Journal of Pharmacovigilance and Drug Research

January-March 2021
JPADR, 2021; 2(1): 27-32.
DOI: 10.53411/jpadr.2021.2.1.5



RESEARCH ARTICLE

Journal home page: www.jpadr.com

Prescription audit a tool to determine the effects of antibiotics in the pediatric inpatient department of a tertiary teaching care hospital in Punjab

Monika Kapoor [a, b, *], Jagminder Kaur Bajaj [b], Shalini Salwan [b]

[a] Department of Pharmacy Practice, I.S.F College of Pharmacy, Moga, Punjab, India.

[b] Department of Pharmacology, Punjab Institute of Medical Science, Jalandhar, Punjab, India.

ARTICLE INFO

Received 06 December 2020;
Revised 26 January 2021;
Accepted 21 February 2021.

Keywords:
Infants and children, antimicrobials, audit, in-patient department, infection, prescription pattern.

ABSTRACT

Introduction: Health care professionals dealing with pediatric patients face a lot of challenges and pass through hurdles during their daily practice of medicines owing to the scarcity of suitable drugs and other facilities. A fundamental part of the antibiotic prescription is inappropriate due to errors in the selection of appropriate antibiotics, dose, duration, route of administration, and frequency for treatment. Medication use evaluation and audits are an integral part of evaluating whether the drugs are being utilized appropriately considering the social, economic, and medical points.
Objectives: The main objective of this study was to do an antibiotic audit to analyze the prescribing pattern in the in-patient department of pediatrics of the hospital.
Methods: A prospective observational study was conducted in the inpatient pediatrics department of Punjab Institute of Medical Science and Hospital, Jalandhar. The study was conducted on a total of 150 hospitalized children and infants for a period of two months from February 1, 2020, to March 30, 2020.
Results: The analysis of 150 prescriptions was done using IBM SPSS software version 24 and statistical analysis was done. Antibiotic usage was expressed in percentile and the duration of treatment was expressed. Aminoglycosides (Amikacin) were the top most used class of antibiotics followed by cephalosporin. Among cephalosporins, the third generation ceftriaxone, and cefoperazone were found to be mostly used.
Conclusions: Accordingly, health care professionals must keep a clear understanding of the need for microbiological diagnosis, antibiotics usage, and make good judgment in clinical situations. Regular antibiotic audits and staff education must be implemented.

An official publication of Global Pharmacovigilance Society.

Introduction

The paediatric population is most prone to acquiring the illness. The drug regimen for any disease being prescribed is one of the most crucial parts of treatment based upon its appropriateness. The effectiveness of the therapy of an infant or children is completely dependent on correct diagnosis and optimized therapy. Antibiotics are the most commonly prescribed drugs for treating any illness during the hospitalization period. Although, antibiotics play a major role in combating the infectious diseases there are also reports regarding their irrational use which increases the complexity of the situation by increasing the severity

* Corresponding Author
Monika Kapoor
E-mail: monikakapoor01.mk@gmail.com
Contact: +917696721580

* Copyright: 2582-7235 // © 2021 The Author(s).
Published by Global Pharmacovigilance Society.
This is an open-access article under the CC BY-NC-ND license.

Available online 1 March 2021

of the infection and worsening the diagnosis. High usage of antimicrobials may also further owe to community and healthcare-associated infections. (Smith et al., 2015; Sanz et al., 1989; Summers et al., 1986)

Health care professionals dealing with pediatric patients face a lot of challenges during the daily practice of medicines owing to the scarcity of suitable drugs and other facilities. A fundamental part of the antibiotic prescription is inappropriate due to errors in the selection of appropriate antibiotics, dose, duration, route of administration, and frequency for treatment. Due to the excessive usage and exploitation of antibiotics, chances of antibiotic resistance are rapidly increasing which has been marked as a global threat to the health of patients. Antibiotic stewardship programs (ASP) are one of the basic fundamental strategies which can be used to enhance the knowledge and discuss the problems related to over usage and resistance seen with antibiotic use. ASP is intended to ensure that the patients receive optimized treatment. (Palikhe et al., 2004; Principi et al., 1981; Schollenberg et al., 1980;)

Thereby, rational medication needs evaluation and audits are an integral part of evaluating whether the drugs are being utilized appropriately for social, economic, and medical points. (Palikhe et al., 2004; Kolar et al., 1993; Marr et al., 1988) World health organization (WHO) has also issued a set of guidelines for the rational usage of antibiotics for the paediatric population, and in its right choice, dose, duration, route of administration, and frequency depending on the diagnosis. The aim of the present study is to do an antibiotic audit in the paediatric inpatient department of a tertiary care teaching hospital.

Material and Methods

A prospective observational study was conducted in the inpatient paediatrics department of Punjab Institute of Medical Science and Hospital, Jalandhar. The study was conducted on a total of 150 hospitalized children and infants for a period of two months. The study was conducted after prior approval from the Institutional Ethics Committee (IEC). Case records of neonates admitted in the neonate intensive care unit (NICU) were excluded from the study and all of the other admitted in general ward were included for this study. The survey for the study was done based on the following parameters:

- The patient's socio-demographic characteristics include age, gender, and weight.
- Duration of stay and final diagnosis.
- A total number of antimicrobials and drugs in total prescribed.
- Treatment regimen provided: Mono, dual antibiotics, antiviral, antitubercular drugs.
- Apart from this data regarding nebulization, syrups, electrolytes, diuretics, glucocorticoids, proton pump inhibitors, anticonvulsants, and other drugs were also collected and analysed.
- Any adverse drug reaction observed was collected and reported to the ADR Monitoring centre as well.

Data were analysed to check for the frequency of antibiotics prescribed, duration of stay and total number of antimicrobials prescribed. The analysis of data was done using IBM SPSS software version 24 and statistical analysis was done. Antibiotic usage was expressed as the percentage.

Results

The study was evaluated for n=150 patients admitted in the general paediatric ward of the tertiary care hospital during the study period.

Socio-demographic characteristics of the patient

Age distribution of patient

Maximum number of patients were observed in the age category of 1-5 year (46 %). A detailed representation is given in **Table1**.

Table 1: Age-wise distribution of the patient

Age-wise distribution of the patient	Frequency	Percent %
1 month- 9 month	33	22.0
1- 5 year	69	46.0
6- 12 year	34	22.7
13- 18 year	14	9.3
Total	150	100.0

Gender distribution of the patient

Out of the 150 patients, it was observed that 83 (55.3 %) patients were males whereas 67(44.7 %) were females. A detailed representation is given in **Table 2**.

Table 2: Gender distribution of the patient

Gender of the patient	Frequency	Percent %
Male	83	55.3
Female	67	44.7
Total	150	100.0

The weight distribution of the patients

Maximum number of patients were observed in the category of 4-9 Kgs (32.7 %). A detailed representation is given in **Table 3** and **Figure 1**.

Table 3: Weight distribution of the patients

Weight of the patient (Kg)	Frequency	Percent %
4- 9	49	32.7
10- 15	37	24.7
16- 20	21	14.0
21- 24	09	6.0
25- 30	13	8.7
<30	21	14.0
Total	150	100.0

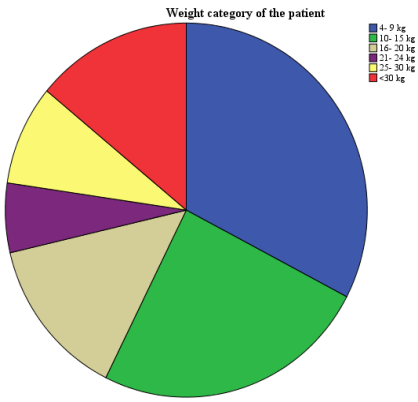


Figure1: Weight Category of the patient

Duration of stay

The duration of stay was observed to be 2- 18 days. The mean ± SD length of stay was 6.01 ± 3.09.

The number of antimicrobials received in total

Out of 150 children, 10 (6.7 %) children did not receive any antimicrobial during treatment, 61 (40.7 %) received a minimum of 2 antimicrobials, and only 1 (0.7 %) patient received 5 antimicrobials. The average number of antimicrobial prescribed per patient was 1.99 ± 1.04. Single and dual combinations of antibiotics were prescribed. A detailed representation is given in **Table 4**.

Table 4: Total number of antimicrobials

Total number of antimicrobials	Frequency	Percent
1	37	24.7
2	61	40.7
3	29	19.3
4	12	8.0
5	1	0.7

Total number of drugs prescribed

Out of 150 patients, there were 10 (6.7 %) patients who received more than 9 drugs for treatment and 12 (8.0 %) patients who received a minimum of 2 drugs. A detailed representation is given in **Table 5** below.

Table 5: Total number of drugs prescribed

Total No. of drugs prescribed	Frequency	Percent
2	12	8.0
3	28	18.7
4	40	26.7
5	25	16.7
6	17	11.3
7	12	8.0
8	6	4.0
<9	10	6.7
Total	150	100.0

Final Diagnosis

Acute febrile illness (AFI) was the leading cause of hospital admission. In total, there were 26 (17.3 %) patients who suffered from AFI followed by 20 (13.3 %) patients who were diagnosed with acute gastroenteritis with dehydration. A detailed representation is given in **Table 6**.

Table 6: Final diagnosis and its frequency of occurrence

Final Diagnosis	Frequency	Percent
Lobar Pneumonia	2	1.3
Acute Gastroentritis with Severe Dehydration	20	13.3
Acute Febrile illness	26	17.3
Acute Hepatitis	6	4.0
Pneumonia	14	9.3
Convulsions with Meningitis	1	0.7
Acute Glomerulonephritis	2	1.3

Acute Pharyngitis	2	1.3
Convulsions	5	3.3
Convulsions with Pyrexia of unknown origin	1	0.7
Laryngo Malacia	1	0.7
Acute Interstitial Nephritis	3	2.0
Tuberculosis with Pulmonary Kotch	3	2.0
Nephrotic Syndrome	2	1.3
Upper Respiratory Tract Infection	3	2.0
Meningitis	3	2.0
Dysentry	2	1.3
Attention deficit disorder with Vomitting	1	0.7
Extra Hepatic portal venous obstruction	1	0.7
Encephalitis with Sub arachnoid haemorrhage	2	1.3
Liver Abcess	3	2.0
Blood Hematasis with Vomitting	2	1.3
Bronchiolitis	15	10.0
Respiratory Distress and Enteric Fever	18	12.0
Maple Syrup Urine Disease	2	1.3
LRTI with CHD	2	1.3
Severe Anaemia with Congestive heart failure	3	2.0
Typhoid Fever with thrombocytopenia	4	2.7
Submandibular Lymphalenitis	1	0.7
Total	150	100.0

Treatment Regimen

Amikacin was the most frequently prescribed mono drug (47.3 %) followed by ceftriaxone (18.6 %). Cefoperazone and sulbactam was the most frequently prescribed fixed drug combination (28.0 %) followed by piperacillin and tazobactam (24.0 %). Detailed representation is given in **Table 7** and **Table 8** below.

Table 7: Antibacterial Mono Drug Therapy

Antibacterial Mono Drug Therapy	Frequency	Percent
Ceftriaxone	28	18.6
Amikacin	71	47.3
Cefotaxime	7	4.6
Zenflox	2	1.3
Ofloxacin	1	0.6
Linezolid	1	0.6
Vancomycin	9	6.0
Meropenem	2	1.3
Metronidazole	11	7.3
Doxycycline	1	0.6
No Mono drug therapy prescribed	17	11.3
Total	150	100.0

Table 8: Antibacterial Fixed Drug Combination

Antibacterial Fixed Drug Combination	Frequency	Percent
Piperacillin + Tazobactam	36	24.0
Cefoperazone + Sulbactam	42	28.0
Amoxycillin + Potassium Clavulanate	16	10.7
Ampicillin + Sulbactam	18	1.3
No combination of drug therapy prescribed	38	36.0
Total	150	100.0

Anti-Viral Drugs- Out of 150 patients, only 3 (2.0 %) patients were prescribed acyclovir as an antiviral drug.

Anti-Tubercular Drugs- Only 3 (2.0 %) patients were diagnosed with tuberculosis and were prescribed AKT-4 i.e Rifampicin, Pyrazinamide, Ethambutol, and Isoniazid.

Diuretics- 5 patients were on diuretics, out of which 2 (1.3%) were prescribed furosemide, and 3 (2.0 %) were prescribed both spironolactone and furosemide.

Syrups- Paracetamol Syrup was the most frequently prescribed followed by Azithromycin to 21 (14.0 %) and 15 (10.0 %) children respectively.

Proton pump inhibitor and antiemetic agent- Fixed drug combination of Ranitidine and Domperidone was the most frequently prescribed PPI and antiemetic drug to 30 (20.0 %) patients followed by ondansetron to 21 (14.0 %) patients.

Others- Out of 150 patients, 24 (16.0 %) were on nebulization, Vitamin K was frequently prescribed to 54 (36.0 %) patients, 7 (4.7 %) patients received Na valproate and 4 (2.7 %) received Phenytoin for treatment of convulsions. 12 (8.0 %) patients received hydrocortisone, 8 (5.3 %) received dexamethasone and 7 (4.7 %) received Prednisolone. Tablet Paracetamol (500 mg) was the most frequently advised drug to around 60 (40.0 %) patients.

Discussion

Test for normality was conducted to check the normality distribution of the age of the patient. It was found that the value of Kolmogorov-Smirnov (KS) and Shapiro-Wilk (SW) is significant i.e *p=0.000*. Age was found to be not normally distributed because the p-value was found below the cut-off point. But the value of Skewness, Kurtosis, and standard error was found to be 0.198, 0.394, and 0.321 respectively. The median (IQ) of the age observed in the study was 5.00 (6). The number of male patients were more in comparison to female patients. In another study the number of male patient was comparatively more than the number of female patient. (Woldu et al., 2013) Also, in some other study among the 265 children, 162 (61.10 %) were found to be males. (Badiya et al., 2017) Weight was found to be not normally distributed. But the value of Skewness, Kurtosis, and standard error was found to be 0.198, 0.394, and 0.946 respectively. the median of the weight observed in the study was 14.0. The mean duration of stay was observed to be 6.01, which was relatively less in comparison to another study in which mean duration of stay was observed to be 8.91 ± 5.35. (Choudhary et al., 2013)

In our study, Acute febrile illness (AFI) was the leading cause of hospital admission. In total, there were 26 (17.3 %) patients who suffered from AFI followed by 20 (13.3 %) patients who were diagnosed with acute gastroenteritis with dehydration. Whereas, in alternative study the most common indication was pneumonia (10.2 %), followed by other lower respiratory tract infections (9.4 %). (Badiya et al., 2017) In our study, the average number of antimicrobial prescribed per patient was 1.99 ± 1.04. Whereas in another study the average mean of antimicrobial use per patient was 1.41 ± 0.67. (Choudhary et al., 2013)

In our study, Amikacin was the most frequently prescribed mono drug in 71 (47.3 %) patients followed by ceftriaxone prescribed to 28 (18.6 %) patients. Cefoperazone and sulbactam was the most frequently prescribed fixed drug combination in 42 (28.0 %) patients followed by piperacillin and tazobactam to 36 (24.0 %) patients. In a Ghanaian teaching hospital, third-generation cephalosporins were commonly used for CAIs (28 %). In a different study third-generation cephalosporins, ampicillin, and gentamicin were the most widely prescribed antimicrobials. (Koopmans et al., 2018)

In this study, more than 90 % of antimicrobials were administered via the parenteral route. Whereas, in one more study 92.5 % of antibiotics were given via IV route. (Fahimzad et al., 2016) Since the parenteral route is mostly preferred therefore precautions regarding syringes used to administer the antibiotics must be taken. Also, Tablet paracetamol (500 mg) was the most frequently prescribed antipyretic to 40 % of the study population. In our study, suspected adverse drug reactions (ADR's) were observed in only 1.3 % of the patients and were primarily itching associated with rashes. Therefore, these ADRs were controllable. However, in a particular study on ADRs in pediatric patients reported that antibiotics were accountable for urticaria and rashes being the most common ADRs observed due to antibiotics. (Priyadharsini et al., 2011) The hospital being part of an ADR Monitoring Center under PvPI, these reports were aptly submitted to PvPI.

Conclusions

Aminoglycoside was the top most used class of antibiotics followed by cephalosporins. Among cephalosporins, the third generation of ceftriaxone and cefoperazone were found to be mostly used. Multiple uses of antibiotics and a common place of the Injection site is bothering and needs to be addressed. Accordingly, health care professionals must keep a clear understanding of the need for microbiological diagnosis, antibiotics usage, and make good judgment in clinical situations. To promote the rational use of antibiotics regular antibiotic audits and staff education must be implemented.

Limitations

Pediatric intensive care unit (PICU) patients were not a part of the study, but drug use patterns in such children also need to be addressed.

Financial Support and Sponsorship

Nil.

Conflicts of Interest

There are no conflicts of interest.

References

Baidya, S., Hazra, A., Datta, S., & Das, A. K. (2017). A study of antimicrobial use in children admitted to pediatric medicine ward of a tertiary care hospital. *Indian journal of pharmacology*, *49*(1), 10–15.

Choudhury, D. K., & Bezbaruah, B. K. (2013). Antibiotic prescriptions pattern in paediatric in-patient department gauhati medical college and hospital, Guwahati. *Journal of applied pharmaceutical science*, *3*(8), 144-148.

Fahimzad, A., Eydian, Z., Karimi, A., Shiva, F., Sayyahfar, S., Kahbazi, M., Rahbarimanesh, A., Sedighi, I., Arjmand, R., Soleimani, G., Sanaei Dashti, A., Abdinia, B., Mostafavi, N., Nikfar, R., Abedini, M., Rezaei, M. S., Mohammadpour, A., Hashemian, H., Hidari, H., Ghadiri, K., … Entezari Heravi, R. (2016). Surveillance of Antibiotic Consumption Point Prevalence Survey 2014: Antimicrobial Prescribing in Pediatrics Wards of 16 Iranian Hospitals. *Archives of Iranian medicine*, *19*(3), 204–209.

Kolar, J. V., & Kadakova, E. (1993). Prescription of antimicrobial drugs to hospitalized children. *The Annals of pharmacotherapy*, *27*(7-8), 974–977.

Koopmans, L. R., Finlayson, H., Whitelaw, A., Decloedt, E. H., & Dramowski, A. (2018). Paediatric antimicrobial use at a South African hospital. *International journal of infectious diseases: IJID: official publication of the International Society for Infectious Diseases*, *74*, 16–23.

Marr, J. J., Moffet, H. L., & Kunin, C. M. (1988). Guidelines for improving the use of antimicrobial agents in hospitals: a statement by the Infectious Diseases Society of America. *The Journal of infectious diseases*, *157*(5), 869–876.

Palikhe N. (2004). Prescribing pattern of antibiotics in paediatric hospital of Kathmandu valley. *Kathmandu University medical journal (KUMJ)*, *2*(1), 6–12.

Principi, N., Sher, D., Moresco, R. C., Marchisio, P., Boccazzi, A., Viola, G., & Sereni, F. (1981). Control of antibiotic therapy in pediatric patients. I. A computer system to collect and analyze antibiotic prescriptions in hospitals. *Developmental pharmacology and therapeutics*, *2*(3), 145–155.

Priyadharsini, R., Surendiran, A., Adithan, C., Sreenivasan, S., & Sahoo, F. K. (2011). A study of adverse drug reactions in pediatric patients. *Journal of pharmacology & pharmacotherapeutics*, *2*(4), 277–280.

Sanz, E. J., Bergman, U., & Dahlstrom, M. (1989). Paediatric drug prescribing. A comparison of Tenerife (Canary Islands, Spain) and Sweden. *European journal of clinical pharmacology*, *37*(1), 65–68.

Schollenberg, E., & Albritton, W. L. (1980). Antibiotic misuse in a pediatric teaching hospital. *Canadian Medical Association journal*, *122*(1), 49–52.

Smith, M. J., Gerber, J. S., & Hersh, A. L. (2015). Inpatient Antimicrobial Stewardship in Pediatrics: A Systematic Review. *Journal of the Pediatric Infectious Diseases Society*, *4*(4), e127–e135.

Summers, R. S., & Summers, B. (1986). Drug prescribing in paediatrics at a teaching hospital serving a developing community. *Annals of tropical paediatrics*, *6*(2), 129–133.

Woldu, M. A., Suleman, S., Workneh, N., Berhane, H. (2013). Retrospective study of the pattern of antibiotic use in Hawassa University referral hospital pediatric ward, Southern Ethiopia. *Journal of applied pharmaceutical science*, *3*(2): 93-98.