Use of Antibiotic among Children with Upper Respiratory Tract Infections post COVID-19 Pandemic

Amel M. Abouelfettoh[1], DhuhaAljumaiah [2], EmanAlbasti[3]
[1] Associate Professor of Maternal and Child Health Nursing, King Saud bin Abdulaziz University for Health Sciences & King Abdullah Medical Research Center, Al Ahsa, KSA
& Assistant Professor, Pediatric Nursing, Faculty of Nursing, Cairo University, Cairo- Egypt.
[2] RN, King Saud Medical City& Medical Student, Dar Al Uloom University, Riyadh, KSA.
[3]RN, Maternal and Child Hospital, Al Ahsa, KSA.

Abstract

Background: Acute Respiratory Syndrome Coronavirus2 (SARS-CoV-2) pandemic caused parents to be very suspicious with any respiratory tract infections (URTI) in their children. Whether antibiotics needed to treat COVID-19 or other URTI caused by viruses remains controversial causing irrational use of antibiotics among parents. **The aim** of the current study is to assess pattern of antibiotics use among parents of children suffering from URTI infections and COVID 19 like symptoms.**Methods:**Descriptive Cross-sectional study of a convenient sample of 209 Parents attending pediatric outpatient and primary health clinics at Ministry of National Guard Health Affairs (MNGHA) Hospital were consented to completethe study questionnaire:demographics, child's health information, COVID 19 exposure, and parents' perceptions on antibiotics(knowledge, beliefs, behaviors and adherence).**Results:** Majority of parents (93.78%) reported that children had URTI during the year post pandemic with 68.41% had symptoms for at least twice, about 60% complained from similar COVID19 symptom, out of 128 children screened for COVID19, 20 were positive (15.62%). Antibiotics prescribed to all positive and to majority of non-COVID19 illness. Parents believe and adherence to antibiotics was not favorable.**Conclusion:**Parents knowledge, believes,behaviors and adherence to antibiotics is alarming. Excessive prescription of antibiotics, irrational use during COVID-19 illness or other viral infections and obtaining antibiotics even without prescription is a public health problem.**Recommendations:**There is a need for monitoring antibiotics use among parents. An educational program and follow up needed to decrease parents' self-prescriptions or use of leftover of antibiotics. Finally, a national program for proper treatment of infections in children should be in place.

Key words: COVID19 pandemics, antibiotics, children, parents

Introduction

The Spread of COVID-19 infection caused parents to be very suspicious and anxious with any child illnesses affecting respiratory tract**(Oikonomou, et al., 2021).** Within one year of the pandemic, about 16 million confirmed cases in children reported to the Centers for Disease Control and Prevention (CDC). By March 2023,4.4 million deaths occurred from COVID 19, out of which 17,400 were children and adolescents**(Irfan, et al., 2021&UNICEF, 2023).** The optimal treatment of COVID 19 in children had not yet proven by clinical trials. Few descriptive studied are available. Researchers in Latin America reported a high rate of antibiotic prescriptions in children with COVID-19**(Yock-Corrales et al., 2021).** It is of no doubt, antibiotics are essential for the treatment of confirmed bacterial infections. However, use of antibiotics to treat children with COVID-19 or other upper respiratory tract infections caused by viruses still remains a controversial issue with some studies even do not recommend it unless there is evidence of bacterial infections. Because patients with COVID19 infections are liable to secondary bacterial infections, they may require the general use of antibiotics**(Chedid et al., 2021 & Feldman, & Anderson, 2021).** Some antibiotics found to have antiviral effects and modulate the immune response and decrease inflammatory mediators**(Wang,2020)** these effects cause health care providers to think

about the potential utilization of antibiotics in the treatment of COVID-19 infections**(Bendala Estrada, 2021).**

There is a growing concern regarding the negative impact of antibiotic use during and after exposure to COVID 19 especially on children. Data from two studied suggested that COVID-19 might increase dramatically the antibiotic overuse**(Clancy, & Nguyen, 2020 & Langford, 2020).**The overall antibiotic duration of therapy and bed days of care, significantly increased during the pandemic in many settings**(Nestler et al., 2021, Abelenda-Alonso et al., 2020, &Buehrle, 2020).** Antibiotics overuse among parents before the pandemics reported across countries**(Hallit, et al., 2020 &Mazińska, Strużycka, Hryniewicz, 2017).** A recent systematic review of 57 studies reported a higher prevalence of Antibiotics Self Medication among children found in the Middle East (34%), Africa (22%), Asia (20%) and South America (17%)**(Bert et al., 2022)**, this can lead to a public health problem and endangering the efficacy of antibiotics because of the development of antimicrobial resistance. In addition to the increasing cost and burden of chronic disease and the development of its side effects and leading to more difficult to treat infections and death. The World Health Organization [WHO] mandates the overcome of antimicrobial resistance to achieve the sustainable development goals in health care**(WHO, 2021).**

Parents are misusing antibiotics during child's illness with upper respiratory tract infections (URTIs) and similar symptoms which is mostly due to viral infection, self-limited and managed by symptomatic treatment. Self-prescription and use of treatment protocols including use of antibiotics without clear indications during upper respiratory tract infections are common among parents leading to overuse of antibiotics when they are not the correct treatment**(Alsuhaibaniet al., 2019).**

Judicious use of antibiotics reduces the negative impact of antibiotic resistance, reduce burden of diseases and its complications. Literature about parents' perception about use of antibiotics during and after the COVID19 pandemic is scarce. A study of parents' antibiotics uses during URTIs and COVID-19 infection reported that half of parents were not sure if antibiotics needed for its treatment. Parents also were not sure if antibiotics can improve the symptoms, or it can reduce illness duration**(Oikonomou, et al., 2021).**A recent systematic review of 12 studies indicated the complexity of antibiotic control especially in the context of a pandemic**(Nortey, et al., 2023).**

Significance of the study

Antibiotics overuse is public health problem, which lead to the development of bacterial resistance, increasing the cost and burden of chronic disease and the development of side effects. Antibiotics were widely prescribed during COVID19 pandemic. Whether to use antibiotics or not during viral URTI is controversial. The impact of COVID 19 pandemic on antibiotic use among parents of children who have upper respiratory tract infections or symptomsinadequatelyinvestigated in our region. In order, educate the parents regarding the proper antibiotic use, data that reflect their knowledge, believes, behavior and adherence and its correlates needed. Therefore, the aim of the current study is to assess pattern of antibiotics use among parents of children suffering from URTI infections and COVID 19 like symptoms.

Aim of the study

The aim of the current study is to assess pattern of antibiotics use among parents of children suffering from URTI infections and COVID 19 like symptoms.

Research Questions

The current study addresses the following research questions:

What is the parents' knowledge and believes level regarding antibiotics use during URT and COVID19 infections?

What is the parents' behavior and adherence level regarding antibiotics use during URT and COVID19 infections?

What is the relationship between number of URTI and COVID19 infections and number of antibiotics administered for the child?

Operational Detentions

Parents' knowledge and beliefs about antibiotics: parents' response to 10 items, 5-point Likert scale (ranged from strongly disagree to strongly agree). The total score ranges from 0 to 50, with higher score means better knowledge and believes regarding appropriate use of antibiotics. The score cut point considered poor if it was less than 60% and considered good if it was 60% and above.

Parents' behaviors and adherence with antibiotics: parents' response to 10 items, 5-point Likert scale (ranged from never to always). The total score ranges from 0 to 50, with higher score means better behavior and adherence regarding appropriate use of antibiotics. The score cut point considered poor if less than 60% of the behavior and adherence and 60% or above considered good.

Methods

The IRB committee at King Abdullah Research Center (KAIMRC) approved this Cross-sectional descriptive study. A sample of convince of 300 eligible parents who are attending with their children to pediatric outpatients' clinics and primary health care clinics in at four selected hospitals and primary health care centers (PHC) from October 2021 to February 2023 in AL Ahsa city, Saudi Arabia approached. Available parent (a mother or a father attending with the child)invited to fill in the study questionnaire.

The questionnaire included four sections:thefirst section included parents and children demographics, the second section included child illness and history of COVID19 exposure. The third section included frequency of antibiotic use. The fourth section included parenteral perception of Antibiotics (PAPA) Scale developed and validated in previous research **(Alumran, Hou, & Hurst, 2013 &Alumran, Hou, Sun, Yousef, & Hurst, 2014).** The scale included two subscales: Knowledge and Beliefs (10 items), Behavior and adherence (10 items).Parents were asked to rate their responses for the knowledge and believes items on 5-point Likert scale ranging from strongly disagree to strongly agree, and for the behaviors and adherence scale from never to always. For each scale, the score is calculated and higher score on any scale is generally desirable. A higher score on the Behavior and adherence means better behavior regarding appropriate use of antibiotics. Reverse scoring done for negative stated items.

Statistical Package for Social Sciences (SPSS) version 27used for data analysis. Descriptive statistics presented as mean, standard deviation (SD), and median for the quantitative variables. Additionally, categorical variables presented as frequency and percentage. Independent t test used to compare parents' Knowledge, belief, behavior and adherencescores with parents demographics as well as the number of antibiotic courses used for the child during the last year.

Results

Table 1 shows parent's demographics. Two hundred and nine parents provided complete data from four settings.Most of participating parents were mothers (81.8%) with a mean age of 33.83±9.045 Years old, 22.5% have training or education in the medical filed, and 55% with university or higher degree.

Majority of children (93.78%) experienced URT illnesses during the year post Pandemic, out of which 60.2% have COVID19 similar symptoms and 19.4% hospitalized. About one third of the children who had experienced URTI reported to have chronic illness such as Asthma, diabetes and gastrointestinal problems (33.16%, 10.20%, and 3.07%) respectively. Children had history of COVID19 exposure for once (40.8%) or twice or more (23.5%). Out of 128-screened children for COVID19, 15.6% were positive. Majority of children who had URTI or COVID19 illnesses (89.5%) received antibiotics for once (41.7%), two to three times (40.10%), or more than three times (18.18%). All children tested positive to COVID received antibiotics and 80% who had COVID like symptoms received

antibiotics(Table2). There was significant relationship between number of URTIs and frequency of antibiotics used (X2 = 100.79, p= 0.000) (Table 3).

Parents'antibiotics knowledge and believes mean score was 30.57± 3.63 out of 50. Parents (both fathers and mothers)tend to have poor knowledge about antibiotics uses during children respiratory illness. Majority of parentsagree that antibiotics needed with common cold, sore throat and viral infections as well as its use in children is safe (Table4). There was no significant difference between mothers and fathers'knowledge and belief scores (t=0.837, P=0.404) (Fig1).

Table 5 illustrates parents' behavior and adherence level, about 43% of parents showed unsatisfactory behavior and adherence with antibiotic use during child's URTI. More than third of the parents expect antibiotics prescription when they visit the clinic (32.5%), they get antibiotics without prescription (37.3%) and they store antibiotics at home just in case they needed it (32.6%). Almost half of Parents (50.3%) give antibiotics if the child have high temperature and 42.6% had changed the doctor if did not prescribes antibiotics. Many parentsagree that if child gets betterthey can reduce the dose of antibiotic (47.9%) and they can skip a dose of antibiotic with no problem (33%). Mothers' mean behavior and adherence score was higher than fathers' score (36.91.53±5.3 and 32.66±6.3) respectivelywith significance difference in their scores (t=3.468, P=0.001)(Figure2).

Table 1. Parents and children demographics

Items	**N=209 (M ± SD)**	**%**
Participated Parents		
Father	38	38%
Mother	171	81.8%
Parents Age	(33.83 ± 0.045)	
<20	4	1.9%
(20-<30)	74	35.4%
(30-<40)	80	38.3%
(40-<50)	36	17.2%
(50-<60)	15	7.2%
Employment status		
Not employed	133	63.6
Employed	76	36.4
Level of education		
Primary school	14	6.6
Middle school	31	14.8
High school	49	23.4
University or higher	115	55

Table 2. Children health history and exposure to COVID19 and antibiotics use

Items	N=209	%
URTI During last year		
Non	13	6.22%
Once	53	25.35%
(2-3) times	140	66.98%
>3 times	3	1.43%
Chronic Conditions (N=196)		
Non	105	53.57%
Respiratory (Asthma)	65	33.16%
Diabetes	20	10.20%
GIT	6	3.07%
COVID19 Exposure: (N=196)		93.77%
None	70	35.71%
Once	80	40.8%
Twice or more	46	23.5
COVID19 Similar symptoms (n=196)		
None	76	38.7%
Once	90	44.9%
Twice or more	30	15.3%
COVID 19 Screened/tested (n=196)		
Yes	128	65.3%
No	68	34.7%
Positive	20	15.6%
Negative	108	84.4%
Hospitalized due to COVIDURTI	196	93.78%
Yes	38	19.4%
No	158	80.6%
Received antibiotics during last year	187	89.5%
Once	78	41.7%
(2-3) times	75	40.10%
>3 times	34	18.18%
Antibiotic During COVID infection (20)	20	100%
Antibiotic with COVID like symptoms (120)	96	80%

Table 3. Times of antibiotics give during last year and times of a previous common cold and COVI19

Times of a previous common cold-COVID19	**Times given antibiotics during last year**				**χ^2 P**
	Once or less (n=100)		**2 times and more (n=109)**		
	N	**%**	**N**	**%**	
▪ Once or less	50	23.92	16	7.66	100.79 0.000*
▪ 2 times and more	50	23.92	93	44.50	

* Statistically significant at level P<0.001

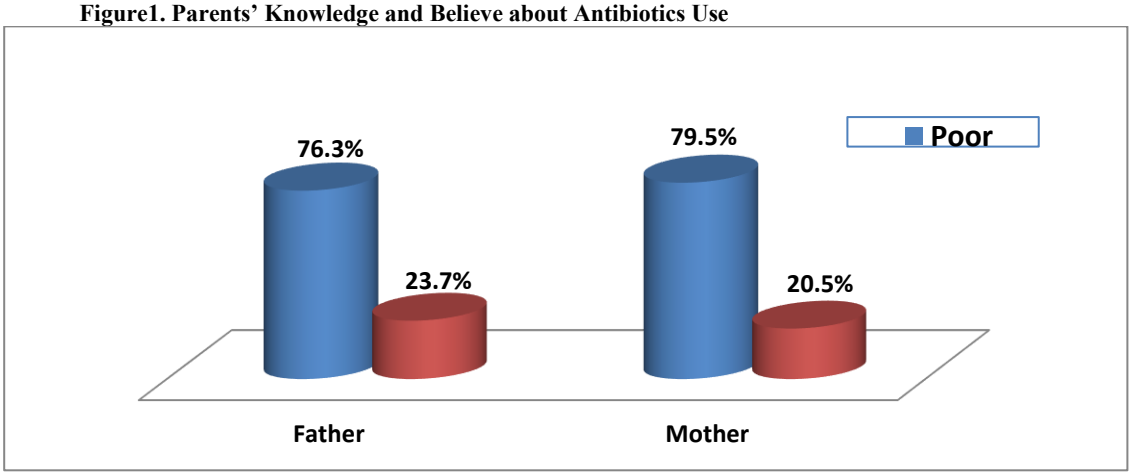
Table 4. Frequency distribution of Parents' knowledge and believe regarding antibiotic use

Knowledge and Believes Items	Strongly agree		Agree		Neutral		Disagree		Strongly disagree	
	N	%	N	%	N	%	N	%	N	%
Antibiotics are needed for common cold	4	1.9	68	32.5	37	17.7	62	29.7	38	18.2
Antibiotics are needed for sore throat	12	5.7	100	47.8	38	18.2	43	20.6	16	7.7
Antibiotics treat bacterial infections	7	3.3	86	41.1	37	17.7	48	23.0	31	14.8
Antibiotics treat viral infections	22	10.5	121	57.9	39	18.7	21	10.0	6	2.9
Antibiotics can cure all types of infections	19	9.1	50	23.9	61	29.2	65	31.1	14	6.7
Antibiotics are safe to use	31	14.8	70	33.5	56	26.8	44	21.1	8	3.8
Antibiotics are helpful in treating common cold among children	7	3.3	82	39.2	39	18.7	54	25.8	27	12.9
Antibiotics can be harmful to one's health	12	5.7	22	10.5	48	23.0	100	47.8	27	12.9
Some germs are becoming harder to treat with antibiotics	13	6.2	35	16.7	65	31.1	81	38.8	15	7.2
Some germs can become resistant to antibiotics if they are taken in inadequate doses	12	5.7	34	16.3	47	22.5	87	41.6	29	13.9

Table 5. Frequency distribution of Parents' behavior and adherence with antibiotic use

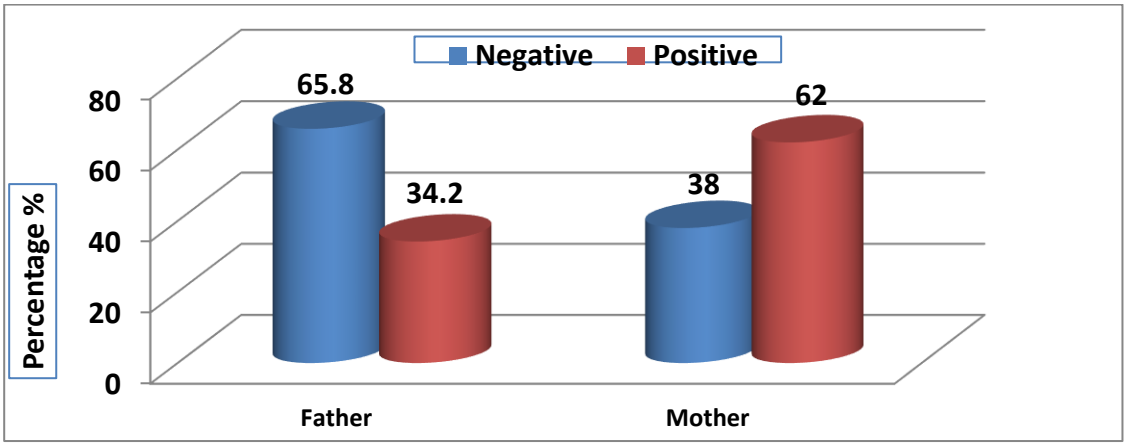
Behavior and Adherence Items	Strongly agree		Agree		Neutral		Disagree		Strongly disagree	
	N	%	N	%	N	%	N	%	N	%
1. When I visit the doctor for my child's common cold I expect prescription for medication including antibiotics	12	5.7	56	26.8	31	14.8	67	32.1	43	20.6
2. I get my child's antibiotics from the pharmacy without a prescription	12	5.7	66	31.6	33	15.8	63	30.1	35	16.7
3. I generally store antibiotics at home for when they are needed	15	7.2	53	25.4	41	19.6	65	31.1	35	16.7
4. I have given my child an antibiotic when he/she had a high temperature for a few days	29	13.9	76	36.4	47	22.5	35	16.7	22	10.5
5. I have changed doctors when my doctor did not prescribe antibiotics for my child	23	11.0	66	31.6	64	30.6	38	18.2	18	8.6
6. I have stopped giving my child an antibiotic because he/she felt better	8	3.8	30	14.4	25	12.0	90	43.1	56	26.8
7. I have stopped giving my child an antibiotic because my friends/family advised me to	4	1.9	13	6.2	14	6.7	71	34.0	107	51.2
8. If my child gets better I can reduce the dose of antibiotics	53	25.4	47	22.5	72	34.4	25	12.0	12	5.7
9. Skipping one or two antibiotic doses doesn't make much difference	26	12.4	43	20.6	69	33.0	17	8.1	54	25.8
10. It is not important to follow antibiotics doses strictly	6	2.9	20	9.6	38	18.2	19	9.1	126	60.3

Figure1. Parents' Knowledge and Believe about Antibiotics Use



< 60% Poor ≥ 60% Good t=0.837, P=0.404

Figure 2. Parents' Behavior and Adherence Level with Antibiotics Use



<60% Unsatisfactory ≥ 60% Satisfactory (30-50) t=3.468, P=0.001*

Discussion

Since the spread of COVID19 infection, the study was the first in the region. The study assessed antibiotics use among parents of children with URTI and/ or COVID19 symptoms. Majority of parentsreported that their children experienced URTI, following the year of pandemic and return of the normal life, and about three quarters of the children experienced RTIs two times or more with majority had similar COVID19 symptoms and all tested positive for COVID admitted to the hospital and received antibiotics.

Acute respiratory infections considered a public health problem especially among children**(Hasan, et al., 2022).**It accounts for about a third of overall pediatric attending the primary health care facilities**(Chelabi, et al., 2023).** After the lock down announcement in March (2020), and the use of social distancing, less exposure to infections were expected. However, the year after, more socialization might be a reason for the increased incidence especially with the continued existence of the COVID19 and the emergence of the new COVID19 sub-mutants as well as other viruses until now. The incidence of RTI is multifactorial: seasonal, demographics and socioeconomic as well as the child's health conditions. Additionally, the occurrence of widespread of new infectious disease such as COVID19 can also contribute to the high incidence and increased acuity level. It was reported by Chelabi and associates that the

acuity level of respiratory illness was reported to be higher in children with asthma during the COVID19 pandemic**(CDC, 2023).** Similarly, in the current study all children exposed to COVID infected adults had more frequent Respiratory Illnesses. Children with chronic illnesses such as asthma and diabetes showed more frequent URTI.

The study results indicated that all suspected as well as confirmed cases of COVID19 received antibiotics as well as parents who have a member in the family exposed to COVID 19 had more tendency to overuse antibiotics. There is a growing concern regarding the negative impact of antibiotic use during and after exposure to COVID 19 especially on children. Data from two studies suggested that COVID-19 causesantibiotic overuse**(Clancy & Nguyen, 2020 & Langford, 2020).**Surprisingly and colleagues, reported that community consumption rate of antibiotics during the COVID 19 lockdown months **(March, April and May 2020)** was proportionally less compared to same month of the year before**(Gagliotti, et al., 2021).** On the other hand, the overall antibiotic duration of therapy and bed days of care significantly increased during the pandemic in many settings**(Nestler, et al., 2021, Abelenda-Alonso, et al., 2020, &Buehrle, 2020).**Similarly, Malik, &Mundra (2022) reported that an over consumption of antibiotics during the COVID-19 Pandemic.

The evidence of using antibiotics for treatment of COVID19 is not clear until the moment in addition, there is no evidence to support antibiotic use for children with COVID-19 with absence of bacterial infection**(Wang, et al., 2020).**

Home use of antibiotics and self-prescription was high. The current study revealed that, most of parents believe that antibiotics are the first and foremost line of treating respiratory infections including COVID19 infection.A study in Saudi Arabia reported that the parents lack adequate knowledge regarding the use of antibiotics in the treatment of URTIs. This led to wrong practices and attitudes toward the same**(Alzaid, Alosaimi, Alkahtani, 2020).**The influencing factors on the overuse of antibiotics include; psychosocial factors such as attitudes and beliefs, knowledge-related factors that may lead to unwanted behaviors such as parents' pressure and inappropriate use of antibiotics, and demographic factors including education levels, socioeconomic status, and employment.These factors may explains parents' behavior regarding antibiotics overuse. Parents requesting antibiotic prescription from their health care providers or using old saved antibiotics at home if they fail to pressuring the health care provider to prescribe the antibiotic for their children who have URTI even without confirming bacterial origin.

Conclusion& Recommendations

Excessive prescription of antibiotics, irrational use during viral infections and obtaining antibiotics even without prescription is a public health problem. COVID19 pandemics caused parents use more antibiotics, parents knowledge and believes, behaviors and adherence to antibiotics use for children's URTI is alarming. Therefore, the study recommends that, a national program for proper diagnosis and treatment of infections in children is mandated. Parents needed education about the overuse and low adherence with antibiotics to save the community and to prevent antibiotic resistant infections and other complications. This educational programs need to include information related to giving clear, specific and about the child's symptoms and medical history, taking only the prescribes antibiotics with accurate following the instruction of its use. Further researches needed to investigate other variables affecting parents' use of antibiotics.

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