: 2.78; 95% CI: 1.27–4.12 $p < 0.01$), having professional qualification (aOR:3.07; 95% CI 1.57– 4.68; $p < 0.01$), residing in urban area (aOR: 3.17; 95% CI: 2.13–5.61, $p < 0.05$), working in health care (aOR: 5.99; 95% CI: 1.78–18.2, $p < 0.01$), income more than 20,000 SAR and (aOR: 3.57; 95% CI: 2.08–6.34, $p < 0.05$).

4. Discussion

In the current study, we sought to identify parental trends in children’s self-medication, health-seeking behavior, and knowledge of antibiotic use and antimicrobial resistance in Asir, Saudi Arabia. In light of this, we assessed the driving forces that may be the subject of upcoming population-specific awareness initiatives. According to our survey, the parents in the Asir region have a good degree of awareness regarding the identification and use of antibiotics. Each participant acknowledged having heard the phrase “antibiotics” and accurately identifying its application in eradicating germs. Comparable to earlier studies conducted in other nations (You et al., 2008; Chan et al., 2012; Chanvatik et al., 2019), almost two-thirds of the respondents’ thought antibiotics were frequently used to hasten the healing process or relieve the symptoms of illnesses like the flu and the common cold, pointing up gaps in our understanding of how to use antibiotics properly.

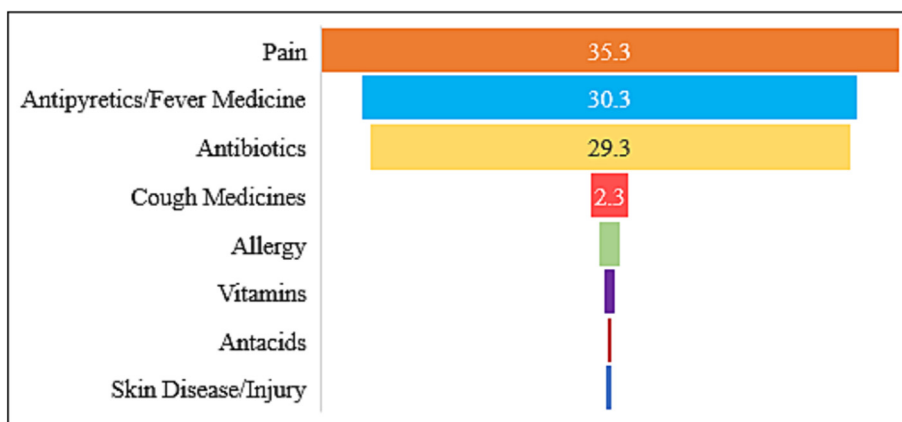


Fig. 2. Common drugs used for Self medication.

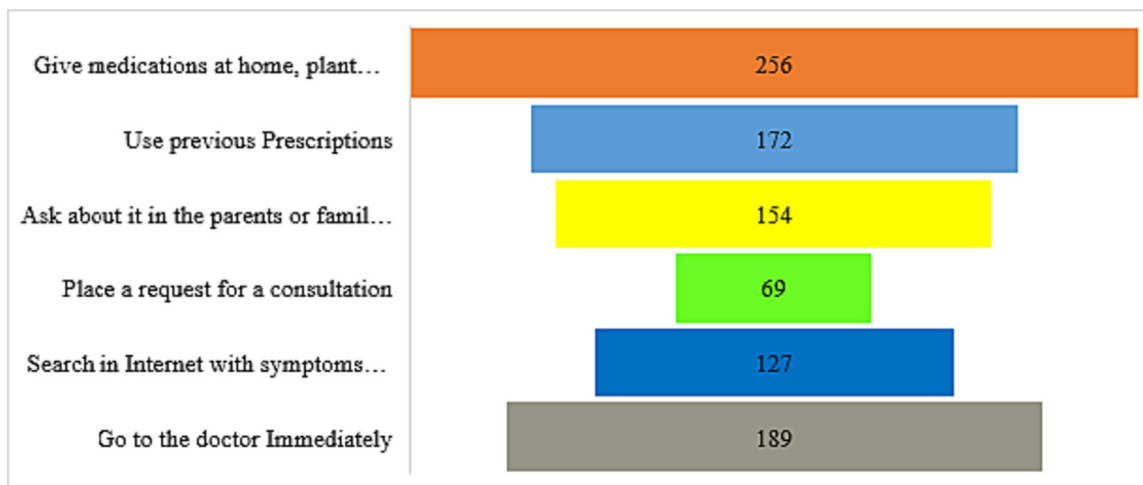


Fig. 3. The types of solutions taken by parents when their children were sick.

Table 2 Participant knowledge on antibiotic self-medication, its' usage, and AMR (n = 624).

Domains	Questions	Yes n (%)	No n (%)
Identification of antibiotics	Amoxicillin is an antibiotic	525 (84.2)	99 (15.8)
	Paracetamol is an antibiotic	12 (1.9)	612 (98.1)
Knowledge on antibiotics	Aluminium hydroxide + Magnesium hydroxide is an antibiotic	118 (18.9)	506 (81.1)
	Antibiotics are useful for killing germs	0	624 (100)
	Antibiotics are often needed for cold and flu illness	445 (71.3)	179 (28.7)
Side-effects of antibiotics	Different antibiotics are needed to cure different disease	552 (88.5)	72 (11.5)
	Antibiotics can kill "good bacteria" present in our bodies	397 (63.6)	227 (36.4)
	Antibiotics can cause secondary infections after killing good bacteria present in our bodies	263 (42.1)	361 (57.9)
	Antibiotics have side-effects such as diarrhea, nausea and vomiting	354 (56.7)	270 (43.3)
Antibiotic Self Medication	Antibiotics can cause allergic reactions	384 (61.5)	240 (38.5)
	Antibiotics can create life threatening side effects among children	213 (34.1)	411 (65.9)
	Antibiotics can be shared from and to a child in the family who have experienced the same symptoms	351 (56.3)	273 (43.8)
	Leftover antibiotics can be stored and used in the future if anyone/ any children have the same symptoms	337 (54)	287 (46)
We can refill the previous antibiotic resistance	prescriptions to treat the infections for children	212 (34)	412 (66)
	If bacteria are resistant to antibiotics, it can be very difficult to treat the infections they cause	460 (73.7)	164 (26.3)
Antibiotic resistance	If I stop giving a full course of antibiotic to my child when the symptoms are improving, it may lead to AR	174 (27.9)	450 (72.1)
	Many infections are becoming increasingly resistant to treatment by antibiotics	406 (65)	218 (35)
	There is a need to establish public campaign on rational use of antibiotics	601 (96.3)	23 (3.7)
	Misuse/overuse of antibiotics can lead to antibiotic resistance	397 (63.6)	227 (36.4)
	Children with incomplete or improper antibiotic dosage, may develop AMR	369 (59.1)	255 (40.9)

Only 23% of parents were able to accurately identify the processes of antibiotic resistance, indicating a lack of understanding among parents and the need for more education in this area. Other population-level antibiotic surveys (Lim et al., 2021; Aslam et al., 2020; Tsuzuki et al., 2020) and the WHO multi-country antibiotic resistance public awareness study in 12 countries (WHO Organization, 2017) similarly reflect these misunderstandings. Similar to our observation, the common respondents across all nations studied believed that antibiotic resistance happens when our bodies develop a tolerance to drugs, whereas around half believed that antibiotic resistance only distresses those who take antibiotics frequently.

The results of this study partially concur with earlier studies involving AB usage since parents at the community level have a crucial role in the establishment and spread of ABR (Efunshile et al., 2019; Karuniawati et al., 2021). If they do not receive an antibiotic after expecting one, almost 66% of the respondents are less happy with a doctor's visit. These findings are consistent with different studies, which showed that parental self-medication rates for children ranged from 43 percent to 95.7 percent (Du and Knopf, 2009).

Another finding that supports earlier research is that around 72% of the participants were unaware that stopping a complete course of antibiotics when their symptoms are improving may result in AMR (Alqarni and Abdulbari, 2019). Additionally, the majority of users opted to utilize AB to speed up recovery after a cold or fever which is consistent with this study's findings. Surprisingly, 54% of parents reported using unused antibiotics (ABs) to treat infections; 34% of participants reported filling previous prescriptions for antibiotics to treat infections; and 56.3 percent of participants agreed that antibiotics can be shared with someone who has the same symptoms as you do.

The present study results were consistent with some earlier studies (Alqarni and Abdulbari, 2019) and a sizable study that looked at the KAP concerning ABs among Hajj pilgrims and reported that the pilgrims had some unfavorable attitudes and bad habits, such as getting and using ABs without a prescription, using ABs that were left over, sharing ABs, and also carrying ABs into Saudi Arabia from their native countries (Thangaraju and Venkatesan, 2019; WHO Organization, 2017; Chang et al., 2019). Additionally, storing unused ABs for later usage has been linked to reports of AB abuse in multiple studies (Liu et al., 2019; Barker et al., 2017). The participants' high degree of knowledge related to the identification and function of antibiotics is completely at odds with the incorrect use or self-medication of AB

Table 3
Participants' attitude on antibiotic self-medication, its usage, and AMR (n = 624).

Domains	Questions	Response				
		Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
Preference for use of antibiotics	When my child has cold, I should give antibiotics to prevent getting a more serious illness.	54 (8.7)	98(15.7)	126(20.2)	190 (30.4)	156(25)
	When my child gets fever, antibiotics helps to get better, more quickly.	35(5.6)	57(9.3)	178(28.5)	189 (30.2)	165 (26.4)
Antibiotic resistance and safety	My child would rather take an antibiotic that may not be needed than wait to see if he/she gets better without it.	159(25.5)	97(15.5)	94(15.1)	132 (21.2)	142 (22.3)
	Whenever I give an antibiotic, it contributes to the development of antibiotic resistance.	138(22.1)	145 (23.2)	176(28.2)	45 (7.2)	120 (19.2)
	Skipping one or two doses does not contribute to the development of antibiotic resistance.	124(19.9)	145 (23.2)	178(28.5)	124 (19.9)	53(8.5)
	Antibiotics are safe drugs; hence they can be commonly used.	135(21.6)	156(25)	259(41.5)	29 (4.6)	45(7.2)
Attitude towards the doctor's prescribing of antibiotics	Willingness to learn about AMR	6(0.96)	12(1.92)	109(17.5)	174 (27.9)	323 (51.8)
	If my child is expected to receive an antibiotic, I am less satisfied with a doctor's visit if he/she do not receive an antibiotic.	121(19.4)	33(5.3)	54(8.6)	176 (28.2)	240 (38.5)
	If a doctor does not prescribe an antibiotic when I think it is needed, I will go to another doctor.	112(18)	76(12.2)	233(37.3)	105 (16.8)	98(15.7)

Table 4
Correlation analysis of Knowledge, Attitude and Practice.

		Knowledge	Attitude
Attitude	Pearson Correlation	0.172**	
	Sig. (2-tailed)	0.007	
	N	624	
Practice	Pearson Correlation	0.141**	0.273**
	Sig. (2-tailed)	0.001	0
	N	624	624

** Significant Correlation at 0.01 level (2-tailed).

found in this study. The actual degree of antibiotic usage is not correlated with the understanding of basic identification. Additionally, AB accounts for 29.3 percent of self-medication causes. These findings underline the significance of spreading accurate data about

antibiotics and antibiotic resistance in order to lower parents' expectations about the prescription of antibiotics.

According to this study, the facilitators for self-medication were male gender, had more Children, and professional qualifications, resided in urban areas, worked in health care, and had high incomes. In a few other studies also, it was shown that more educated parents used self-medication than uneducated parents, and more common in affluent families (Du and Knopf, 2009). Regarding the area of residence, it was a contract to the study done in Indonesia (Ahmed et al., 2021) in which parents in rural areas used more self-medication than urban inhabitants.

Despite the fact that public campaigns have emphasized the effectiveness of antibiotics in treating particular medical conditions (Huttner et al., 2019; Al Omari et al., 2019), our findings indicate that more work needs to be done to improve both the way

Table 5
Logistic Regression Analysis of antibiotic Self-Medication Practice and the demographic variables.

Variables	N	%	Antibiotic Self - Medication (%)		aOR (95% CI)
			Yes	No	
Gender					
Male	377	60.4	72.3	27.7	2.13(1.26---3.98) *
Female	247	39.6	81.7	18.3	
Education					
Below secondary	24	3.8	71.8	28.4	3.07(1.57-4.68) **
Secondary	124	19.9	73.7	26.3	
Diploma and ProfessionalQualification	167	26.8	88.4	11.6	
Bachelors and above	309	49.5	89.1	10.9	
Area of residence					
Urban	426	68.3	61.7	38.3	3.17(2.13--5.61) *
Rural	198	31.7	78.3	21.7	
Occupation					
Student	116	18.6	48.3	51.7	5.99(1.78-18.2) **
Non-Health Care	74	11.9	41.3	58.7	
Health Care	148	23.7	59.4	40.6	
Own Business	178	28.5	23.8	76.2	
Others	108	17.3	83.2	16.8	
No. of Children					
One	201	32.2	63.8	36.2	2.57 (1.51-4.09) *
Two	308	49.4	56.9	43.1	
More than two	115	18.4	89.3	10.7	
Average Monthly Family Income					
5000---10000 SAR	207	33.2	62.5	37.5	3.57 (2.08-6.34) *
10000---20000 SAR	232	37.2	76.0	24.0	
More than 20,000 SAR	185	29.6	89.0	11.0	

that parents use antibiotics and the way that health professionals convey that information. Future studies should investigate how and where parents often obtain knowledge about antibiotics and how this affects the way they use antibiotics. The fact that online survey respondents could not be completely representative of the overall population is a possible drawback of our study. This may have an impact on the generalizability of our findings since these sociodemographic traits may be linked to better understanding about AMR as well as health seeking behaviors.

5. Conclusion

A considerable percentage of parents included in this study were either self-medicating or using home remedies for their children. Strategic education programs to the targeted population especially to the parents about antibiotics, dangerous consequences and side effects of self-medication, and AMR are all crucial concerns that must be addressed right immediately.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

The authors extend their sincere appreciation to the Deanship of Scientific Research at King Khalid University for funding support for this review through the Large Research Group Project under grant number "RGP 2/92/44".

Ethical Approval

The Research Ethics Committee, King Khalid University, KSA approved the research project with the ref. No. ECM-2022-1705.

Author Contribution

Premalatha Paulsamy, Krishnaraju Venkatesan, and Shadia Hamoud Alshahrani, conceived and designed research, and conducted experiments, Shadia Hamoud Alshahrani, Kousalya Prababar analyzed data and wrote the manuscript. Premalatha Paulsamy, Absar Ahmed Qureshi, and Sirajudeen Shaik Alavudeen supervised the work. All authors read and approved the manuscript.

References

Ahmed, N., Ijaz, S., Manzoor, S., Sajjad, S., 2021. Prevalence of self-medication in children under-five years by their mothers in Yogyakarta city Indonesia. *J. Family Med. Prim. Care* 10, 2798–2803.

Al Omari, S., Al Mir, H., Wrayde, S., Merhabi, S., Dhaybi, I., Jamal, S., Chahine, M., Bayaa, R., Tourba, F., Tantawi, H., Al Atrouni, A., El Omari, K., Ayash, O., Zeidan, N. S., Mallat, H., Dabboussi, F., Hamze, M., Osman, M., 2019. First Lebanese Antibiotic Awareness Week campaign: knowledge, attitudes and practices towards antibiotics. *J. Hosp. Infect.* 101, 475–479.

Alele, P.M., Musoke, P., Nicollette, N., 2015. Self-medication practices by caretakers for children under five years in a rural district of eastern Uganda. *Int. J. Med. Sci.* 2, 165–171.

Almeleebia, T.M., Alhifany, A.A., Almutairi, F., Alshibani, M., Alhossan, A.M., 2021. Regulating antimicrobial sales in Saudi Arabia: Achievements and challenges. *Int. J. Clin. Pract.* 75, e13833.

Alqarni, S.A., Abdulbari, M., 2019. Knowledge and attitude towards antibiotic use within consumers in Alkharij, Saudi Arabia. *Saudi Pharm. J.* 27, 106–111.

Aslam A, Gajdacs M, Zin CS, Binti Abd Rahman NS, Ahmed SI, Jamshed SQ. Public Awareness and Practices towards Self-Medication with Antibiotics among the Malaysian Population. A Development of Questionnaire and Pilot-Testing. *Antibiotics (Basel)*.2020, 9: 97.

Barker, A.K., Brown, K., Ahsan, M., Sengupta, S., Safdar, N., 2017. Social determinants of antibiotic misuse: a qualitative study of community members in Haryana, India. *BMC Public Health* 17, 333.

Bin Nafisah, S., Bin Nafesa, S., Alameery, A.H., Alhumaid, M.A., AlMuhaidib, H.M., Al-Eidan, F.A., 2017. Over-the-counter antibiotics in Saudi Arabia, an urgent call for policy makers. *J. Infect. Public Health* 10, 522–526.

Chan, G.C., Tang, S.F., 2012. Parental knowledge, attitudes and antibiotic use for acute upper respiratory tract infection in children attending a primary healthcare clinic in Malaysia. *Malays. Fam. Phys.* 2, 5.

Chang, Y., Chusri, S., Sangthong, R., McNeil, E., Hu, J., Du, W., Li, D., Fan, X., Zhou, H., Chongsuvivatwong, V., Tang, L., 2019. Clinical pattern of antibiotic overuse and misuse in primary healthcare hospitals in the southwest of China. *PLoS One* 14, e0214779.

Chanvatik, S., Kosiyaporn, H., Lekagul, A., Kaewkhankhaeng, W., Vongmongkol, V., Thunyahan, A., Tangcharoensathien, V., 2019. Knowledge and use of antibiotics in Thailand: A 2017 national household survey. *PLoS One* 14, e0220990.

Du, Y., Knopf, H., 2009. Self-medication among children and adolescents in Germany: Results of the National Health Survey for Children and Adolescents (KiGGS). *Br. J. Clin. Pharmacol.* 68, 599–608.

Efunshile, A.M., Ezeanosike, O., Nwangwu, C.C., König, B., Jokelainen, P., Robertson, L.J., 2019. Apparent overuse of antibiotics in the management of watery diarrhoea in children in Abakaliki, Nigeria. *BMC Infect. Dis.* 19, 275.

European Commission. Special Eurobarometer 445; Antimicrobial resistance. Brussels and Luxembourg;2016

Founou, L.L., Founou, R.C., Essack, S.Y., 2016. Antibiotic resistance in the food chain: A developing country-perspective. *Front. Microbiol.* 7.

Hijazi, A.R.A., Jammoul, Z., Fares, S., Kassak, K.M., 2021. Antibiotic use: Knowledge, attitude and practices of a Southern Community in Lebanon. *Eur. J. Environ. Public Health* 5, em0088.

https://www.dhsprogram.com/What-We-Do/Survey-Types/upload/AMR_Mod_8_5_8_FINAL.pdf.

Huttner, B., Saam, M., Moja, L., Mah, K., Sprenger, M., Harbarth, S., Magrini, N., 2019. How to improve antibiotic awareness campaigns: findings of a WHO global survey. *BMJ Glob. Health* 4, e001239.

Jamhour, A., El-Kheir, A., Salameh, P., Hanna, P.A., Mansour, H., 2017. Antibiotic knowledge and self-medication practices in a developing country: A cross-sectional study. *Am. J. Infect. Control* 45, 384–388.

Kardas, P., Devine, S., Golembesky, A., Roberts, C., 2005. A systematic review and meta-analysis of misuse of antibiotic therapies in the community. *Int. J. Antimicrob. Agents* 26, 106–113.

Karuniawati, H., Hassali, M.A.A., Suryawati, S., Ismail, W.I., Taufik, T., Hossain, M.S., 2021. Assessment of knowledge, attitude, and practice of antibiotic use among the population of Boyolali, Indonesia: A cross-sectional study. *Int. J. Environ. Res. Public Health* 18, 8258.

Khan, F.U., Khan, F.U., Hayat, K., Ahmad, T., Khan, A., Chang, J., Malik, U.R., Khan, Z., Lambojon, K., Fang, Y., 2021. Knowledge, attitude, and practice on antibiotics and its resistance: A two-phase mixed-methods online study among pakistani community pharmacists to promote rational antibiotic use. *Int. J. Environ. Res. Public Health* 18, 1320.

Lim, J.M., Chhoun, P., Tuot, S., Om, C., Krang, S., Ly, S., Hsu, L.Y., Yi, S., Tam, C.C., 2021. Public knowledge, attitudes and practices surrounding antibiotic use and resistance in Cambodia. *JAC Antimicrob. Resist.* 3, dlaa115.

Liu, C., Liu, C., Wang, D., Deng, Z., Tang, Y., Zhang, X., 2019. Determinants of antibiotic prescribing behaviors of primary care physicians in Hubei of China: a structural equation model based on the theory of planned behavior. *Antimicrob. Resist. Infect. Control* 8, 23.

Thangaraju P, Venkatesan S.WHO Ten threats to global health in 2019: Antimicrobial resistance. *Cukurova Med. J.* 2019, 44: 1150–1151.

Tsuzuki, S., Fujitsuka, N., Horiuchi, K., Ijichi, S., Gu, Y., Fujitomo, Y., Takahashi, R., Ohmagari, N., 2020. Factors associated with sufficient knowledge of antibiotics and antimicrobial resistance in the Japanese general population. *Sci. Rep.* 10, 3502.

Verraes, C., Van Boxtael, S., Van Meervenne, E., Van Coillie, E., Butaye, P., Catry, B., de Schaetzen, M.A., Van Huffel, X., Imberechts, H., Dierick, K., Daube, G., Saegerman, C., De Block, J., Dewulf, J., Herman, L., 2016. Antimicrobial resistance in the food chain: a review. *Int. J. Environ. Res. Public Health* 10, 2643–2669.

Organization, Global Priority List of Antibiotic-Resistance Bacteria to Guide Research, Discovery, and Development of New Antibiotics, World Health Organization, Geneva, Switzerland, 2017.

Yagoub, U., Al Qahtani, B., Hariri, I.A.L., Al Zahrani, A., Siddique, K., 2019. Antibiotic resistance: A hospital-based multicenter study in Tabuk city, Kingdom of Saudi Arabia. *Infect. Drug Resist.* 12, 1815–1825.

You, J.H., Yau, B., Choi, K.C., Chau, C.T., Huang, Q.R., Lee, S.S., 2008. Public knowledge, attitudes and behavior on antibiotic use: a telephone survey in Hong Kong. *Infection* 36, 153–157.

Yusef, D., Babaa, A.I., Bashaireh, A.Z., Al-Bawayeh, H.H., Al-Rijjal, K., Nedal, M., Kailani, S., 2018. Knowledge, practices & attitude toward antibiotics use and bacterial resistance in Jordan: A cross-sectional study. *Infect. Dis. Heal.* 23, 33–40.