DOI: https://doi.org/10.53555/nnmhs.v8i6.1372 Publication URL: https://nnpub.org/index.php/MHS/article/view/1372

PATTERN OF ANTIBIOTIC PRESCRIPTION AMONG CHILDREN WITH UPPER RESPIRATORY TRACT INFECTION IN AN EGYPTIAN OUTPATIENT CLINIC DURING COVID-19 PANDEMIC

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Abstract:-

Objective:

Study aimed to investigate the pattern of antibiotic prescription and assess its inappropriate use to treat children complaining of upper respiratory tract infection (URTI). A cross-sectional survey was conducted to identify the antibiotic prescribed to children aged 1 day -12 years who complained of URTI from February 2020 till March 2020. All guardians or care givers were interviewed for 10-15 minutes to fill in a predesigned interview schedule.

***Results**: A total of 300 children participated in the study, their mean age was 5.83±3.59, 41.1% were school aged, males represented 57%, the medical causes of seeking medical advice were acute tonsillitis (67.0%), common cold (18.0%), sinusitis (14.0%), and Otitis media (3.0%). Antibiotic prescription rate of outpatient children was 83.0% (249/300), 16.5% of them received parenteral antibiotic. Most common antibiotics were amoxicillin and clavulanic (41.0), amoxicillin and fluxacillin (38.2), followed by cefotaxime (20.8). All cases with acute tonsilitis and acute otitis media were prescribed antibiotics, while 50% of sinusitis and 55.56 with common cold received antibiotics. There was inappropriate use of antibiotic for outpatient children among 86.7%. Inappropriate antibiotic prescription for children on outpatient basis was a serious problem. Management strategy should be implemented to improve the quality of antibiotic use.*

Keywords: *antibiotic prescription, appropriate antibiotic prescription, children, outpatient clinics, upper respiratory tract infections*

INTRODUCTION

Antibiotic resistance is a global threat to public health, and it has been worsened by the inappropriate antibiotic prescription and increasing number and types of resistant bacteria. The exact magnitude of inappropriate antibiotic prescription is not well defined globally. This problem is not only encountered in developing countries; nearly one-third of the antibiotics prescribed in the outpatient setting in United States (US) were deemed to be inappropriate.(1) Higher rate of inappropriate antibiotic prescription was reported in Qatar; in total 34177 of 75733 (45%) of the included claims during the study period were for inappropriate indication.(2)

The main problematic consequences of inappropriate antibiotic prescription - particularly broad-spectrum antibiotics - are increasing healthcare costs, adverse events, and poorer outcomes.(3) More critically, inappropriate prescription is a key contributor to growing antimicrobial resistance, which poses a significant danger to global public health. (1) Consequently, the United Nations General Assembly has designated antimicrobial resistance as a global priority health concern.(4) Generally, the most frequent indication for antibiotic prescription in outpatient clinic is the upper respiratory tract infections (URTIs) accounting for nearly half of such prescriptions.(5)

It is worthy to note that, between 30% and 64% of the antibiotics prescribed for URTIs are considered to be inappropriate.(5-8) With the emergence of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) the magnitude of this problem marvelously increased. In an attempt to manage coronavirus disease-2019 (COVID-19) which is a group of manifestations caused by the cytokine storm aggravated by superadded bacterial infection broad spectrum, antibiotics are frequently prescribed.(9) Therefore, antibiotic prescription must be monitored to develop targeted antimicrobial resistance prevention and control measures. Indeed, the rates and patterns of antibiotic use in the outpatient setting in the Egypt is not fully addressed. This study was conducted to determine the pattern of antibiotic prescription and the rate of inappropriate antibiotic prescription for children aged 12 years or less in an outpatient governmental healthcare setting for URTIs.

Main Text

Material and Methods

A cross-sectional survey was conducted in February 2020 till March 2020 in the pediatric outpatient Chest Clinic at Markaz Elseha in Mamoura area in Alexandria Egypt. Sample size was calculated using the computer package Epi-info version 7.2 based on a magnitude of antibiotic prescribing of 49.7 % (10), a degree of precision of 5, and an alpha level of 0.05, power =80%, the minimal required sample size was 278, which was adjusted to 300. All children aged 12 years or less, complaining of URTIs attending the clinic were eligible for the study. All guardians or care givers were interviewed for 10-15 minutes to fill in a predesigned interview schedule. The interview schedule consisted of the following sections: sociodemographic data (age, sex), diagnosis (acute otitis media, sinusitis, acute tonsilitis, common cold), antibiotic prescription (yes/no, type of antibiotic, number of antibiotics, dosage, route, and duration of administration). Appropriateness of prescription (dose and duration) was determined using antimicrobial prescribing guidance-managing common infections of - National Institute for Health and Care Excellence (NICE) and Public Health England (PHE). (9)

The study was approved by the authorities and Ethical Committee of the High Institute of Public Health, Alexandria University, Egypt. All participants or their caregivers gave oral consent to participate in the study and they were able to withdraw themselves from the study at any time.

Statistical Analysis:

The collected data were coded, revised, cleaned, tabulated, and analyzed through IBM SPSS Statistics version 26 using appropriate statistics. Quantitative data such as age, number of prescribed antibiotics, dose of prescribed antibiotics and duration of antibiotics were described by mean and standard deviation. Categorical data such as gender, type of diagnosis, type of prescribed antibiotic and route of administration were pronounced by number and percentages. Chi square test was used to test the association between categorical variables.

Results

In this study, a total of 300 children were included, their mean age was 5.83±3.59, 41.1% were school aged, males represented 57%, the medical causes of seeking medical advice were acute tonsillitis (67.0%), common cold (18.0%), sinusitis (14.0%), and otitis media (3.0%) (Table 1).

The frequency of antibiotic prescription among children aged below 12 years was 83% (249/300); the highest among school age among school age children 92.7 (114/123), followed by toddlers 84.9% (73/86), then preschool children 80.7% (67/83), and infants 62.5% (5/8). Figure 1 There is an observed trend to prescribe antibiotics with increasing age.

The most frequently prescribed antibiotics were amoxicillin and clavulanic acid (41.0%), and amoxicillin and fluxacillin (38.2%) followed by cephalosporine (20.8%). In total 73.5% of antibiotics were given parentally, 96.4% of given antibiotics were inappropriate antibiotic group, 67.8% were given for inappropriate duration, 57.0 were given for unspecific duration, and 3.6% for inappropriate dose. There was insignificant difference regarding the frequency of prescribing antibiotics, and type of prescribed antibiotics, and route of administration in-between different age categories. We observed a statistically significant difference in-between the studied age group in the duration of antibiotic

prescription. Interestingly, all antibiotics prescribed for infants were of inappropriate duration, the same finding was reported in 98.6% and 98.5% in toddlers and preschool, while lower magnitude of inappropriate antibiotic prescription was observed among school age (68.0%), this difference was statistically significant $p<0.05$ (Table 2).

Discussion

Reducing needless antibiotic usage is a crucial step toward slowing the spread of antibiotic resistance. Inappropriate antibiotic prescriptions are frequent in pediatrics, such as overuse of broad-spectrum antibiotics in respiratory tract infections and urinary tract infections.(11, 12) In this study, pattern of antibiotic prescriptions in pediatric outpatient from a main pediatric chest clinic was described during the early waves of COVID-19 pandemic. We found that 83.0 percent of hospitalized children were administered antibiotics. According to certain point prevalence studies, 40.9% of pediatric inpatients in the United Kingdom,(13) 37 in Riga%, and 26.3% in Vilnius were on antibiotics.(14) The data in the aforementioned trials were obtained on a single day of hospitalization. In a large cross-sectional survey conducted in China, the antibiotic prescription rate among hospitalized children was 66.9%. Antibiotic prescription rates are greater in general hospitals and non-tertiary children's hospitals than in tertiary children's hospitals 46.1% and 85% respectively.(15) A cross-sectional research in Ethiopia using a similar technique to ours found that almost 74% of hospitalized children received antibiotic therapy (16) , which is lower than the proportion in this study considering that patients included in our study were not hospitalized. There are geographical differences in antibiotic usage among pediatric inpatients, despite the fact that they should be examined in the same way. It is recognized that developing has a greater rate of antibiotic usage in children than Europe and North America.(17, 18)

The route of delivery is determined by the type and severity of the disease, but it is also influenced by the illogical social acceptance that intravenous medications are more "effective" than oral antibiotics. In this study, the parenteral route was not commonly used; around 16.5 percent of patients got parental antibiotics, whereas most outpatients received oral antibiotics. According to antibiotic route studies, the prevalence of purely oral antibiotics ranged from 0 to nearly 80%, with an average of 21.5% in hospitalized children across hospitals.(19) It is worth noting that multiple randomized trials have shown that oral amoxicillin is as safe and effective as parenteral penicillin for pediatric patients with community-acquired pneumonia, which is the most frequent illness in children.(20) In addition, oral administration has potential to avert suffering of children, minimize the risk of hospital infection, reduce nursing burdens, shorten hospital stay and decrease medical expenses for many hospitalized children with common pediatric infections.(19) Early switch from parenteral to oral has been proposed to be a quality indicator for improving antibiotic prescribing on pediatric inpatients worldwide.(12)

Reducing needless antibiotic usage in pediatric URTIs may be another issue to consider in order to prevent improper antibiotic use in Egypt. In this study discovered that a significant proportion of antibiotics were administered for URTIs in pediatric outpatients, with rates over 50% indicating overprescribing. In fact, the vast majority of URTIs are caused by viruses and do not require antibiotics.(21) the misuse of antibiotics may be difficult to identify bacterial infections from viral URIS as junior physicians may lack awareness about antibiotic treatment for URTIs.(22) Similarly, Maio et al., (13) discovered that a significant proportion of antibiotics were prescribed for URTIs in pediatric inpatients, particularly in general hospitals, with rates of more than 30% indicating overprescribing. According to the American Academy of Pediatrics, judicious antibiotic prescribing for URTIs in pediatrics should follow three principles: determine the likelihood of bacterial infections based on clinical symptoms, weigh the benefits and harms of antibiotics based on strict bacterial diagnosis, and choose appropriate strategies based on the severity of disease.(23)

Conclusions and Recommendations

More attention should be paid to the unnecessary prescription of antibiotics in managing mild to moderate cases visiting outpatient clinics. Unnecessarily many viral diseases were managed using a broad-spectrum antibiotic. Physicians needs more practical training on how to appropriately prescribe antibiotics to treat URTIs in children. Guidelines for appropriate antibiotic prescription should be adhered to.

Limitations: This is a short-term cross-sectional survey, with data gathered just from February 2020 to March 2020, which may result in seasonal bias. However, it does show the general status of contemporary antibiotic usage to some extent. A comprehensive analysis may be conducted to assist us comprehend the seasonal patterns. Otherwise, more attention might be paid to other factors of improper antibiotic usage, such as the dose and duration of antibiotics. Furthermore, this study was done in a single center that may not be typical or generalizable beyond the study setting. Finally, because this study was undertaken early in the pandemic, investigations that analyze the pattern of antibiotic prescriptions after the community has experienced many waves of the pandemic are required.

List of abbreviations

COVID-19: Corona Virus Disease; SARS-CoV-2: Severe acute respiratory syndrome coronavirus 2; URTI: Upper Respiratory Tract Infection; URTIs: Upper Respiratory Tract Infection; US: United States.

Declarations

Ethics approval and consent to participate

The approval of the authorities of the High Institute of Public Health for conducting the research was obtained. An informed verbal consent was taken from the study participants' guardians or care givers after explanation of the purpose and benefits of the research. Anonymity and confidentiality were assured and maintained.

Consent for publication

Not applicable.

Availability of data and materials

Data are available on reasonable request.

Conflict of interest

None to be declared.

Funding

Authors declare that no funding has been received related to the manuscript

Author contributions:

BFA: Conceving the idea, designining the quesrionnaire, superviding the collection of data, analysing the results, and writing the manuscript.
EAMA: Data collection and analysis.
SZA: Data collection and analysis.
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Acknowledgment

Authors would offer special thanks to all study participants for their acceptance and cooperation

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Tables and Figures

Table 1: Description of the Study Population

Variable	**(n=300)**	No (%)
Age category	School children	123 (41.1)
	Preschool	83 (27.7)
	Toddler	86 (28.7)
	Infants	8 (2.7)
	Age ($\bar{x} \pm sd$)	5.83±3.59
Gender	Males	171(57.00)
	Females	129(43.00)
Diagnosis	Acute Tonsilitis	201(67.00)
	Common Cold	54(18.00)
	Sinusitis	42(14.00)
	Otitis Media	3(3.00)

Table 2: Frequency and Type of Antibiotic Prescribed for Different Age Groups

		Age Group						
		Total (n=249)	Infant (n=5)	Toddler (n=73)	Preschool (n=67)	School (n=104)	*df*- χ^2	p
Antibiotic used	Amoxicillin and Clavulanic	102(41.0)	4(80.0)	26(25.6)	33(49.2%)	39(37.5)	6- 9.71	0.117
	Amoxicillin and fluxacillin	95(38.2)	0(0.0)	32(43.8)	18(23.7)	45(43.3)		
	Cephalosporines	52(20.8)	1(20.0)	15(20.6)	16(21.1)	20(19.2)		
Route of administration	Oral	183(73.5)	4(2.2)	57(31.1)	51(27.9)	71(38.8)	3 – 2.59	0.47
	Parental	66(16.5)	1(1.5)	16(24.2)	16(24.2)	33(50.0)		
Antibiotic group	Appropriate	5(3.6)	0(0.0)	3(4.1)	4(6.0)	2(1.9)	3.-2.16	0.54
	Inappropriate	240(96.4)	5(100.0)	70(95.9)	63(94.0)	102(98.1)		
Duration	Appropriate	34 (13.7)	0(0.0)	1(1.4)	1(1.5)	32(32.0)	3- 45.91	<0.001
	Inappropriate	212 (86.7)	5(100.0)	72(98.6)	66(98.5)	69(68.0)		
Duration	Specified	107(43.0)	3(60.0)	16(21.9)	46(68.7)	59(56.7)	3- 82.7021	<0.00001
	Not specified	142(57.0)	2(40.0)	47(78.1)	21(31.3)	45(43.3)		
Dose	Appropriate	240(96.4)	5(100.0)	70(95.9)	63(94.0)	102(98.1)	3-2.52	0.098
	Inappropriate	9(3.6)	0(0.0)	3(4.1)	4(6.0)	2(1.9)		

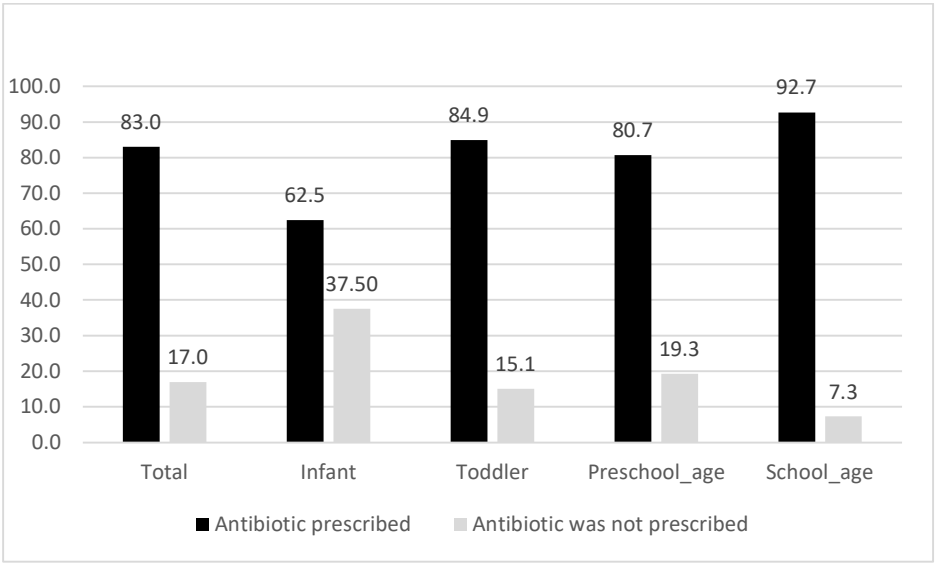

Figure 1: Frequency of antibiotic prescription among children aged 12 years or below

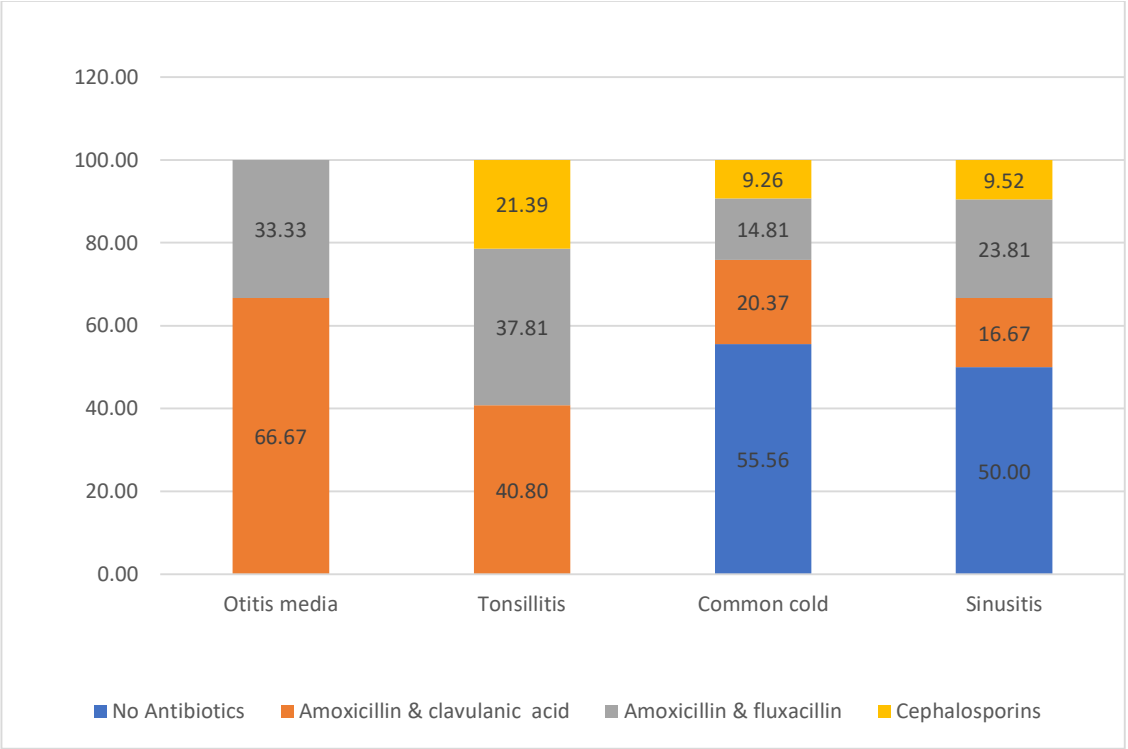

Figure 2. Prescription pattern of various antibiotic categories for assorted diagnoses. Amoxicillin & Clavulanic, Amoxicillin & fluxacillin and cephalosporins – in descending order- were exclusively the three types of antibiotics prescribed.