Original Manuscript

Evaluation & the Health Professions
1-19

DOI: 10.1177/0163278716686809
journals.sagepub.com/home/ehp
SAGE

Misconceptions and Malpractices Toward Antibiotic Use in Childhood Upper Respiratory Tract Infections Among a Cohort of Lebanese Parents

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Abstract

Antimicrobial resistance is an emerging global health threat. Misuse and abuse of antibiotics are of particular concern in the pediatric population. Since management of childhood illnesses depends considerably on parents' perceptions, the objectives of this study were to report parents' perspectives and assess their practices toward antibiotics used for upper respiratory tract infections (URTIs) in children. Using a cross-sectional design, anonymous structured questionnaires were completed by 1,037 parents in public and private schools across Lebanon's largest governorate. Descriptive statistics were used to report participants' responses. A multivariate

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analysis was performed to identify factors affecting knowledge and malpractice related to antibiotic use. Significant misconceptions and malpractices were identified among parents. For instance, 33.9% of parents considered that antibiotics are helpful in treating common cold among children and 36.2% believed antibiotics expedite the recovery of their child with common cold infection. Moreover, there was a lack of knowledge concerning antibiotic coverage, since 37.9% of the respondents believed that antibiotics treat viral infections and 21.5% were neutral toward this question. Around 20% of the participants believed they can reduce the dose of antibiotics if the child gets better. Significant factors associated with poor knowledge and misuses were parents' lower educational and socioeconomic levels. Despite extensive evidence on the limited role of antibiotics in URTIs, parents in Lebanon continue to misuse them. More concerted efforts are needed to improve parents' knowledge and practices with regard to the rational use of antibiotics.

Keywords
antibiotic resistance, parental perceptions, antibiotic misuse, pediatric population, Lebanon, upper respiratory tract infection

Background

Antimicrobial resistance is an emerging global health threat. It is a massive problem in view of the limited development of new antibiotic agents. Antibiotic resistance threatens the core of medicine in finding sustainable responses to infectious diseases. According to the latest World Health Organization (WHO) report, the world is heading in the direction of a post-antibiotic era in which people will die again from common infections unless an immediate, structured global action plan is implemented (WHO, 2015).

The unjustified use of antibiotics, commonly reported in children, is leading to a concerning increased microbial resistance in the pediatric population (Hart & Kariuki, 1998; Tenover & Hughes, 1996). Furthermore, early childhood exposure to antibiotics has been associated with detrimental long-term metabolic consequences (Bailey et al., 2014; Mamtani, Haynes, & Yang, 2015; Turta & Rautava, 2016). Therefore, evaluating antibiotic use in the pediatric population continues to be of paramount significance.

The incidence of antibiotic misuse in children presenting with nonspecific illnesses, unexplained abdominal pain, or upper respiratory tract

infections (URTIs) is well-documented (Gieteling, Lisman-van Leeuwen, van der Wouden, Schellevis, & Berger, 2011; Mangione-Smith, McGlynn, Elliott, Krogstad, & Brook, 1999; Vinson & Lutz, 1993). More than 90% of URTIs in children are of viral etiology, ideally treated with symptomatic management (National Institute for Health and Clinical Excellence (2008); Cotton, Innes, Jaspan, Madide, & Rabie, 2008). Despite the evidence that antibiotic treatment does not alter clinical outcomes or reduce complication rates when compared to placebo, antibiotic overuse in childhood URTIs remains problematic (Fahey & Stocks, 1998; Gieteling et al., 2011).

Several factors are reported to contribute to the irrational antibiotic use in children including lack of physicians' concerns regarding long-term resistance to antibiotics, physicians fulfilling what they perceive as being parents' expectations and their fear of possible complications (Lopez-Vazquez, Vazquez-Lago, & Figueiras, 2012), self-medication in countries where pharmacies dispense antibiotics without prescriptions (WHO, 2014), and parental misconceptions and lack of knowledge regarding antibiotic use (Lopez-Vazquez et al., 2012; Mangione-Smith et al., 1999).

The literature has described parental misconceptions and the consequent suboptimal practices related to antibiotic use, as accelerators of the emergence and spread of global antimicrobial resistance (Panagakou, Theodoridou, & Papaevangelou, 2009; Rousounidis, Papaevangelou, & Hadjipanayis, 2011; WHO, 2014; Yu, Zhao, & Stålsby Lundborg, 2014).

Successful interventions addressing the global problem of antibiotic resistance revolved around correcting misconceptions and spreading awareness on the rational use of antibiotics. For instance, in Australia and New Zealand, national education campaigns were associated with a significant decrease in antibiotic prescriptions for URTIs among children (Huttner, Goossens, Verheij, Harbarth, & for the CHAMP consortium, 2010). Moreover, the French national campaign entitled "les antibiotiques c'est pas automatiques" (p. 6) directed toward the general public and health-care professionals was associated with a marked reduction of unnecessary antibiotic prescriptions, particularly in children (Sabuncu, David, & Bernède-Bauduin, 2009). Mass media used as channels for educational campaigns were proven to reduce antibiotic usage.

The misuse and abuse of antibiotics are global issues, of particular concern for developing countries due to their relatively higher infection rates as well as limitations in their sanitation system and suboptimal public health awareness (WHO, 2015).

Lebanon, a developing country located in the Eastern Mediterranean region and a member of the WHO, reports no national surveillance

programs or action plan for antimicrobial resistance (WHO, 2015). It is also characterized by the availability of antibiotics without prescription and significant malpractices on the rational use of antimicrobial medicines among the adult and pediatric population (Cheaito, Azizi, Saleh, & Salameh, 2014; El Sayed et al., 2009; Farah, Lahoud, Salameh, & Saleh, 2015).

Since management of childhood illnesses depends considerably on parents' perception of the diseases as well as their perception of treatment regimens (Belongia, Naimi, Gale, & Besser, 2002; Togoobaatar et al., 2010) and view the lack of any similar assessment in the Lebanese population, the objective of our study was to target parents, as primary caregivers, to assess their knowledge and practices toward antimicrobial agents administered to their children for URTIs.

Method

Study Design and Setting

A cross-sectional study was conducted between November 2015 and May 2016. The study took place in Mount Lebanon, the largest and most populated of five governorates, including around 40% of the Lebanese population. Since childhood is defined between ages 2 and 12, we conducted our study in 25 primary schools. From the list of public and private schools available from the Ministry of Education, 10 public and 15 private schools were selected by convenience sampling. Sixty percent (15 out of 25) of the selected schools were private to match the approximate 60% of Lebanese pupils that are enrolled in private schools (Lebanese Ministry of Education and Higher Education, 2010; Central Administration of Statistics, 2012).

Data Collection Tool

The data collection tool consisted of questions derived from a structured and validated Arabic questionnaire "Parental Perception on Antibiotics (PAPA) Scale," (p. 4) designed and tested by Alumran, Hou, and Hurst (2013) in Saudi Arabia. Parallel analysis and exploratory factor analysis, using principal axis factoring, produced six factors in the originally developed PAPA instrument: knowledge and beliefs, behaviors, sources of information, adherence, awareness about antibiotics resistance, and parents' perception regarding doctors' prescribing behaviors. The instrument reliability was also demonstrated, with overall Cronbach's $\alpha = .87$, and

individual subscales Cronbach's αs ranging from .771 to .794 (Alumran, Hou, & Hurst, 2013).

Since some Arabic written terminologies may slightly differ between Saudi Arabia and Lebanon, we had to amend the instrument accordingly in our population (see Online Appendix 1). Thus, the questionnaire was first pilot tested on 20 volunteers before its administration, to evaluate the clarity of the survey queries. Accordingly, minor modifications were made to questions' wording and layout based on feedback from the respondents. The final circulated questionnaire was made up of a cover page detailing the purpose of the study, its voluntary and confidential nature followed by a list of questions. The questions addressed the major following areas: (1) parents' sociodemographics characteristics (relationship to the child, sex, age, number/age/sex of children in the family, area of residence, educational level, financial situation, occupation, and health literacy), (2) general information about children's health (chronic diseases, occurrence of URTIs and serious infections), (3) parents' perspective regarding antimicrobial resistance and their knowledge on antibiotics use for URTIs (9 items), (4) parents' practices toward antibiotic uses for URTIs (15 items), and (5) their source of information on antibiotics. All questions relating to antibiotic use were measured using a 5-point Likert-type scale.

The questionnaire was cross-validated in the Lebanese population. At first, we ran a factor analysis using the initial structure previously suggested by the developers of the PAPA Scale. We checked for the sample adequacy measures (Kaiser–Meyer–Olkin [KMO] measure—KMO sample adequacy and Bartlett's test for sphericity), communality of items, and anti-image items correlation adequacy. Since the obtained validation results were not satisfactory, we reran a new exploratory analysis while removing inadequate items, and splitting the total scale into two separate scales (one for knowledge composed of 9 items and the other for malpractice composed of 15 items). The KMO measure of sampling adequacy to the knowledge construct was .719 ($p < .001$ for Bartlett's test of sphericity) and to the malpractice construct was .855 ($p < .001$ for Bartlett's test of sphericity). For the knowledge and malpractices score calculations, the Likert-type scales were added, ranging from a score of -2 to 2 with a score of 0 allocated to neutral answers. In the knowledge scale calculation, Items 1, 2, 3, 8, and 9 were negatively counted (false information), while Items 4, 5, 6, and 7 were counted positively (right information) to obtain a homogeneous scale, since the direction of knowledge was different. Knowledge scores ranged from -18 to $+18$; higher scores indicated more knowledge. On the other hand, malpractice scores ranged from -30 to $+30$ with a higher score indicating more malpractice of antibiotics use.

Data Collection Process

Before initiation of the data collection, the study was approved by the Lebanese American University Institutional Review Board (IRB Registration Number #IRB00006954).

The minimal necessary sample size was calculated using EpiInfo 7.0 software (Centers for Disease Control and Prevention, Atlanta). Based on the study by Cheaito, Azizi, Saleh, and Salameh (2014), demonstrating that patients in pharmacies bought antibiotics without prescription in 42% of cases, and given the cluster sampling design (design effect = 2) and an error of 5%, the minimal necessary sample size equals to 750. A pilot period permitted to calculate the response rate of self-administered questionnaires by parents (25%). After obtaining the school directors' consent, we distributed 4,000 questionnaires to obtain a return of 1,000 units.

Data Management Process

All obtained information was processed confidentially. Gathered data were entered and analyzed using Statistical Package for the Social Sciences (SPSS) software (IBM SPSS Statistics for Windows, Version 22.0. IBM Corp, Armonk, NY). Descriptive statistics were used to calculate and report all participants' responses. Continuous variables (age) were described using mean and standard deviation (*SD*). Categorical variables were described using frequencies, percentages, and confidence intervals. The associations between categorical variables were evaluated using Pearson χ^2 test or Fisher's exact test where the expected cell count is less than 5. A multivariable analysis was also performed; multiple linear regression analyses were performed to identify factors that affect the knowledge and the malpractice related to antibiotic use, using a stepwise descending method. Variables with a p value of .2 or less in the bivariate analysis were included in the initial model.

Results

Description of the Study Participants

The questionnaires were completed by 1,037 participants (response rate of 26.73%). The study respondents mainly consisted of the children's mothers as a majority (75.6%), with a total mean age of respondents being 39.87 (SD = 6.73). The majority of the participants' families (94%) had up to three children under the age of 12 years, and most of the household incomes (70%) ranged between US$1,000 and US$3,000 which is considered middle class for

Lebanon. The respondents were mainly employed (45.6%) or housewives (34.4%), university (51.3%) or high school graduates (32.8%), and did not have any family member trained in the medical/paramedical field (83.3%). Sociodemographic characteristics of participants are further detailed in Table 1.

Parental Misconceptions and Malpractices Regarding Antibiotic Use in URTIs

After score calculation, the mean score of antibiotic knowledge was 1.21 ($SD = 4.95$); 25 percentile was −2, median was 1 and 75 percentile was 4; and the mean score of antibiotic use malpractice was 19.56 ($SD = 9.00$); 25 percentile was 13, median was 18, and 75 percentile was 25. Misconceptions and malpractices regarding antibiotics were identified among the respondents. Parents considered that antibiotics are helpful in treating common cold among children (33.9%); antibiotics expedite the recovery of their child with common cold infection (36.2%), and antibiotics are needed for sore throat (41%). Moreover, there was a lack of knowledge concerning antibiotic coverage, since 37.9% of the respondents believed that antibiotics treat viral infections and 21.5% were neutral toward this question. Similarly, 31.2% of the respondents believed that antibiotics cure all types of infections (bacterial, viral, and fungal), while 24.9% were neutral toward this question. Misconceptions around antibiotics' safety were also identified in 9.2% of study participants who did not recognize that antibiotics can be harmful to one's health, while 16.7% were neutral toward this question. When asked about antimicrobial resistance phenomenon, 12.8% of respondents did not agree that some germs are becoming harder to treat with antibiotics, 9.7% did not agree that some germs can become resistant to antibiotics if taken in inadequate doses, and 19.9% had neutral answers. Identified malpractices revolved around poor adherence to antibiotics' dosing regimen, as 19.6% of the study participants believed they could reduce the dose of antibiotics if the child gets better and 10.8% of the parents reported discontinuing a past prescribed antibiotic to their child because he or she felt better. Moreover, 5.2% of the respondents reported that they get their child's antibiotics from the pharmacy without a prescription, 6.7% reported storing antibiotics at home for when needed, and 6.5% of parents have given their child an antibiotic without a prescription when he or she had a high temperature for a few days. The percentage of parents who expected their physicians to prescribe antibiotics for URTIs was equivalent to 15.7%.

Across the survey queries, it is important to note the high percentage of neutral answers which indicates a probable high level of parental

Table 1. Baseline Characteristics of Respondents.

Participants' Characteristics	Frequency	Valid %
Sociodemographic characteristics		
Who is completing the questionnaire:		
Father	229	22.2
Mother	784	76
Other (i.e., grandmother, aunt, and grandfather)	19	1.8
Gender of legal guardian completing the questionnaire		
Male	234	22.7
Female	798	77.3
Number of children under the age of 12 years old are there in your family:		
1	340	32.9
2	421	40.8
3	214	20.7
4	43	4.2
5	13	1.3
6	2	0.2
Is either one of the parents/guardian trained in medical/paramedical field:		
Yes	160	15.6
No	864	84.4
Mean age of respondents *M* (standard deviation)	39.87 (6.73)	
Employment status		
Unemployed	38	3.7
Employed	473	45.8
Student	12	1.2
Housewife	357	34.6
Self-employed	143	13.9
Retired	8	0.8
Highest level of education obtained		
No formal education	3	0.3
Junior high school	65	6.3
High school	340	33.2
Diploma or bachelor degree	532	51.9
Higher degrees (i.e., postgraduate, master's, and PhD)	85	8.3
Geographical background		
North	37	4.6
Mount Lebanon	762	94.2
Household monthly income		
US$<1,000/month	145	14.6
US$1,000–2,000/month	386	38.9
US$2,001–3,000/month	339	34.1
US$3,001–4,000/month	94	9.5
US$>4,000/month	29	2.9

(continued)

Table 1. (continued)

Participants' Characteristics	Frequency	Valid %
Children's health		
In the past year, how often has your youngest child had a common cold		
Never	209	20.4
Once a year	398	38.6
2–3 times a year	356	34.7
4–6 times a year	58	5.7
More than 6 times a year	7	0.7
In the past year, how often did your youngest child receive an antibiotic		
Never	364	35.8
Once a year	382	37.6
2–3 times a year	237	23.3
4–6 times a year	21	2.0
More than 6 times a year	13	1.3
Have any of your children (less than 12 years old) ever experienced a serious infectious disease in the past?		
Yes	25	2.4
No	997	97.6
Do any of your children (less than 12 years old) have a chronic illness?		
Yes	73	7
No	963	93

misinformation or lack of information on the various circulated questions. Refer to Table 2 for more results.

Parental Source of Information

When asked about their source of health-related information, more than 50% of the parents responded that they do not refer to the pharmacist, allied health-care professionals, or scientific literature to get their information. In fact, 51.2% reported getting their health-related information from their previous experience and 20.7% would refer to the Internet as pictured in Table 2.

Factors Associated With Parental Misconceptions and Malpractices

Results from the multivariate analysis revealed that variables associated with lower parental knowledge regarding rational use of antibiotics in URTIs included the number of times the youngest child received an

Table 2. Descriptive Results of Parents' Knowledge and Practices Toward Antibiotics.

Outcome	Strongly Disagree *n* (%)	Disagree *n* (%)	Neutral *n* (%)	Agree *n* (%)	Strongly Agree *n* (%)
Parents' knowledge regarding antibiotic use in URTIs					
Antibiotics are needed for the common cold	235 (23.0)	418 (41.0)	176 (17.3)	184 (18.0)	7 (0.7)
Antibiotics are needed for sore throat	98 (9.6)	328 (32.1)	177 (17.3)	402 (39.3)	17 (1.7)
Antibiotics are helpful in treating common cold among children	127 (12.4)	293 (28.7)	255 (25.0)	330 (32.4)	15 (1.5)
Some germs are becoming harder to treat with antibiotics	18 (1.8)	110 (11.0)	343 (34.4)	428 (42.9)	99 (9.9)
Some germs can become resistant to antibiotics if taken in inadequate doses	24 (2.4)	74 (7.3)	202 (19.9)	521 (51.4)	193 (19.0)
Antibiotics can be harmful to one's health	21 (2.0)	74 (7.2)	172 (16.7)	555 (53.9)	208 (20.2)
Antibiotics treat bacterial infections	19 (1.9)	74 (7.3)	166 (16.3)	612 (60.3)	144 (14.2)
Antibiotics can cure all types of infections (bacterial, viral, and fungal)	135 (13.1)	316 (30.8)	255 (24.9)	292 (28.5)	28 (2.7)
Antibiotics treat viral infections	184 (18.0)	231 (22.6)	219 (21.5)	340 (33.3)	47 (4.6)
Parents' practices toward antibiotic uses for URTIs					
Children with common cold get better faster when antibiotics are given	163 (15.9)	275 (26.9)	215 (21.0)	347 (34.0)	22 (2.2)
In the past, antibiotics have cured my child's cold symptoms	226 (22.3)	225 (22.2)	337 (33.2)	181 (17.8)	46 (4.5)
When I visit the doctor for my child's common cold, I expect prescription for medications including antibiotics	166 (16.2)	233 (22.7)	466 (45.4)	132 (12.8)	30 (2.9)

(continued)

Table 2. (continued)

Outcome	Strongly Disagree *n* (%)	Disagree *n* (%)	Neutral *n* (%)	Agree *n* (%)	Strongly Agree *n* (%)
My child will be sick for a longer time if he or she doesn't receive an antibiotic for cough, cold, or flu symptoms	173 (16.9)	310 (30.3)	162 (15.9)	342 (33.5)	35 (3.4)
If my child has a cold or cough it is best to get an antibiotic to get rid of it	220 (21.6)	388 (38.0)	182 (17.8)	211 (20.7)	19 (1.9)
I get my child's antibiotics from the pharmacy without a prescription	776 (75.8)	103 (10.0)	92 (9.0)	50 (4.9)	3 (0.3)
In the past, I have given my child an antibiotic without a prescription when he or she had a high temperature for a few days	739 (72.1)	104 (10.1)	116 (11.3)	58 (5.7)	8 (0.8)
In the past, I have stopped giving an antibiotic because my friends/family advised me to	902 (88.3)	53 (5.2)	60 (5.9)	6 (0.6)	0
In the past, I have changed doctors when my doctor did not prescribe antibiotics for my child	914 (89.7)	46 (4.5)	39 (3.8)	16 (1.6)	4 (0.4)
I generally store antibiotics at home for when they are needed	725 (70.9)	131 (12.8)	98 (9.6)	36 (3.6)	32 (3.1)
In the past, I have stopped giving an antibiotic because he or she felt better	699 (68.7)	98 (9.6)	111 (10.9)	73 (7.2)	36 (3.6)
If my child's condition is mild, I would give the antibiotic according to what I see is suitable to his or her condition	337 (33.0)	396 (38.8)	87 (8.5)	178 (17.4)	23 (2.3)

(continued)

Table 2. (continued)

Outcome	Strongly Disagree *n* (%)	Disagree *n* (%)	Neutral *n* (%)	Agree *n* (%)	Strongly Agree *n* (%)
Skipping one or two antibiotic doses doesn't make much difference	359 (35.5)	494 (48.9)	100 (9.9)	49 (4.9)	8 (0.8)
If my child gets better, I can reduce the dose of antibiotics	291 (28.4)	467 (45.7)	64 (6.3)	166 (16.2)	35 (3.4)
It is not important to follow antibiotic doses strictly	527 (51.3)	413 (40.2)	52 (5.1)	18 (1.7)	18 (1.7)
Source of information					
I get my health-related information from the pharmacist	236 (23.0)	389 (38.0)	95 (9.3)	282 (27.5)	23 (2.2)
I get my health-related information from nurses and/or other allied health professionals	179 (17.6)	343 (33.7)	101 (9.9)	340 (33.4)	56 (5.5)
I get my health-related information from books and/or scientific literature	214 (21.1)	389 (38.4)	153 (15.1)	238 (23.5)	19 (1.9)
I get my health-related information from family and/or friends	342 (33.5)	460 (45.1)	150 (14.7)	62 (6.1)	6 (0.6)
I get my health-related information from the Internet	245 (24.0)	391 (38.3)	171 (16.7)	203 (19.9)	11 (1.1)
I get my health-related information from the media: TV, radio, and newspapers	276 (26.9)	459 (44.7)	163 (15.9)	118 (11.5)	11 (1.1)
I get my health-related information from my previous experience	111 (10.8)	228 (22.2)	158 (15.4)	503 (48.9)	28 (2.7)

Note. URTI = upper respiratory tract infection.

antibiotic in the previous year ($p < .0001$) and health-related information being taken from the pharmacist ($p < .0001$). Factors that were associated with a poorer practices related to antibiotics in URTIs were health-related information taken from the pharmacist ($p < .0001$), health-related information taken from the Internet ($p = .022$), and the number of times the youngest child received antibiotics in the past year ($p < .0001$).

Results also showed that parents being trained in the medical/paramedical field ($p < .0001$), respondents' educational level ($p = .004$), household monthly income ($p = .027$), and the number of times the youngest child had an URTI in the past year ($p = .001$) were all associated with a higher knowledge. Better practices were observed in respondents with higher knowledge regarding use of antibiotics ($p < .0001$), respondents' higher educational level ($p = .004$), and parents being trained in the medical/paramedical field ($p = .032$). Full results of the multivariate analysis are found in Table 3.

Discussion

Our study examined the parental knowledge and practices toward antibiotics for URTIs among a sample of Lebanese parents. The results show that significant misconceptions and malpractices exist. The reported knowledge score was 1.21 on a scale ranging from −18 to 18. The malpractice score was 19.56, close to the maximum score of 30 allocated for worst practices. Indeed, a proportion of our study population appeared poorly aware or unaware of the antibiotic resistance phenomenon, its risk factors, and its implications. Noticeable misconceptions about the role and coverage of antibiotics were also identified. Additionally, malpractices related to poor adherence to the prescribed dosage regimens, use of antibiotics without prescriptions as well as storage of antibiotics at home for future need, were documented. Factors associated with both poor knowledge and misuse of antibiotics were parents' lower educational and socioeconomic levels. There was a significant improvement in parents' knowledge and practice with the recurrence of URTIs episodes. Additionally, parents using the media/Internet and the pharmacists as sources of health information for common cold treatment were found to know less and to malpractice more.

Consistent with the literature, we found that lower socioeconomic factors are associated with malpractices leading to acquired antimicrobial resistance (Okeke, Lamikanra, & Edelman, 1999). Previous research also supports that the use of the media/Internet and/or the pharmacists as sole sources of health information is a potential for antimicrobial misuse

Table 3. Multivariable Analysis of Parents' Knowledge and Malpractice Related to Antibiotics.

Factor	Standardized Coefficient	Unstandardized Coefficient	95% Confidence Interval	*p* Value
Factors associated with knowledge				
Parent/guardian trained in medical/paramedical field ("no" being the reference)	.300	4.040	[3.001, 5.080]	<.001
Highest educational level obtained	.129	0.883	[0.286, 1.480]	.004
Household income	.097	0.505	[0.057, 0.953]	.027
Number of times the youngest child had a common cold in the previous year	.150	0.878	[0.347, 1.409]	.001
Number of times the youngest child received antibiotics in the previous year	−.257	−1.454	[−1.966, −0.941]	<.001
Health-related information taken from the pharmacist ("No" being the reference)	−.143	−0.630	[−0.958, −0.301]	<.001
Factors associated with malpractice				
Knowledge regarding use of antibiotics	−.405	−0.726	[−0.595, −0.857]	<.001
Highest educational level obtained	−.102	−1.267	[−2.121, −0.414]	.004
Parent/guardian trained in medical/paramedical field ("no" being the reference)	−.077	−1.846	[−3.530, −0.161]	.032
Number of times the youngest child had a common cold in the previous year	−.158	−1.644	[−2.474, −0.814]	.001
Number of times the youngest child received antibiotics in the previous year	.232	2.336	[1.524, 3.148]	<.001
Any of the children having a serious infection in the previous year ("no" being the reference)	−.066	−3.393	[−6.737, −0.480]	.047
Health-related information taken from the Internet ("no" being the reference)	.082	0.687	[0.097, 1.276]	.022
Health-related information taken from the pharmacist ("no" being the reference)	.217	1.714	[1.151, 2.277]	<.001

(Farah et al., 2015; Harbarth & Samore, 2005; Morgan, Okeke, Laxminarayan, Perencevich, & Weisenberg et al., 2011). Pharmacists in Lebanon are at the frontline of patient care and have full prescribing authorities. They can prescribe and dispense antimicrobial agents without proper medical prescriptions. Moreover, the Lebanese health-care system is unregulated and allows the over-the-counter use of antibiotics. According to the WHO, the development of multidrug-resistance organisms in developing countries is directly linked to the unregulated dispensing of antimicrobials (WHO, 2014). Our finding on the limited parental knowledge and concern regarding antibiotics is another driver to malpractice and antimicrobial resistance (Laxminarayan and Heymann 2012). Moreover, parental expectations of physicians prescribing antibiotics for URTIs were also identified and reported in our study results. Extensive evidence exists on the relationship between perceived parental expectations and pediatrician antimicrobial prescribing behavior. Parental pressure is often associated with misuse of antibiotics in childhood infections in primary care settings (Bauchner, Pelton, & Klein, 1999; Lucas, Cabral, Hay, & Horwood, 2015; Mangione-Smith et al., 1999).

Our study has some potential limitations to be considered. It includes children aged 3–12 years and does not provide information on infants and adolescents. Our survey is not a national one and has a response rate of around 27%. Despite that, we consider our sample large and representative of the country's largest governorate. We also believe that the participants are more likely to have better knowledge and more interest in antibiotic use when compared to the nonrespondents. Moreover, given our study population—mostly employed, holding university degrees, and mid-class economic level—, we expect parents living in smaller areas of the country and those with lower socioeconomic conditions to show poorer practices. Children not enrolled in schools were not accounted for; however, homeschooling is not common in Lebanon and rates of primary school enrollment are considerably high (93.9% as per Central Administration of Statistics in Lebanon, 2009). Additionally, under- or inaccurate reporting might have occurred since parents were asked to self-report their knowledge and practices. We did not assess physicians' perceptions of parental preferences, but we acknowledge the importance of studying physicians–parents' interactions and their impact on the rational dispensation of antibiotics.

Despite the mentioned limitations, the major strength of our study resides in the fact that it is the first to survey a large number of parents and report on their perspectives and practices on antibiotic use. It considerably unveils the need for interventions among parents in the attempt to reverse

the identified misconceptions and malpractices. Pharmacists are also important stakeholders, and interventions aiming to enhance their practices are essential. Assessing and addressing the motives behind Lebanese physicians' prescribing behaviors are additional essential steps to reduce antibiotics' abuse and misuse. Proper education of parents and health-care providers on rational use of antibiotics are crucial interventions, yet alone not enough to combat antimicrobial resistance. A national plan of action should be in place with clear and practical suggestions involving all stakeholders.

Conclusions

Antibiotics are overused for URTIs among the Lebanese children. Parents appear to have poor knowledge and practices toward rational use of antibiotics. Education of parents and providers, improvements in culture as well as health-care systems reform, can only when combined, lead to more rational use of antibiotics and subsequently combat antibiotic resistance.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Supplemental Material

The online [appendices/data supplements/etc.] are available at http://journals.sagepub.com/doi/suppl/10.1177/0163278716686809.

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