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Research Article

ANALYSIS OF ANTIMICROBIAL PRESCRIPTIONS IN PEDIATRIC PATIENTS IN A TEACHING HOSPITAL

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ABSTRACT

Objectives: This study was undertaken to analyze the prescriptions of antimicrobials in children to know which ones are being commonly prescribed and how rational they are for a given diagnosis. Methods: In a prospective observational study conducted from 31 August 2010 to 21 October 2010 in the pediatric department of a teaching hospital, we analyzed 275 prescriptions which contained antimicrobials. The demographic data, diagnosis and the antimicrobials prescribed were recorded. Results: Cephalosporins were the most often prescribed class of antimicrobials (56.36%) followed by penicillins (40.36%) and aminoglycosides (36.36%). Injection was the commonest route of administration (58.25%). Lower respiratory tract infection was the commonest diagnosis. Conclusions: By and large, the antimicrobials prescribed were appropriate for the respective diagnosis. One case of gastroenteritis and three cases of enteric fever were prescribed antimicrobial combinations that seemed irrational. No adverse drug reactions were reported in this study.

Key words: Antibiotics, Children, Prescription.

INTRODUCTION

Antimicrobials are among the most commonly prescribed drugs in children as well as adults. A wide variety of antimicrobials are currently used in pediatric patients, including penicillins, cephalosporins, macrolides, aminoglycosides and newer antimicrobials. Often multiple options are available to treat a particular infection and the doctor's choice of an antimicrobial may depend upon factors like sensitivity pattern of microbes in the locality, safety of the drug for a given age group, cost of treatment, etc.

Parents are often concerned about what they perceive to be unnecessary prescription of antimicrobials for their children. Even medical professionals warn against indiscriminate use of antimicrobials as it may promote bacterial resistance[1,2]. Hence a study of prescribing pattern would reveal which antimicrobials are being commonly prescribed in children and how rational they are for a given diagnosis.

OBJECTIVES

1. To get an insight into the current pattern of antimicrobial prescription in children.
2. To identify the extent of polypharmacy.
3. To evaluate the adverse drug reactions reported by the patients / parents.

MATERIALS AND METHODS

This was a prospective observational study conducted from 31 August 2010 to 21 October 2010 in the pediatric department of a teaching hospital.

All antimicrobial containing prescriptions were monitored. Data from prescriptions was recorded in data entry forms. Children of either sex, both inpatients and outpatients were included in the study.

The demographic data, diagnosis, antimicrobials prescribed and any adverse drug reactions reported by the patient/parent were recorded. The data thus obtained was analyzed to arrive at prescribing indicators, patient indicators and adverse drug reaction (ADR) profile as shown below.

Prescribing indicators include:

1. Average number of antimicrobials prescribed per patient. It is calculated as

$$\text{Average no. of antimicrobial prescribed per patient} = \frac{\text{Total no. of antimicrobials prescribed for all patients}}{\text{Total no. of patients}}$$

2. Number of antimicrobials prescribed by oral route/injection/topically.
3. Most commonly prescribed antimicrobial(s) in this study and the commonest antimicrobial(s) prescribed for each type of infection.

Patient indicators include

1. Total no. of male and female patients.
2. Average age of male and female patients.
3. Number of patients receiving single and multiple antimicrobials respectively.

Adverse drug reaction (ADR) profile includes

1. The incidence and type of adverse drug reactions.
2. The drug(s) most commonly causing ADRs.
3. Whether the suspected drug was stopped after the ADR.

RESULTS

Prescribing indicators

$$\text{Average no. of antimicrobials prescribed per patient} = \frac{\text{Total no. of antimicrobials prescribed for all patients}}{\text{Total no. of patients}}$$

$$= \frac{424}{275} = 1.54$$

The percentage of antimicrobials prescribed by various routes is shown in figure-1

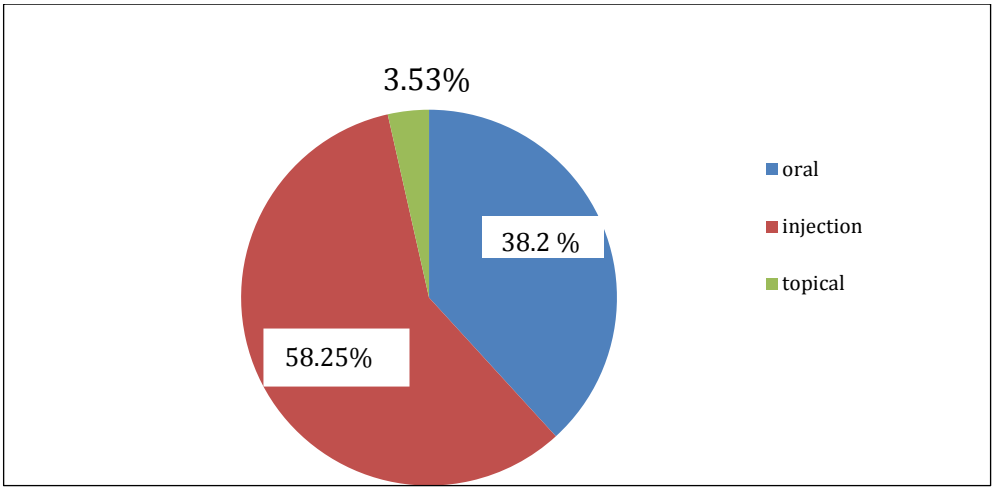

Fig.1: Percentage of antimicrobials prescribed by various routes.

Table-1 Antimicrobials prescribed according to diagnosis

Diagnosis	Antimicrobials prescribed	No. of prescriptions
Lower respiratory tract infection (LRTI) (n= 108)	Coamoxiclav	29
	Cefixime	26
	Coamoxiclav + Amikacin	17
	Ceftriaxone + Amikacin	9
	Cefpodoxime	9
	Coamoxiclav + Amikacin + Ceftriaxone	9
	Cefotaxime + Amikacin	2
	Cefotaxime	2
	Ceftriaxone	2
	Coamoxiclav + Chloroquine	2
	Cloxacillin + Ceftriaxone	1
LRTI with conjunctivitis (n=1)	Coamoxiclav syrup + Tobramycin eye drops	1
Acute gastroenteritis (n= 34)	Cefotaxime + Amikacin	10
	Metronidazole + Ofloxacin	6
	Metronidazole + Furazolidone	5
	Cefotaxime	5
	Metronidazole	2
	Metronidazole + Cotrimoxazole	1
	Cotrimoxazole	1
	Cefpodoxime	1
	Colistin	1
	Ceftriaxone + Amikacin	1
	Cefotaxime + Amikacin + Metronidazole + Furazolidone	1
Upper respiratory tract infection (URTI) (n= 26)	Coamoxiclav	13
	Cefixime	9
	Cefpodoxime	3
	Cephalexin	1
URTI with ASOM (acute suppurative otitis media) (n= 3)	Coamoxiclav syrup + Tobramycin ear drops	1
	Coamoxiclav syrup + Ciprofloxacin ear drops	1
	Cefpodoxime syrup + Ciprofloxacin ear drops	1
URTI with Amoebiasis (n=2)	Cefixime + Metronidazole	2
Sepsis (n= 26)	Piperacillin + Tazobactum + Netilmicin	16
	Piperacillin + Tazobactum + Amikacin	2
	Piperacillin + Tazobactum + Netilmicin+ Ceftriaxone	2
	Ceftriaxone + Amikacin	2
	Ceftriaxone + Amikacin + Ofloxacin	1
	Ceftriaxone + Amikacin + Coamoxiclav	1
	Cefotaxime + Amikacin	1
	Coamoxiclav + Amikacin	1

Table-2 Antimicrobials prescribed according to diagnosis

Diagnosis	Antimicrobials prescribed	No. of Prescriptions
Pyrexia for evaluation	Cefpodoxime	7
(n= 22)	Cefixime	4
	Ceftriaxone + Amikacin	4
	Ceftriaxone + Amikacin + Chloroquine	3
	Cefpodoxime + Chloroquine	2
	Coamoxiclav + Amikacin	1
	Cefotaxime + Amikacin	1
Febrile convulsions	Ceftriaxone + Amikacin	9
(n=16)	Ceftriaxone	3
	Cefotaxime	2
	Cefotaxime + Amikacin	1
	Coamoxiclav	1
Urinary tract infection	Cefixime	6
(n= 8)	Ceftriaxone	1
	Cefotaxime	1
Enteric fever/Typhoid	Ceftriaxone + Ofloxacin	3
(n= 6)	Ceftriaxone	1
	Ceftriaxone + Amikacin	1
	Cefpodoxime	1
Infective hepatitis(n=5)	Ampicillin	5
Acute suppurative otitis media (ASOM)	Coamoxiclav syrup	
(n=2)	+ Ciprofloxacin	
	ear drops	2
Asthma	Cefotaxime + Amikacin	1
(n=2)	Coamoxiclav	1
Pustules (n=2)	Fusidic acid ointment	2
Insect bite	Cefotaxime injection	1
(n=2)	Fusidic acid ointment	1
Conjunctivitis (n=1)	Ciprofloxacin eye drops	1
Chickenpox	Coamoxiclav syrup	
(n=1)	+ Acyclovir syrup	
	+ Acyclovir ointment	1
Acute tonsillitis (n=1)	Coamoxiclav	1
Oral candidiasis(n=1)	Clotrimazole oral gel	1
Infected scabies(n=1)	Mupirocin ointment	1
Abscess in right thigh(n=1)	Coamoxiclav syrup	1
Fever with burns(n=1)	Ceftriaxone + Amikacin	1
Acute appendicitis(n=1)	Ceftriaxone + Amikacin	1
Hypoxic ischemic encephalopathy (n=1)	Piperacillin + Tazobactum + Netilmicin	1
Impetigo with cellulitis(n=1)	Coamoxiclav inj. +Amikacin inj.	
	+Mupirocin ointment	1

Table-3 Frequency of various antimicrobials prescribed in the study

Drug	No. of prescriptions	Percentage (%)
Coamoxiclav	84	30.54
Amikacin	81	29.45
Ceftriaxone	55	20.00
Cefixime	47	17.09
Cefotaxime	28	10.18
Cefpodoxime	24	8.72
Piperacillin + Tazobactum	21	7.63
Netilmicin	19	6.90
Metronidazole	17	6.18
Ofloxacin	10	3.63
Chloroquine	7	2.54
Furazolidone	6	2.18
Ampicillin	5	1.81
Cotrimoxazole	2	0.72
Cephalexin	1	0.36
Cloxacillin	1	0.36
Colistin	1	0.36
Topical antimicrobials*	13	4.72

***Topical antimicrobials included Ciprofloxacin eye/ear drops, Tobramycin eye/ear drops, Fusidic acid ointment, Mupirocin ointment, Acyclovir ointment and Clotrimazole oral gel.**

Patient indicators:
Total number of male patients = 138
Total number of female patients = 137
Average age of male patients = 2.64 years
Average age of female patients = 2.48 years

Figure.2 shows the number of antimicrobials per prescription.

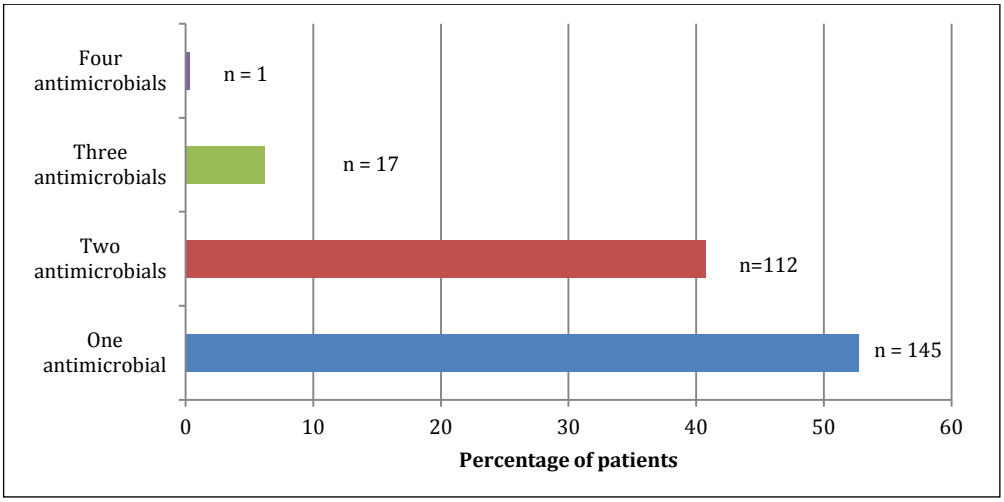

Fig.2 Number of antimicrobials per prescription.

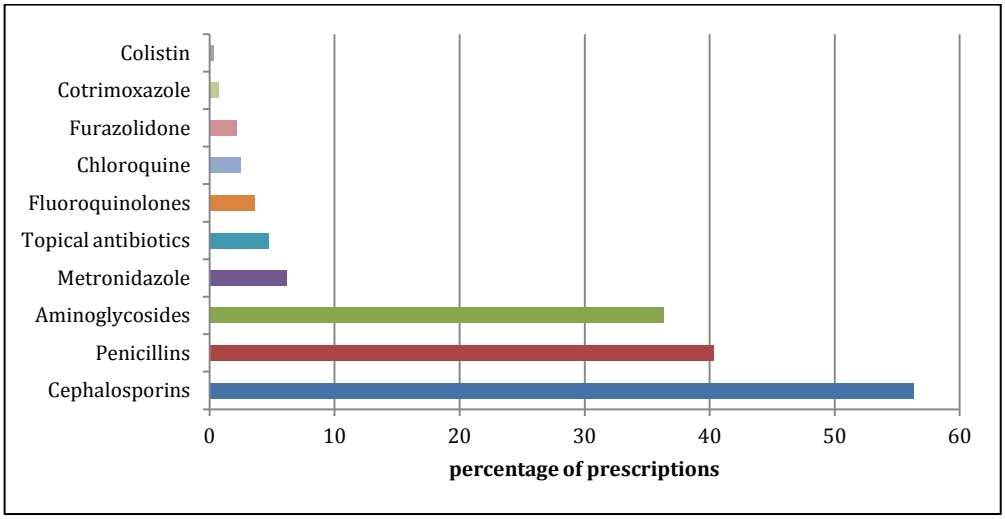

Fig.3 Category wise prescription of antimicrobials.

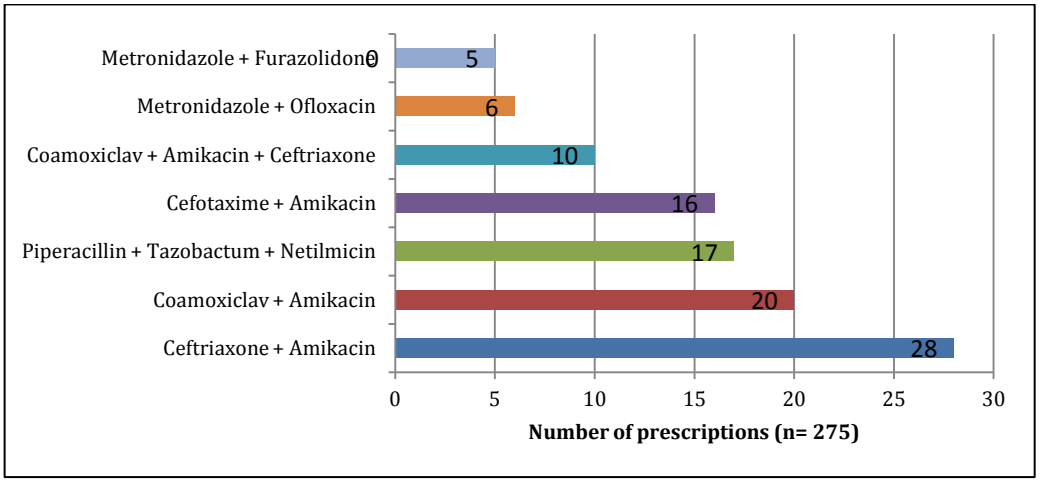

Fig.4 Combinations of antimicrobials commonly prescribed.

Adverse drug reaction (ADR) profile

No adverse drug reactions were reported in this study.

DISCUSSION

This study showed (Fig.3) cephalosporins were the most often prescribed class of antimicrobials (56.36% of prescriptions) followed by penicillins (40.36%) and aminoglycosides (36.36%). This finding is similar to the results of other studies[3,4,5]. Combinations of antimicrobials commonly given were ceftriaxone + amikacin (28 cases), coamoxiclav + amikacin (20 cases) and piperacillin + tazobactum + netilmicin (17 cases) (Fig.4). Combination of cephalosporin and aminoglycoside was the commonest in other studies[3] also.

The average number of antimicrobials prescribed per patient was 1.54. The commonest route of administration was injection (58.25%), unlike other studies[6].Next common was oral route (38.20%) followed by topical application(3.53%)(Fig.1). As in other studies[4], majority of the patients (52.72%) received a single antimicrobial (Fig.2). Among the individual antimicrobials coamoxiclav was the most commonly prescribed (30.54% of prescriptions) followed by amikacin (29.45%) and ceftriaxone (20%) (Table-3).

Lower respiratory tract infection (LRTI) was the commonest diagnosis[6] in this study(Table-1) accounting for 108 cases. Out of these, 29 cases were treated with coamoxiclav, 26 cases with cefixime and 17 cases with coamoxiclav + amikacin. Penicillins & derivatives were the most commonly used antimicrobials in LRTI in other studies[7,8] also.

Acute gastroenteritis was the second commonest diagnosis. The drug combinations frequently used were cefotaxime + amikacin, metronidazole + ofloxacin and metronidazole + furazolidone. One case of gastroenteritis was prescribed four antimicrobials, namely cefotaxime + amikacin + metronidazole + furazolidone. This combination seems irrational because cefotaxime, amikacin as well as furazolidone mainly cover aerobic gram negative bacteria. Giving these three drugs together does not offer any benefit and may increase the possibility of adverse effects.

In upper respiratory tract infection (URTI) coamoxiclav followed by cefixime were most frequently prescribed. Among the topically used antimicrobials, ciprofloxacin was the commonest, similar to other studies [9].

In cases of sepsis, piperacillin + tazobactum + netilmicin was given in 16 out of 26 cases. This is in accordance with studies on sensitivity patterns of gram negative bacteria [10].

Third generation cephalosporins accounted for most of the prescriptions in pyrexia for evaluation, febrile convulsions, urinary tract infection and enteric fever (Table-2). In 3 out of 6 cases of enteric fever, both ceftriaxone and ofloxacin were given together. This combination appears irrational as either of them is sufficient for treating enteric fever and combination of antimicrobials is not recommended in textbooks.

CONCLUSIONS

Cephalosporins followed by penicillins were the most commonly prescribed antimicrobials. Injection was the commonest route of administration. Majority of the patients received a single antimicrobial. Lower respiratory tract infection was the commonest diagnosis. By and large, the antimicrobials prescribed were appropriate for the respective diagnosis. One case of gastroenteritis and three cases of enteric fever were prescribed antimicrobial combinations that appear to be irrational. No adverse drug reactions were reported in this study.

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