



**A REVIEW ON PRESCRIBING PATTERNS OF ANTIBIOTICS AND RATIONALITY  
ASSESSMENT IN PEDIATRIC POPULATION**

**Patel Trushali<sup>1\*</sup>, Dr. Jalpa A. Soni<sup>2</sup>, Dr. I. S. Anand<sup>3</sup> and Dhiren Chaudhari<sup>4</sup>**

<sup>1</sup>Research Scholar, Shree Sarvajani Pharmacy College, Mehsana-384001, Gujarat, India.

<sup>2</sup>Assistant Professor, Department of Pharmacology and Pharmacy Practice, Shri Sarvajani Pharmacy College, Mehsana-384001, Gujarat, India.

<sup>3</sup>HOD & Professor, Department of Pharmacology and Pharmacy Practice, Shri Sarvajani Pharmacy College, Mehsana-384001, Gujarat, India.

<sup>4</sup>Assistant Professor, Department of Pharmacology and Pharmacy Practice, Shri Sarvajani Pharmacy College, Mehsana-384001, Gujarat, India.

**\*Corresponding Author: Trushali Patel**

Research Scholar, Shree Sarvajani Pharmacy College, Mehsana-384001, Gujarat, India.

Article Received on 29/01/2020

Article Revised on 19/02/2021

Article Accepted on 09/03/2021

**ABSTRACT**

The paediatric population comprises of 20-25 percent of the total world population and children comprises about 40% of india's population. Paediatric population is among the most vulnerable population group. Since pharmacodynamic and pharmacokinetics parameters are different in children, which make them more susceptible to adverse drug reactions. Moreover, antibiotics are the commonly prescribed class of drugs in the paediatric age group. Antibiotics are highly powerful against bacterial infections. However excessive and inappropriate use of antibiotics causes several adverse effects such as an increase of resistant to microorganisms, morbidity and mortality, drug toxicity, long hospitalization period and increase of costs. The majority of infections which are seen in general are of viral origin and antibiotics can neither treat viral infections nor can prevent secondary bacterial infections in such patients. Irrational use of antibiotics in pediatric population can lead to increase in drug cost, treatment failure, polypharmacy, resistance to the drugs. Hence prescription of this type of patients should be properly reviewed as there are higher chances of bacterial resistance because of inappropriate use of antibiotics for the infections which are of viral origin.

**KEYWORDS:** Antibiotics, Prescription pattern, Pediatric, Irrational, Antibiotic resistance.

**INTRODUCTION**

With the production of penicillin in 1941, the golden age of antimicrobial therapy began. Since that time, antibiotics have been increased in numbers and currently, they are the largest and most widely prescribed class of drug.<sup>[1]</sup> According to the definition of antibiotics by waksman originally, they are the substances which are produced by microorganisms and exhibit either an inhibitory or destructive effect on other microorganisms. In a broad manner antibiotic are the substances of biological origin which do not possess any enzymatic character and in low concentrations inhibit cell growth processes.<sup>[2]</sup>

Antibiotics that kills the bacteria are called "bactericidal" and antibiotics which inhibits the growth of bacteria are called "bacteriostatic".<sup>[3]</sup> Antibiotics are very effective class of drugs against bacterial infections. The majority of infections which are seen in general are of viral origin and antibiotics cannot treat viral infections nor prevent secondary bacterial infections in such patients.<sup>[1]</sup>

According to the world health organization (WHO), resistance to the antibiotics is one of the biggest problem for human health. Which is defined as the resistance of microorganisms to antimicrobial agents which occurs when bacteria tend to protect itself from antibiotics.<sup>[3]</sup> Every year, antibiotics is responsible for 24% of all new and repeated prescriptions.<sup>[4]</sup> Excessive and inappropriate use of antibiotics causes several adverse effects such as an increase of resistant microorganisms, morbidity and mortality, drug toxicity, long hospitalization period and increase of costs.<sup>[5]</sup>

A large number of drug utilization studies have been conducted for adults all over the world. Though very few studies are available which provides information on drug use patterns in paediatrics.<sup>[6]</sup> Paediatrics is the branch of medicine that deals with the development, diseases and disorders of children.<sup>[7]</sup> The paediatric population comprises of 20-25 percent of the total world population<sup>[8]</sup> and there are about 40% of the children in India.<sup>[9]</sup> Paediatrics is among the most vulnerable group of

infectious diseases. Since pharmacodynamic and pharmacokinetics are different in them, which often make them more liable to various adverse drug reactions.<sup>[10]</sup>

Moreover, antibiotics are the commonly prescribed class of drugs in the paediatric population.<sup>[11]</sup> A study conducted in Netherlands from 1999 to 2005 proved that antibiotics were the most commonly prescribed medications among children.<sup>[12]</sup> According to the national ambulatory medical care survey (NAMCS), antibiotics are the second top drug which is being prescribed for treating infectious disease in children.<sup>[13]</sup> Infants and children about 35% who are admitted to hospitals receive antibiotics.<sup>[14]</sup> The global antibiotic resistance partnership (GARP)-India research estimates 190,000 neonatal deaths every year because of infections, of which over 30 percent are attributable to antibiotic resistance.<sup>[5]</sup> The rising incidence of bacterial resistance especially multi-drug resistant pneumococci has alarmed the judicious use of antibiotics in paediatric practices.<sup>[15]</sup>

A study in the Emilia-Romagna region of central Italy, reported that antibiotics were prescribed in 37.8% of 4352 visits for suspected respiratory infections and most frequently for bronchitis or otitis media (69% of children with one of these diagnoses) and pharyngotonsillitis (59%).<sup>[16]</sup> Acute respiratory infections, acute watery diarrhoea and fever are the most common infant diseases that seek for medical care at hospital. Several studies reported that 50% to 85% of children receive antibiotics in developed and developing countries.<sup>[17]</sup> 50% of children consulting a physician for viral respiratory tract infections receive antibiotics as per the data collected from a database on the paediatric antibiotic prescribing.<sup>[14]</sup> Thus the rational use of antibiotics in paediatric population is still of concern.

#### **Prevalence of irrational use of drug in paediatric population**

Tripti Rani Paul, et al. In 2018 evaluated the prescription pattern of antibiotics in paediatric outpatients at private hospitals in Rajshahi city of Bangladesh. Out of 329 paediatric prescriptions 964 drugs were used by the patients with an average of 2.93 per prescription. Only 37.24% drugs were prescribed from the national essential drug list. Fever, common cold and pneumonia were the main diseases noted. Moreover, prescription with antibiotics were 83%. Conclusion of the study was that the prescription pattern was irrational resulting from an indiscriminate use of antimicrobials irrespective to the age of patients.<sup>[18]</sup>

Lawal Waisu Umar, et al. In 2020 evaluated the prescribing pattern and utilization of antibiotics for children. There were 3445 eligible prescriptions with 48.2% written in generic names. Prescriptions containing oral antibiotics and antibiotic injections constituted 50.2% and 41.2%, respectively. Medicines prescribed

were available in the essential medicines list in 95.5% of cases. The IRDP was 2.98 against the ideal of 5.  $\beta$ -lactam penicillin and cephalosporins were the most prescribed with ampicillin/cloxacillin being the most common combination. Irrational prescribing and inappropriate antibiotic use were prevalent in this tertiary hospital.<sup>[19]</sup>

Budhia Majhi, Abinash Panda, et al. In 2017 analysed the pattern of oral antibiotic use in children in the outpatient setting of a tertiary care hospital. Out of the 216 prescriptions analysed, the most common disease was acute respiratory infections (68.05%). Cefpodoxime was the commonly prescribed antibiotics and all antimicrobials were prescribed empirically without any microbiological evidence. This study highlights that  $\beta$ -lactamase were the commonest prescribed antibiotics. The use of antibiotics without any microbiological evidence warrants for increasing the rational use of antibiotics in children.<sup>[20]</sup>

#### **Incidence of higher and inappropriate consumption of antibiotics among paediatric population**

B. Ramya Kuber, et al. In 2018 studied the prescribing pattern of antibiotics in hospital paediatric patients. A total number of 300 prescriptions were screened and 140 patients were enrolled for antibiotic study. Macrolide antibiotics were found to be widely prescribed. Results showed that antibiotic prescribing in children is relatively high in Chittoor district of Andhra Pradesh and prescription of broad-spectrum antibiotics has increased demonstrably which may result in the development of bacterial resistance.<sup>[21]</sup>

Egle Karinauskė, et al. In 2019 determined the trends in consumption of antibiotics and evaluate the antibiotic prescription rates in the paediatric population. Utilization of antibiotics during this study period increased by 8.40%. The most popular antibiotic group was macrolides which showed the highest increase of utilization about 5.9 times. The most commonly prescribed antibiotics were broad spectrum. Most of the diseases that the antibiotics were prescribed includes viral infections. Excessive use of antibiotics may result in resistance of bacteria.<sup>[2]</sup>

Rajeswari G, Rupa G, et al. In 2018 evaluated the use of antibiotics in paediatric patients in a tertiary care hospital. Result shows that the average no of antibiotics per prescription was 1.1, Amoxicillin-clavulanic acid is mostly used and  $\beta$ -lactam class of antibiotics were commonly used. This study revealed that antibiotic resistance is an emerging problem worldwide which can be controlled by restricting the no of antibiotics per prescription and appropriate selection of drug.<sup>[23]</sup>

Linjie Zhang, et al. In 2015 conducted a study to describe patterns of antibiotic use in community-based paediatric outpatients. A sample of children (29 days to 18 years of age) was selected. Out of 489 children, 201

(41.1%) had received at least one antimicrobial course in the previous 2 months. The most commonly prescribed antibiotic was amoxicillin (54.0%) and broad-spectrum agents were used in 15.3% of antimicrobial courses. Acute respiratory infections were the most frequent diagnosis for antibiotic prescribing (91.2%). This concluded that antibiotic prescribing is very common in community-based paediatric outpatients in the southern region of Brazil and inappropriate use is frequent.<sup>[24]</sup>

Shaik Abdul Rehman, et al. In 2018 assessed prescribing pattern of antibiotics in paediatric outpatient department at a multispeciality hospital Nellore. Most prevalent disease were upper respiratory tract infection. The commonly prescribed antibiotics are amoxicillin – clavulanic acid (42.60%) followed by ceftriaxone (19.75). Beta lactam classes of antibiotics are prescribed more frequently. The commonly used combination of drugs is cefixime and amikacin. Out of all the antibiotics administered, 31 drug-drug interactions of 6 combinations were found. The study concluded that antibiotics are prescribed based on empirical therapy without performing any sensitivity tests which suggest that interventions should be developed to reduce the inappropriate antimicrobial prescription.<sup>[25]</sup>

Sahar I. Al-Niemat, et al. In 2014 reported antibiotic prescribing patterns in the outpatient paediatric emergency clinic. Antibiotic prescribing was found to be frequent, broad spectrum antibiotics accounted for approximately (60%) and (83%) of prescribed antibiotics for upper respiratory tract infections and macrolides (primarily azithromycin) were the leading class among them. This concluded that high consumption of antibiotics by emergency department paediatricians highlights the importance for interventions to promote rational and judicious prescribing.<sup>[26]</sup>

## CONCLUSION

This review concludes that prescription pattern of antibiotics should be monitored closely in paediatric patients. There are higher chances of mismatch of dose in the paediatric patients, as there is a difference in the dose of children than adults. However, antibiotics are the first line drug for the bacterial infections, they are recommended for treating bacterial infection in children. Irrational use of antibiotics in paediatric population can lead to increase in drug cost, treatment failure, polypharmacy, resistance to the drugs. Hence prescription of this type of patients should be properly reviewed as there are higher chances of bacterial resistance because of inappropriate use of antibiotics for the infections which are of viral origin.

## REFERENCES

1. Begum S, Ahmed A, Saha S, Nahar S, Parveen F, Sattar. Prescribing pattern of antimicrobials used in under five years children in cough or cold and pneumonia in outdoor settings of two tertiary level hospital. *Bangladesh Journal of Physiology and*

2. *Pharmacology*, 2014; 27(1-2): 13-20.
2. Lishan A, Getu B, Zelalem A. Antibiotics use evaluation for pediatrics at nekemte referral hospital, east wollega zone, oromia region, west ethiopia. *World Journal of Medical Sciences*, 2016; 13(1): 7-26.
3. Rajavardhana T, Jyothi A, Babu G, G Narayana, V Sreedhar. Prescribing patterns of antibiotics in pediatric patients of tertiary care hospital in south indian resource limited settings. *Inventi Journals*, 2019; 2.
4. Obaid A. Prescribing pattern of antibiotics in al-elwia pediatric teaching hospital, baghdad, 2016. *Al-Kindy College Medical Journal*, 2019; 13(2): 117-126.
5. Venu Gopal D, Rama Krishna T, Siva Kumar A, Venkata Subbaiah M, Ravindra Reddy K. Prescribing pattern of antibiotics in the general medicine and pediatrics departments of a tertiary care teaching hospital. *Int J Pharm Pharm Sci*, 2014; 6(2): 221-224.
6. M S Akhtar, Divya V, K K Pillai, Kiran D, M S Roy, A K Najmi, Razia K. Drug prescribing practices in paediatric department of a north indian university teaching hospital. *Asian J Pharm Clin Res*, 2012; 5(1): 146-149.
7. Gedam DS, Patel U, Verma MM, Gedam S, Chourishi A. Drug prescription pattern in pediatric out patient department in a teaching hospital in Central India. *Int. J. Pharm. Sci. Rev. Res*, 2012; 17(2): 42-45.
8. Laya VR, Modupalli A. Prescribing pattern of antibiotics in pediatric inpatient department of a tertiary care teaching hospital in Bangalore. *IOSR J Pharm Biol Sci*, 2015; 10: 26-32.
9. Venkateswaramurthy N, Faisal ME, Sambathkumar R. Assessment of drug prescription pattern in paediatric patients. *Journal of Pharmaceutical Sciences and Research*, 2017; 9(2): 81.
10. Akhtar MS, Vohora D, Pillai K, Dubey KI, Roy M, Najmi A, Khanam RA. Drug prescribing practices in paediatric department of a north indian university teaching hospital. *Asian J Pharm Clin Res*, 2012; 5(1): 146-9.
11. Choudhury DK, Bezbaruah BK. Antibiotic prescriptions pattern in paediatric in-patient department gauhati medical college and hospital, Guwahati. *J Appl Pharm Sci*, 2013; 3(8): 144-8.
12. Al-Balushi K, Al-Ghafri F, Al-Sawafi F, Al-Zakwani I. Antibiotic prescribing trends in an Omani paediatric population. *Sultan Qaboos University Medical Journal*, 2014; 4(4): 495.
13. Malpani AK, Waggi M, Rajbhandari A, Kumar GA, Nikitha R, Chakravarthy AK. Study on prescribing pattern of antibiotics in a pediatric out-patient department in a tertiary care teaching and non-teaching hospital. *Indian Journal of Pharmacy Practice*, 2016; 9(4): 253.
14. Prabahar K. Antibiotics utilization pattern in pediatrics in a tertiary care teaching hospital. *Asian*

- Journal of Pharmaceutics, 2017; 11(01): 13.
15. Mgbahurike AA, Ojiyi ID, Chijioko-Nwauche IN. Antibiotic utilization pattern in pediatrics unit south-south of nigerian teaching hospital. *J Med Biomed App Sci*, 2020; 8(2): 337-42.
  16. Messina F, Clavenna A, Cartabia M, Piovani D, Bortolotti A, Fortino I, Merlino L, Bonati M. Antibiotic prescription in the outpatient paediatric population attending emergency departments in Lombardy, Italy: A retrospective database review. *BMJ Paediatrics Open*, 2019; 3(1).
  17. Jangra S, Bhyan B, Chand W, Saji J, Ghoghari R. To assess prescribing pattern of antibiotics in department of pediatric at tertiary care teaching hospital. *Journal of Drug Delivery and Therapeutics*, 2019; 9(2): 192-6.
  18. Paul TR, Hamid MR, Alam MS, Nishuty NL, Hossain MM, Sarker T, Hosan Z, Wahed MI. Prescription pattern and use of antibiotics among pediatric out patients in rajshahi city of bangladesh. *Int J Pharm Sci Res*, 2018; 9(9): 3964-70.
  19. Umar LW, Isah A, Musa S, Umar B. Outpatient prescribing and antibiotic use for children in a tertiary hospital. *Sahel Medical Journal*, 2020; 23(2): 109.
  20. Majhi B, Panda A, Barma SK. Antibiotic prescribing pattern in paediatrics outpatient in a tertiary care hospital. *J Evid Based Med*, 2017; 4: 3048-51.
  21. Kuber BR, Avanthi D, Vaishnavi CS, Varma SJ. Prescribing pattern of antibiotics in paediatric patients. *Indian Journal of Pharmacy Practice*, 2018; 11(3): 149.
  22. Karinauskė E, Kasciuskeviciute S, Morkuniene V, Garuoliene K, Kadusevicius E. Antibiotic prescribing trends in a pediatric population in Lithuania in 2003–2012: Observational study. *Medicine*, 2019; 98(46).
  23. Rajeswari G, Rupa G, Dishanth A, Harpriya M, Sowjanya P. Drug use evaluation of antibiotics in paediatrics in a tertiary care teaching hospital. *Int J Res. Pharm. Sci*, 2018; 10(1): 227-232.
  24. Zhang L, Mendoza R, Costa MM, Ottoni EJ, Bertaco AS, Santos JC, D'avila NE, Faria CS, Zenobini EC, Gomesa A. Antibiotic use in community-based pediatric outpatients in southern region of Brazil. *Journal of tropical pediatrics*, 2005; 51(5): 304-9.
  25. Rehaman SA, Noorudin S, Salman BS. A study on prescribing pattern of antibiotics in paediatric outpatient department at a multispeciality hospital nellore. *International Journal of Research in Hospital and Clinical Pharmacy*, 2018; 1(1): 18-30.
  26. Al-Niemat SI, Aljbouri TM, Goussous LS, Efaishat RA, Salah RK. Antibiotic prescribing patterns in outpatient emergency clinics at Queen Rania Al Abdullah II Children's Hospital, Jordan, 2013. *Oman medical journal*, 2014; 29(4): 250.