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Original Article

ASSESSMENT OF ANTIBIOTIC USAGE PATTERN IN PATIENTS OF PEDIATRIC DEPARTMENT-A PROSPECTIVE STUDY

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ABSTRACT

Objective: The study aimed to assess the antibiotic usage pattern in patients of the pediatric department in ESI Hospital, Indiranagar, Bangalore.

Methods: A prospective six-month observational study was conducted in the pediatric department. The history of the patients was collected from the case sheets and the patient demographic details were also collected. The details of antibiotics prescribed and the other therapy applied to the patients were collected in terms of dosage, duration, and route of administration. The antibiotic consumption was assessed based on qualitative and quantitative indicators which assess the appropriateness of antibiotic use, and the dosage of antibiotics prescribed, respectively. Regarding the qualitative evaluation of antibiotic consumption, the World Health Organization (WHO) guideline was considered to appraise compliance with indication and dosing.

Results: Distribution of drug prescription indicators showed that the average number of drugs per encounter was 3.7, which is more than the standards suggested by WHO and should be reduced as much as possible to mitigate polypharmacy and its consequences. 93.45% of encounters existed leastwise with one or more antibiotics, which was higher than the WHO standards. Almost 56.08% of drugs were prescribed considering their generic name, which was very much lower than the ideal percentage recommended by WHO.

Conclusion: The percentage of encounters with one or more antibiotics was very higher than the WHO standard percentage, which indicates the irrationality of antibiotic prescribing. To minimize the irrationality of prescriptions and their inappropriateness, effective interventions and compliance with antibiotic prescribing guidelines are required.

Keywords: Antibiotics, Pediatric, Clinical pharmacy, Infectious disease

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INTRODUCTION

According to the World Health Organization (WHO), antibiotics are defined as medicines employed to prevent and treat bacterial infections. Antibiotics are widely used in the treatment and prevention of infectious diseases in pediatrics; however, every drug has a specific hazardous character, which might not be known necessarily [1]. Although antibiotic treatments should be initiated immediately in some cases like neonatal sepsis, they are sometimes unnecessarily prescribed, resulting in a possible increase in morbidity, health-care costs, and resistance to antimicrobials. Hence, prescriptions should be monitored and evaluated regularly to avoid such concerns [2]. Nowadays, resistance to antimicrobial drugs has increased due to the improper use of antibiotics [3]. Increased resistance can be completely prevented or leastwise minimized through the reasonable consumption of antibiotics [4]. Selecting a suitable antibiotic for the treatment of a particular infection is very challenging, and a systematic approach should be applied to antibiotic selection following some key steps.

WHO recommends government's control and preventive efforts in four main areas: Surveillance for antimicrobial resistance, rational antibiotic use, improving the education of healthcare workers and the public in the appropriate use of antibiotics, introducing or enforcing legislation to stop selling antibiotics without prescription, strict adherence to infection prevention and control measures, advising the use of handwashing measures, particularly in healthcare facilities [1].

Rational prescribing practices include R-Reasoning for prescription, right dose, route, duration, A-Academically updated decisions, T-Training of mind, residents, parents, pharmacists, I-Instructions to parents, O-Organism search, N-Noting down the diagnosis, A-Antibiotic Policy, L-Local sensitivity pattern, and E-Ethical considerations, the economic condition of the patient [5].

Concerning WHO guidelines, prescribing indicators include the average number of medicines prescribed per patient encounter, to measure the degree of polypharmacy, percentage of medicines prescribed by generic name, to measure the tendency of physicians regarding prescriptions according to generic name, percentage of encounters with an antibiotic/injection prescribed, to measure the overall level of use of two important, but commonly overused and costly forms of drug therapy, percentage of medicines prescribed from an EML or formulary, to measure the degree to which practices conform to national drug policy, as indicated by prescribing from the national essential drugs list or formulary for the type of facility surveyed [6].

Although the use of antibiotics applies to all ages, their usage for pediatric needs special attention [7]. Pediatrics pose a unique set of risks of medication errors, predominantly because of the need to make dosage calculations, which are individually based on the patient's weight, age or body surface area (BSA), and their conditions. Such a need for special attention in pediatrics increases the likelihood of errors, particularly dosing errors. In particular, preventing dosing errors is an important part of ensuring safe and quality patient care in the pediatric population [8].

India is one of the countries in which uncontrolled use of antibiotics is common, which is a serious concern. Eventually, the irrational use of antimicrobials can lead to antimicrobial resistance. Furthermore, the infections caused by resistant bacteria are very difficult to treat, at the same time, making the therapy decisions complicated. Hence, wise hospital surveillance is required to address and monitor antibiotic usage patterns, as well as, their misuse by patients and clinical staff. The information collected and analyzed by a clinical pharmacist can be of great importance in improving the rational use of antibiotics and providing details to healthcare professionals. Hence, this study is conducted to assess the antibiotic usage pattern in patients of the pediatric department.

MATERIALS AND METHODS

A prospective six-month observational study was conducted in the pediatric department of ESI Hospital, Indiranagar, Bangalore. The history of the patients who were admitted to the pediatric ward was collected from the case sheets. The patient demographic details were also collected. The details of antibiotics prescribed and the other therapy applied to the patients were collected in terms of dosage, duration, and route of administration. Patients were followed up until the time of discharge. In case of any infection, the corresponding disease was evaluated; subsequently, the treatment applied was also documented. The type of antibiotics prescribed and the rationality of the prescription was also analyzed.

The study protocol was approved by the Institutional Ethics Committee before the commencement of the study (Protocol No: GCP/IEC-12/2018-2019). Patients of either sex admitted to the pediatric ward were included in the study. The patient consent form was also completed by the parents. All the information like age, gender, disease history, and drug treatment were recorded. Subsequently, the patients were visited every day until having been discharged from the ward. All the data were analyzed for demographic parameters such as age, sex, type of disease, and antibiotic prescribed. The assessment of antibiotic consumption was performed based on qualitative/quantitative indicators which assess the appropriateness and dosage of antibiotic use, respectively, for the qualitative evaluation of antibiotic consumption, WHO guidelines weres used to appraise compliance with indication and dosing.

The following tools were used to collect the data:

1. Patient information sheet

2. The patient data collection forms

3. Naranjo adverse reaction probability scale.

RESULTS

Out of 107 subjects, the majority of patients were male (59.81%). Age-wise distribution demonstrated that the maximum number of patients (47%) were 5–8 y old, And the mean age was found to be 6.51±3.01. Classification of study based on patients' BMI showed that most of the patients (48.59%) had a normal BMI. Categorization of patients based on the cause of hospitalization showed that the most prevalent cause was pneumonia (23.36%), followed by UTI (15.88%) (table 1).

The mean distribution of drugs based on the number of drugs per the prescription of the sample population was found to be 3.7 encounters per prescription. Most of the prescriptions were having one antibiotic encounter (74.76%). The remaining were having two (18.69%) or no antibiotics encounter (6.54%) (table 2).

Out of 125 prescribed antibiotics, the most prescribed one was azithromycin (18.40%), followed by amoxicillin-clavulanate (16.80%), and amoxicillin (16.80%). Categorization of antibiotics based on the distribution of correct dose calculation showed that most of the antibiotics (84.2%) were having correct dose calculation. Among prescribed antibiotics, most of them were prescribed by generic names (56.08%), and distribution of antibiotics by route of administration showed that most of the antibiotics were administered by the IV route (44%) (table 3).

According to table 4, categorization based on other drugs prescribed for treatment of comorbidities showed that the most common medications were antacids (20.71%), followed by nutritional/ vitamin supplements (19.28%).

Distribution of drug prescription indicators showed that the average number of drugs per encounter was 3.7, which is more than the WHO standard and should be reduced as much as possible to mitigate polypharmacy and its consequences. 93.45% of encounters leastwise existed with one or more antibiotics, which were higher than the WHO standard. Almost 56.08% of drugs were prescribed by their generic name, which was very much lower than the WHO ideal percentage (table 5).

Table 1: Baseline characteristics (n = 107)

Parameter	Frequency (%)
Age (years)	
<5	30 (28)
5–8	50 (47)
9–12	24 (22)
13–16	3 (3)
BMI (kg/m²)	
<18.5 (Underweight)	21 (19.62)
18.5-24.9 (Normal)	52 (48.59)
25-29.9 (Overweight)	11 (10.28)
30-34.9 (Class I obesity)	18 (16.82)
>34.9 (Class II obesity)	5 (4.67)
Gender	
Male	64 (59.81)
Female	43 (40.18)
Cause of hospitalization	
Acute sinusitis	5 (4.67)
Acute otitis media (AOM)	12 (11.21)
Bronchiolitis	12 (11.21)
Common cold	9 (8.41)
Diarrhea	9 (8.41)
Gastroenteritis	7 (6.54)
Pharyngitis	6 (5.60)
Pneumonia	25 (23.36)
Skin infection	5 (4.67)
Typhoid fever	4 (3.74)
Urinary tract infection (UTI)	17 (15.88)

Table 2: Prescription details (n = 107)

Drug encounters	Frequency (%)
Number of drugs per prescription	
Two	5 (4.67)
Three	43 (40.18)
Four	34 (31.77)
Five	20 (18.69)
Six	5 (4.67)
Antibiotic encounters with prescription	
None	7 (6.54)
One	80 (74.76)
Two	20 (18.69)

Table 3: Distribution of antibiotics prescribed in pediatric departments (n = 125)

Antibiotics	Frequency (%)
Amoxicillin	21 (16.80)
Amoxicillin Clavulanate	21 (16.80)
Ampicillin	2 (1.60)
Azithromycin	23 (18.40)
Cefotaxime	4 (3.20)
Ceftriaxone	19 (15.20)
Chloramphenicol	1 (0.8)
Ciprofloxacin	4 (3.20)
Cotrimoxazole	8 (6.40)
Gentamycin	2 (1.60)
Imipenem	3 (2.40)
Metronidazole	9 (7.20)
Penicillin	4 (3.20)
Vancomycin	4 (3.20)
Child calculated dose	
Correct dose calculation	103 (84.2)
Incorrect dose calculation	22 (17.6)
The pattern of prescription by name	71 (56.08)
Generic name	54 (43.2)
Brand name	
Route of administration	55 (44)
IV	70 (56)
PO	

Table 4: Other drugs prescribed along with antibiotics for treatment of comorbidities (n = 280)

Other drugs	Frequency (%)
Nutritional/vitamin supplements	54 (19.28)
Anti-allergic	32 (11.42)
Antipyretics	53 (18.92)
Antacids	58 (20.71)
Anti-inflammatory	30 (10.71)
Anti-cold	11 (3.92)
Steroids	5 (1.78)
Nasal decongestant	9 (3.21)
Anti-diarrheal	13 (4.64)
Anti-emetics	6 (2.14)
other	9 (3.21)

Table 5: Assessment based on WHO prescribing indicator

WHO prescribing indicator	Average/ percent	WHO standard or ideal
Avg. number of drugs per encounter	3.7	2
Percentage of encounter with one or more antibiotics	93.45%	20%-26.8%
Percentage of antibiotic prescribed by generic name	56.08%	100%

DISCUSSION

In the present study, categorization based on the age distribution of pediatric patients demonstrated that the maximum number of patients was in the age group of 5–8 y (47%). In contrast, Suparna Sharma *et al.* [9] showed that the majority of patients were 1–3 y old (29%). The inconsistent results may be explained by the difference in sample size wherein a large sample size was considered in Ref [9].

Among 107 patients involved in the study, most of them were male (59.81%), which is in-line with the consideration of the study conducted by Khaled *et al.* [10], in which the male population was found to be (53.7%). Dominance of the male gender indicates the gender differences and their effect on developing the disease in pediatrics, but less data is available regarding this factor in children.

Classification of the study population based on patients' BMI showed that they had a normal weight (61.5%). A similar outcome has been reported by Kamal Sharma *et al.* [11], in which patients with normal weight were also dominant (61.5%). This may suggest that there is not a significant difference in the risk of occurring infectious diseases between underweight, normal weight, and obese children.

Categorization of patients based on the cause of hospitalization showed that the most prevalent cause was pneumonia (23.36%). In another study [12], conducted in Andhra Pradesh, India, similar results were reported showing that the most prevalent disease was a respiratory infection (21.8%). The results reveal that respiratory infections are more prevalent compared to other childhood diseases among the pediatric population in India, which is possibly due to a lack of appropriate hygiene.

Out of 125 prescribed antibiotics, the most prescribed one was azithromycin (18.40%), followed by amoxicillin-clavulanate (16.80%). In a similar study conducted by M. Bala Gopal *et al.* [13], it is shown that ceftriaxone (32.7%) is prescribed more along with azithromycin (20%) in pediatrics. The inconsistent results stem from the difference in the disease's prevalence in the two studies and the gastrointestinal variation. By way of illustration, in this study, pneumonia was found to be the most prevalent type while all respiratory diseases are considered as the most prevalent type in Ref. [13], which is plausibly due to the high effectiveness of the drug.

125 antibiotics were prescribed in the sample population, among which 56.08% were prescribed by generic name, which is very much lower than the WHO standard value. The result is similar to the observations in the studies conducted in Sudan (49.3%) [14] and Nigeria (68.9%) [15]. This is justified because private pharmacies are more familiar with brand names than generic names, or the physician is not confident about the quality of the unbranded medication.

Distribution of antibiotics by route of administration showed that most of the antibiotics were administered by the IV route (44%). This is inconsistent with the observations reported in the study conducted by Shatavisa Mukherjee *et al.* [16], in which the preferred route of administration was parenteral (64%). This difference may be due to the preference of physicians on the oral route due to achieving more compliance in the pediatric population and reduction in hidden costs forced to parents due to the parenteral route of administration as injectable forms of medication are more costly.

Distribution of drugs based on the number of drugs per the prescription of the sample population ranged from one to six drugs, and the mean was found to be 3.7 encounters per prescription. This is similar to the findings presented in Ref. [17], reporting that the average number of drugs prescribed per encounter to be 3.4, with a range of one to seven drugs at most. The values reported in both studies was higher than the WHO prescribed standard indicator value. This may suggest the presence of comorbidities that require the prescription of other medications along with antibiotics or can stand for polypharmacy.

Consideration based on the number of drug encounters with antibiotics showed that about 93.45% of prescriptions were having at least one antibiotic encounter. This is comparable to the observations found by Harshal N Pise *et al.* [17], which demonstrated that most prescriptions (60.6%) contained at least one antimicrobial agent. Both studies show a percent higher than the WHO standard percentage. This may be due to a lack of knowledge, overwork of health personnel, or demand from the patient to prescribe antibiotics.

CONCLUSION

The patterns of prescription of antibiotics and their usage were not appropriate comparing to WHO indicators. The antibiotics were prescribed more by branded names rather than generic names. The percentage of antibiotics prescribed by generic name was very lower than the standard percentage, suggested by WHO. The percentage of encounters with one or more antibiotics was very much higher than the WHO standard percentage indicating the irrationality of antibiotic prescription. To minimize the irrationality of prescriptions and their inappropriateness, effective interventions and compliance with antibiotic prescribing guidelines are required. Further studies are needed to find the cause-effect relationships for the irrationality of prescribing antimicrobials.

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Nil

LIMITATIONS

The study was single centered and so, limited sample size.

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Nil

AUTHORS CONTRIBUTIONS

All authors contributed equally to the preparation and final approval of the manuscript.

CONFLICT OF INTERESTS

Declared none

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