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Original Article

Prescribing Pattern of Antibiotics in Paediatric Hospital of Kathmandu Valley

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Abstract

Introduction

Antibiotics are among the most commonly prescribed drugs in paediatrics. Because of an overall rise in health care costs, lack of uniformity in drug prescribing and the emergence of antibiotic resistance, monitoring and control of antibiotic use is of growing concern and strict antibiotic policies should be warranted. Before such policies can be implemented, detailed knowledge of antibiotic prescribing practice is important.

Objective

The main objective is to study the prescribing practice of antibiotic in hospital in-patient.

Methods

A prospective follow up study of one and half month's duration was undertaken during November- December of 2003. A total number of 121 patients were taken for the study.

Results

The average number of drugs per patient was 5.01±1.36 and antibiotics per patient was 2.41±1.02. More than 98% of the patients were exposed to, at least, two drugs. Among 121 patients clinically diagnosed with infectious diseases and treated with antibiotics, specimens were taken for culture in only 24 cases i.e. (19.8%) to identify pathogenic organisms. Only 13 specimens showed positive culture results. Infants less than 1 year received antibiotics more frequently than 1-5 and 5-12 years (40, 31 and 29%, P<0.001, P=0.000). Seventy-five percentage of the total antibiotics were administered parentrally. Cephalosporin was the top most frequently prescribed antibiotics followed by penicillin group. Significant difference was found between age group of patient and disease encountered (χ^2 = 42.95, P=0.000).

Conclusion

The fact that children below 1 year or infants are at special risk of receiving multiple courses of antibiotics, together with the knowledge that antibiotic resistance develops in this setting; suggest that strategies to control antibiotic use should focus on these patients' populations.

Keywords: Antibiotic, Inpatient and Paediatrics

Infants and children are among the most vulnerable population groups to contract illnesses. The use of antimicrobial agents, especially antibiotics has become a routine practice for the treatment of paediatric illnesses[1,2]. The key role of antibiotics for the treatment of infectious diseases that are prevalent everywhere in developing countries may not be denied. However, there are also reports of an irrational use of antibiotics[3,4] which may even lead to infections that are worse than the originally diagnosed ones. The pediatricians and other medical personnel who provide health care for infants and children in developing countries confront a number of challenges during the day- to day practice of medicine due to the shortage of appropriate drugs and other facilities.

The rising incidence of bacterial resistance to common antibiotics, particularly, multi- drug resistant pneumococci, has prompted the need to use antibiotics judiciously in paediatric practice. Many of the antibiotics are unnecessarily prescribed for viral infections such as common cold. In a Kentucky study, 60% of patients were prescribed antibiotics for the common cold[5]. In a Canadian study from Saskatchewan, 85% of antibiotics prescribed for respiratory tract infection in children less than 5 years of age were considered inappropriate.

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Appropriate drug utilization studies have been found to be crucial to evaluate whether drugs are properly used and utilized in terms of medical, social and economic aspects.

Several professional societies have issued guidelines designed to reduce the use of antibiotics world- wide by means of various control strategies[6,7]. Detailed knowledge of antibiotic prescription pattern is important before the policies and measures can be implemented.

Materials and methods

The prescribing pattern of antibiotic usage was investigated in general ward of major children hospital in Kathmandu valley. A prospective follow up study of one and half month's duration was undertaken during November- December of 2003. Medical records of paediatric in- patients of age falls between 1 month- 12 years were reviewed prospectively. Neonates, and patients from other ward are excluded. Every odd number of patients was taken for the randomization of sampling technique. Total sample size was 121. Patient characteristics such as age, sex, body weight, cases with previous drug history, duration of hospitalization was noted. Similarly admission and discharge diagnosis, and the condition of the patients on admission and discharge were recorded. Moreover, drug data, including name of the drug, dosage regimen (form, route, frequency and duration), and the date on which the pharmacotherapy was instituted, were recorded. Blood transfusion and nutritional preparations were not included in the study. Drug data and patient characteristic data were computed using Ms Excel and SPSS statistical package. The results were expressed as proportions or as means ± Standard deviation (SD). Means have been compared by the Student's t- test. Paired sample t- test and independent sample t- test were used where appropriate. A difference was considered as significant if a P value was less than 0.05. The retrieved medical records contained most of the required information.

Results

The mean age of paediatric in- patient was 4.45□3.9. The male patients were 61.9% where as the female patients were 38.1%. Thirty-nine percentage of patients were exposed to herbal or modern drugs prior to admission in hospital. Previous drug history (PDH) couldn't be found out for 19% of patients. Initial diagnosis per patient was 1.07 where as final diagnosis per patient was 1.23. Initial diagnosis was different to the final diagnosis in 35% of patients (Table 1).

Table 1: Paediatric in- patient characteristics

Parameters	**% (No)**
Age (Mean±SD years)	
1 month-1 yr. (0.40±0.24)	28.9 (35)
1-5 yr. (3.62±1.63)	36.4 (44)
5-12 yr. (9.32±2.06)	34.7 (42)
Total mean age (4.45 ± 3.9)	
Sex	
Male	61.9 (75)
Female	38.1 (46)
Cases with Previous Drug History	
Yes	38.8 (47)
No	42.1 (51)
Not Significant	19.0 (23)
Diagnosis / patient	
Initial	1.07
Final	1.23
Difference in the initial and final diagnosis	35.0
Length of stay/patient (days)	7.29 ± 4.26

The average number of drugs per patient was 5.01±1.36. More than 98% of the patients were exposed to, at least, two drugs. The average number of antibiotic per patient was 2.41±1.02. The multiple antibiotics were 79%. Only one antibiotic was prescribed in 21%, two antibiotics in 37% (highest), three antibiotics in 28%, four antibiotics in 10% of and finally five or even more than five antibiotics were prescribed in about 4% of all cases (Table 2).

Table 2: Paediatric In- Patient's exposure to drug(s) and antibiotic(s)

Drug(s)/patient	% (No)	Antibiotic(s)/patient	% (No)
1	2 (3)	1	21 (25)
2	5 (6)	2	37 (45)
3	16 (19)	3	28 (34)
4	20 (24)	4	10 (13)
5	22 (27)	5	2 (2)
6	14 (17)	6	1 (1)
7	9 (11)	7	1 (1)
8	8 (10)		
>9	4 (4)		
Range	1-15	**Range**	1-7
Mean ± S.D	5.01 ± 1.365	**Mean ± S.D**	2.41 ± 1.02

Combination antibiotics were administered to all the patient of pneumonia (Pneu), urinary tract infection (UTI), not diagnosed and pleural effusion. Similarly, 80% cases of meningitis were treated by combination antibiotics and 75% cases of Enteric fever (E.fever) were treated by single antibiotic.

Among all patient prescribed with antibiotics, pneumonia was the most common diagnosis. Pneumonia was the leading cause of hospital admission among infant. Enteric fever and other diseases were mostly found in age above 1 year. Significant difference was found between the age group of patient and disease encountered (χ^2=42.95, P=0.000) (Table 3).

Table 3: Diagnosis pattern % (No) in different age group

Diagnosis	(1 month-1 yr) Infant	1- 5 yr	5-12 yr	Total
Pneu	15.00 (18)	7.00 (8)	2.00 (3)	24.00 (29)
Meningitis	3.30 (4)	1.65 (2)	4.13 (5)	9.09 (11)
E. fever	0	5.00 (6)	2.00 (2)	7.00 (8)
Pyrexia of unknown origin	0	2.47 (3)	1.65 (2)	4.13 (5)
Not diagnosed	1.65 (2)	1.65 (2)	1.65 (2)	4.95 (6)
Combination*	6.61 (8)	4.13 (5)	6.61 (8)	17.35 (21)
Pleural effusion	0	0.82 (1)	3.30 (4)	4.13 (5)
Others**	2.47 (3)	12.39 (15)	13.22 (16)	28.09 (34)
UTI	0	1.65 (2)	0	1.65 (2)

*Combination: Acute gastro enteritis (AGE) with hypokalemia, AGE with Pneu, AGN, and hyptertension encephalopathy, AGN+ UTI, E.fever with malaria with ulcer, Jaundice with Pneu, Pneu with hypertension etc.

**Others: Rabies encephalomyelitis, rheumatic chorea, occult sepsis, acute glomerulonephritis (AGN), rheumatic fever etc.

Benzyl penicillin (C.P) was prescribed in highest percentage in pneumonia followed by cefotaxim and other antibiotics. Third generation ceftriaxone was prescribed in highest percentage in case of meningitis followed by cefotaxim and other antibiotic (Table 4).

Antibiotic of cephalosporin was the top most frequently prescribed antibiotic followed by penicillin group. Fluoroquinolones were prescribed by 6% (Figure 1).

Table 4: Frequency (%) of individual antibiotic for specific diagnosis

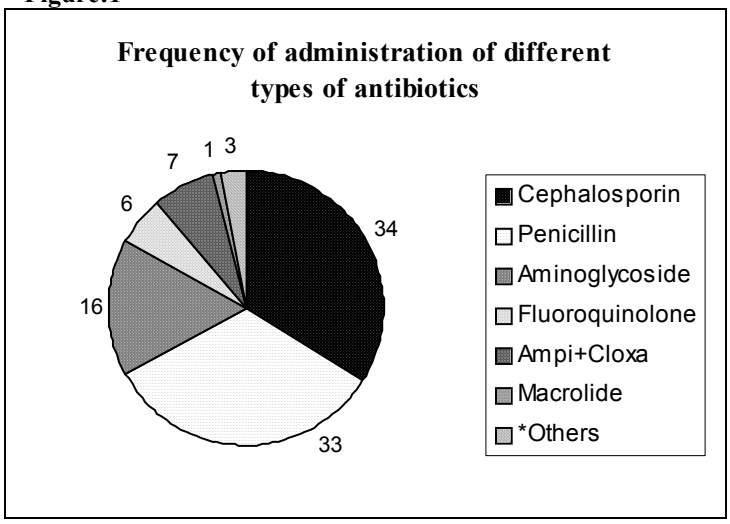
Diagnosis	C.P	Cefo	Genta	Ceftria	Cefalex	Amox	Cefa	Oflo	A+C	Clox	Others
Pneu	26	19	13	2	12	10	7	0	6	2	3
Meningitis	14	17	10	21	0	3	0	0	0	4	31
E.fever	0	10	10	70	0	0	0	0	0	10	0
PUO	0	38	12	12	0	0	0	25	13	0	0
Pleural effusion	0	23	0	0	0	0	0	8	23	15	30
UTI	0	20	20	20	0	0	0	20	0	0	20
Not diagnosed	17	0	24	12	6	0	0	6	0	0	35
Combination**	22	14	16	3	9	9	2	0	8	7	20
Others*	22	13	13	6	5	6	0	0	4	1	28

*Others: Rabies encephalomyelitis, rheumatic chorea, occult sepsis, acute glomerulonephritis (AGN), rheumatic fever etc.

**Combination: Acute gastro enteritis (AGE) with hypokalemia, AGE with Pneu, AGN, and hyptertension encephalopathy, AGN+ UTI, E.fever with malaria with ulcer, Jaundice with Pneu, Pneu with hypertension etc.

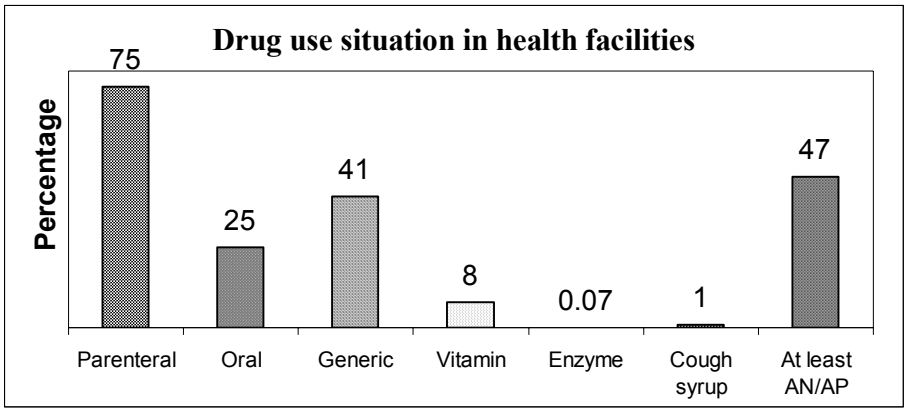
Cefo:Cefotaxim;Genta:Gentamycin;Ceftria:Ceftriaxone;Cefalex:Cefalexin;Amox:Amoxycillin;Cefa:Cefaclor;Oflo:Ofloxacin;A+C:Ampicillin+Cloxacillin;Clox:Cloxacillin.

Figure:1



In this study, 75% of the total antibiotics were administered parentrally. Drugs were prescribed in generic by 41%. Significant difference was found between the generic prescribing and brand prescribing of drug to children (P=0.000). Fourty-seven percentage of the patients were prescribed at least one analgesic/antipyretic drug (AN/AP).

Figure 2



(n=121) for patient receiving at least one analgesic and antipyretic
(n_2 = 607) for others.

Among 121 patients clinically diagnosed with infectious diseases and treated with antibiotics, specimens were taken for culture in only 24 cases i.e. (19.8%) to identify pathogenic organisms. Only 13 specimens showed positive culture results. Sensitivity analysis was done in 6 cases (one E. fever and five UTI). In all cases (4-7) antibiotics were resistant

Null hypothesis set i.e. H_0 = 10%; 10% of patients are requested for culture of blood. Result from the analysis showed that 14.87% of patients were requested for blood culture. The hypothesis is acceptable since no significant difference was found (P=0.0768) (Table 5).

Table 5: Antibiotic prescription and identification of pathogenic organism

Culture Information	Blood Culture	Urine culture	Both
Total culture-24	18	2	4
Culture +ve-13	7	2	1 BP +3 UP

BP: Both Positive
UP: Urine Positive

In this study out of 121, 11 of them had a record of adverse drug reaction associated with fever and rashes.
Infant less than 1 year received antibiotics more frequently than 1-5 and 5-12 years. (40, 31 and 29 respectively, (P<0.001, P=0.000).

Sixteen percentage of patients were in fair condition though their mean length of hospital stay was slightly greater than improved patient. Eight percentage of patients were referred in different hospital according to the diagnosis (Table 6).

Table 6 Summary of treatment/Patient follow up evaluation

Patient condition	%	Mean hospital stay (days)
Improved	70	6.97
Fair	16	8.63
Discharge under request	3	7
Referred	8	8.6
Death	3	4.33

Discussion

The number of male patients was comparatively more than the number of female patients. The average number of drugs per patient (5.01±1.36) was similar to the study conducted by Rehana[8] et al (5.26) in B.P. Koirala Institute of Health Sciences, Dharan, Nepal. Previous drug history was found in 38.8% of patients. This may be slightly above as there were still 19.0% of cases for which exact previous drug history couldn't be figured out properly. The average number of initial diagnosis per patient was 1.07. The average number of final diagnosis (1.23) was slightly greater than former ones. This may be due to proper diagnosis and the result of different investigations. Child may develop other complications due to various reasons such as nosocomial infection, complication of disease itself, complication due to inappropriate drug etc. A high percentage of patients i.e. 93% was prescribed at least one antibiotic which was different than study done by Marlies et al[9] i.e. 36% and Jason Hall[10] i.e. 60.6%. Study conducted by Shankar[11] et al in teaching hospital of western Nepal shows that 203 of the 687 patients admitted to the Internal Medicine ward were prescribed antibiotics during the study period. Ninety-eight patients were prescribed a single antibiotic, while 75 patients were prescribed two antibiotics. Twenty-three patients were prescribed 3 antibiotics, while 4 and 5 antibiotics were prescribed to 5 and 2 patients respectively. Similarly study done by Bosu et al[12] again showed the variation in average percentage of patients receiving at least one antibiotic, which was 41%, 45%, 79% and 98% in different health centers. It is not possible to draw any firm conclusion since the patients are not matched socio- economically. The morbidity pattern also may not be similar. Six and seven antibiotics were found to be prescribed in 1% of patient. This is due to requirement of more time to diagnose the patient and select the appropriate treatment. The prescription of antibiotics was based on mainly clinical judgement without investigation.

Benzyl penicillin and gentamycin/cefotaxim were found to be mostly used combination antibiotics in case of pneumonia. Similarly ceftriaxone in combination with chloramphenicol was used in case of meningitis. Enteric fever was generally treated by ceftriaxone. It is the only disease where exposure to combination antibiotic was found to be minimum.

Pneumonia was the most prevalent diagnosis among infant, which agrees with studies. Only 19.8% cases were demanded for the culture of blood or urine. Only 13 cases showed the positive results out of 24 so, only in a few patients therapy could be modified after culture results were available. Similar study was done by S. Hu et al[13] where specimens were taken for culture in 8.4%. Specimens were not obtained in most cases in this hospital or patients were not asked for the culture report. It is very necessary to monitor appropriated clinical specimens have been obtained, examined and cultured before antibiotic is initiated. The use of antibiotics is related to antibiotic resistance, side effects of drugs and health care costs. So, measures should be taken care to avoid the inappropriate use of antibiotics. Physicians must have a clear understanding of therapeutic use of antibiotics, they must be aware of the prevalence of various pathogens and resistance patterns in their hospital and exercise good judgement in selection empirical antibiotic regimens[13]. Sensitivity analysis was done in one case of enteric fever and five cases of urinary tract infection. In two cases, third generation of cephalosporin and expensive antibiotic "amikacin" were resistant. Ofloxacin, gentamycin, norfloxacin, nalidixic acid were resistant in all cases.

Infant less than 1 year received antibiotics more frequently was similar kind with that of the study done by Marlies et al[9] which shows infant less than 2 years received antibiotics more frequently than older children (25 and 11% respectively, P=0.0256)

The excessive use of injectable is common in many developing countries[14]. In this study 75% of antibiotics were given by injection. It seems necessary for the paediatric patient to be treated by parenteral route of administration but consideration should be taken care for the syringes used to administer different antibiotic. Higher use of vitamins may be due to its use as placebo. Their benefits should also be viewed from their socio-economic and cultural aspect.

Over prescribing of analgesic/ antipyretic seems to be a problem. When the condition demands the use of such group of drugs, it is preferable to use paracetamol rather than aspirin and nimesulide as the former one is equally effective but has minimal adverse effects as compared to the later. It is noteworthy that nimesulide has been already banned for paediatrics. So, its use should be totally discontinued in paediatrics. The Register of adverse reactions of the Finnish National Agency for medicines (NAM) for the year 2000 shows that the majority of adverse drug reactions among non-steroidal anti-inflammatory diseases were associated with nimesulide; over half of the reports were associated with liver reactions. However nimesulide has never been marketed in some countries such as

the USA and Australia. In South East Asia the drug enjoys variable regulatory status[15].

The habit of recording adverse drug reaction must be encouraged at all level of health care institution. Fever was resulted due to ceftriaxone and rashes were found in case of patient treated by Ampi+Cloxa and ciprofloxacin. Adverse drug reaction was developed in ciprofloxacin prescribed patient due to the development of hypersensitivity reaction.

Cephalosporins were the top most used class of antibiotics in this study followed by penicillin. Among cephalosporins, third generation of ceftriaxone and cefotaxim were found to be mostly used where as ampicillin, amoxicillin, metronidazole, ciprofloxacin and crystalline penicillin were the 5 most commonly prescribed antibiotics in the study conducted by Shankar et al[11]. The use of fluoroquinolones by 6% of total antibiotics reminds that no quinolones were used by paediatric services because of their toxic effects in children below 14 years of age. Ciprofloxacin, as one of the frequently prescribed quinolone, deserves continued monitoring. Similarly, chloramphenicol was used mostly in case of meningitis with combination with cephalosporin. From the potentially serious adverse effects associated with the indiscriminate use of chloramphenicol, and a practice of empirical basis of prescription, the wide use of chloramphenicol may evoke some concern.

In conclusion, the main challenges in prescription of antibiotics are to achieve a rational choice and appropriate use of antibiotics and to recognize their potential problems. Consequently, physicians must keep a clear understanding of need for microbiological diagnosis, use of antibiotics and make good judgement in clinical situations.

References

1. Sanz EJ, Bergman U, Dahlstorm M. Paediatric drug prescribing. Eur J clin pharmacol 1989;37(1):65-68.
2. Summers RS, Summers B. Drug prescribing in paediatrics. Ann Trop paediatr 1986; 6:129-133.
3. Principi N, et al. Control of antibiotic therapy in paediatric patients. Developmental pharmacology and therapeutics 1981;2(3):145-155.
4. Schollenberg E, Albritton WL. Antibiotic misuse in a paediatric teaching hospital. Can Med Assoc J 1980;122 (1):49-52.
5. Dr. M. Ipp .Reduced antibiotic use in a Paediatric practice: Practical office strategies based on current evidence. Published in June 2000.
6. Kolar J, Kadakova E. Prescription of antimicrobial drugs to hospitalized children. Ann Pharmacother 1993; 26: 974-7.
7. Marr JJ, Moffet. Kunin CM. Guidelines for improving the use of antimicrobial agents in hospitals: a statement by the Infectious Disease Society of America. J Infect Dis 1988; 157; 869-76.
8. Rehana H.S, Nagrani M.A. A study on the drug prescribing pattern and use of antimicrobial agents at a tertiary care teaching hospital in eastern Nepal. Indian Journal of Pharmacology 1998; 30: 175-180.
9. Marlies A, Van H, Klarieke L. Antibiotic utilization for hospitalised paediatric patients. International Journal of Antimicrobial Agents 1998;10:161-164.
10. Jason Hall BA. Paediatric prescribing in New Zealand. NZFP 2002;29:14-18.
11. Shankar R.V, et al. Prescribing patterns of antibiotics and sensitivity patterns of common microorganisms in the Internal Medicine ward of a teaching hospital in Western Nepal: a prospective study. Ann Clin Microbiol Antimicrob 2003; 2 (1): 7.
12. Bosu W.K et al. Survey of antibiotic prescribing pattern in government health facilities of the Wasa-west district of Ghana. East African Medical Journal, 74:139; 1997.
13. Suping Hu, Xiuheng Liu and Yan Peng. Assessment of Antibiotic Prescription in Hospitalised Patients at a Chinese University Hospital. 2002.
14. Tomson G. Drug utilization studies in Sri Lanka-Towards an understanding of medicine in society. Thesis, Karolinska Institute, Stockholm, Sweden 1990.
15. Drug Bulletin of Nepal (DBN) 2003; 14(2): Royal pharmaceutical society 1996