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Review Article

**THE EVALUATION OF ANTIBIOTICS IN PEDIATRICS:
A SYSTEMATIC APPROACH****Prof. J.S. Venkatesh*¹, Dr. Upendra N*², Bleslin Varghese³, Gladys Jiji ⁴,
Hemanth Gowda M N⁵, Hridya Suresh⁶.**¹Professor, SCS College of Pharmacy, Harapanahalli²Assistant Professor, SCS College of Pharmacy, Harapanahalli³⁻⁶Pharm D Interns , SCS College of Pharmacy, Harapanahalli**Abstract:**

The distribution, prescription, and use of drugs in society is called drug utilization, which receives medical, social, or economic attention. Antibiotics have been shown to be effective in reducing morbidity and mortality associated with infectious diseases due to their definitive or appropriate use, while their misuse can lead to higher levels of morbidity, patient expenses, and bacterial antibiotic resistance. The primary medication used in pediatrics is antimicrobial agents. Due to the general increase in health care costs, inconsistencies in prescribing medicines and the emergence of antibiotic resistance, the monitoring and control of antibiotic use of increasing concern, and a strict antibiotic policy would be justified. The application of antimicrobial agents must be carefully planned and carried out, as their absence or resistance can be life-threatening. Irrational drug usage is prevalent in developing countries. In India, doctors often prescribe three or four drugs for the most trivial ailments to satisfy the supply of drugs for patients or the profits of drug dealers. Therefore, drug use evaluation studies are necessary for all drugs and especially for antibiotics.

Key words: Drug use evaluation, antibiotic resistance, irrational use, antimicrobial agents.

Corresponding author:**Hridya Suresh,**

Pharm D Interns,

S C S College of Pharmacy,

Harapanahalli, Karnataka, India

QR code



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INTRODUCTION:

The American Society of Health-System Pharmacists (ASHP) has defined medication utilization evaluation (DUE) as "a criteria-based, ongoing, planned, and systematic process designed to monitor and evaluate the prophylactic, therapeutic, and empiric use of medications to help and ensure that they are provided appropriately, safely and effectively." [1,2]. It is a continuous approved, and systematic quality improvement process that aims to review medicines prescribed to patients, provide appropriate feedback to the doctor/other relevant groups, develop criteria and standards that describe the optimal use of medicines, promote appropriate use of medicines through education and patient counseling. In the field of pediatric pharmacotherapy, drug use studies examine many outcomes, including examining prescribing trends in different clinical settings, the extent to which pediatric best practices differ from drug monographs/labels and adult dosing guidelines, the cost-effectiveness of hospital formulations, and the correlation between medication errors and utilization. Pharmacoepidemiology can be a useful tool to assess the appropriateness of drug prescriptions and for treatment needs. The use of Pharmacoepidemiology can be advantageous for children, who are often unaware of the safety and effectiveness of drug usage. In recent years, there has been growing concern about the incompleteness of the evidence regarding the effectiveness and safety of medicines used in children. Almost all drugs prescribed for children are the same drugs originally developed for adults. Typically, these drugs are prescribed without a license or on an "off-label" basis and are derived from adult clinical data without conducting any children's kinetic studies, dose-finding formulas.[3] However, diseases in children can differ from those in adults, and the processes underlying growth and development can cause different outcomes or side effects that are not seen in adults (Reye syndrome is a prime example). Legislation was passed in the European Union in 2007 [4]

and in the United States in 2003 to provide legal and appropriate treatment for pediatric diseases. Both the Food and Drug Administration (FDA) and the Evaluation of Medicines of the European Medicines Agency (EMA) now offer drug licenses to pharmaceutical companies that provide sufficient clinical evidence of the safety and effectiveness of new drugs in children. [5,6]. In December 2007, the World Health Organization emphasized the need for these initiatives and launched the global campaign "Make Medicines Child-Size" to address the need to improve the availability and accessibility of safe pediatric medicines for all children.[7] The rational use of medicines requires the prescription of appropriate medicines; availability of medicines at the right time, at a price people can afford, that they are correctly dosed and that they are taken in the right dose at the right intervals and at the right time. Irrational drug use is a common practice in developing countries. In India, a hospital baseline survey showed that polypharmacy was prevalent in inpatient and outpatient departments.[8]. Doctors often prescribe three or four drugs for the most trivial diseases without laboratory testing to satisfy patients or benefit the drug dealer.[9] DUE studies are therefore required for all drugs, especially antibiotics. in children, because the use of antibiotics in hospitals accounts for 20–50% of treatment costs. [10,11] It has been found that about half of the antibiotics prescribed to children are unnecessary.

Asia is one of the regions where the problem of resistance is most visible. The number of particularly resistant pneumococci in Asian countries was alarming. Nearly all the bacterial strains present in India are resistant antibiotics like ampicillin, ciprofloxacin, trimethoprim, and nalidixic acid or chloramphenicol.[12]. The International Network on Rational Drug Use (INRUD) was founded with the aim of promoting rational drug use in developing countries. In collaboration with the WHO, INRUD has developed various indicators to assess drug use practices. [13] Poor patient compliance or non-adherence to medication is particularly important in clinical practice. It was found to be associated with treatment failure and all its consequences of worsening patient health, the need for additional consultations,

the use of additional medications, additional hospitalizations, and increased direct and indirect costs of treating the disease.[14] Babies and children make up a large part of the population in developing countries.

Children often suffer from respiratory and gastrointestinal infections. Although most childhood infections, such as diarrhea and upper respiratory infections are caused by viruses, and for these infections, children are prescribed large amounts of antibiotics in primary care settings. It is estimated that 90% of upper respiratory tract infections are self-limiting viral illnesses, and even bacterial infections such as acute otitis media often resolve on their own. Clinical studies have shown little or no clinical benefit from the use of antibiotics in the treatment of common upper respiratory infections such as sore throat, nasopharyngitis and otitis. Lower respiratory infections are one of the leading causes of death in children under 5 years of age.[15]. Acute respiratory infection, acute watery diarrhea and viral fever are common childhood illnesses that account for the majority of pediatric visits. [16] Respiratory syncytial virus (RSV) is the most common cause of bronchitis in infants, infecting most children before the age of two. About 1-2% of infected children require hospitalization. Acute respiratory infections occur in 20-40% of general hospital outpatients and 12-35% in inpatients. In the 2004 World Health Report, the World Health Organization (WHO) estimated that respiratory infections caused 94.6 years of life lost due to disability worldwide and was the fourth leading cause of death, accounting for 4 million deaths or 6.9% of global deaths in 2002. It is interesting to note that antibiotics are used in the maximum amount in the community and in primary care, accounting for 80% of all antimicrobials used in humans, but these antibiotics are used inappropriately for mostly self-resolving upper respiratory tract infections (URTI). Antimicrobials are the primary drugs prescribed for children. Most commonly used as empiric therapy, either as a prophylactic or definitive treatment. Excessive and inappropriate use of antibiotics is thought to be associated with the emergence of antibiotic resistance in the community. Careful use of AMAs is very important, as their absence or resistance can be life-threatening under certain conditions. Krivoy N et al. reported that continuous, indiscriminate and excessive use of antimicrobials can promote the emergence of antibiotic-resistant organisms. An international network of surveillance systems monitoring antibiotic use in

Europe through the European Surveillance of Antibiotic Consumption (ESAC) project published in the Lancet. ; found that antibiotic resistance was highest in countries with the highest antibiotic consumption.[17].

In 2010, NICE guidelines advised delaying or not prescribing antibiotics for five common diagnoses, namely acute otitis media (AUS), acute sore throat, acute cough/bronchitis, and acute sinusitis. [18] Several studies that focused on antibiotic prescription in hospitalized children indicate that approximately 35% of hospitalized infants and children receive antibiotics, suggesting widespread antibiotic abuse.[19] In studies by Mohammed Aamer Khan et al.[20] and Marlies et al.[21] showed that children under 1 year and under 2 years are prescribed antibiotics, which are not considered appropriate in some studies. The incidence of infections in babies and children is higher than in adults because the immune defenses are underdeveloped, which leads to an increased use of antimicrobials, increasing in healthcare costs and causing potential adverse effects.[22,23,24] Approximately 50% of prescribed antibiotics were found to be inappropriate based on clinical and economic criteria.[25]. Most studies show that antibiotics are prescribed unnecessarily to children. According to Hindra I. Satar et al.[25], approximately 73% of antibiotics are prescribed as empiric treatment instead of appropriate treatment. Similar results were seen by Van Houten et al. research paper.[26] In a study conducted by Mohammed Aamer Khan et al.[20] shows that most pediatric patients are treated with two antibiotics and three antibiotics for infections. Similarly, studies by Shankar et al [27] and Palikhe et al [28] show that most patients are treated with two antibiotics, while K Shamshy et al. [29] and in a study by Shankar et al.[27] 98% and in Jason Hall[30] 60.6% of patients were treated with one antibiotic. The use of antibiotics for an unknown reason is 3.3% in the study by Hindar I et al.[31] compared to the AMRIN study (32%).[32]. Because the effective treatment of a child patient is based on an accurate diagnosis, which is mostly done by taking samples from the patients. Studies by Palikhe et al [28] and Mohammed Aamer Khan et al[20] obtained very few hematological samples from patients, e.g. 19.8% and 6.27%, while Prakash Katakami et al[33] and S. Hun et al. to [34], hematological samples were obtained from 98% and 17.84% of patients. For these reasons, the number of

antibiotics used to treat infections increases per patient. Jagadish Babu et al.[35] Hindra I. Satari et al.[31] and Robin E Huebner[36], the most commonly used antibiotic is cephalosporin's, while Mohammed Aamer Khan et al. [20] and Shamsy et al. [29] study this amino glycoside and Al Niemat et al. [37] it is penicillin's. The method of administration plays a crucial role in the correct absorption of administered drugs. Intravenous administration was found to be the preferred route of administration in most studies.

In studies by K Shamsy et al.[29] Ansam swalaha et al.[38] and Mohammed Aamer Khan et al.[20] The most common route of antibiotic administration is the intravenous route, accounting for 80.95%, 61.8%, and 84%. The effectiveness of antimicrobial treatment is reflected in the duration of hospitalization. The duration of hospitalization usually depends on the disease and its severity. According to Ufer M et al [39], the duration of hospitalization is directly proportional to the average duration of treatment. The hospital stay of patients in Mohammed Aamer khans study [20] is 5-10 days. In a study by S K Arulmol et al [40], the duration of hospitalization without antibiotics before hospitalization is less than 5 days.

CONCLUSION:

The most important challenges in antibiotic prescription are the rational choice and correct use of antibiotics and the identification of their potential problems. Therefore, clinicians must have a clear understanding of the need for microbiological diagnosis, antibiotic use and evaluation in clinical situations, despite the financial burdens that culture testing imposes on patients. This can reduce the development of resistant bacteria, reduce healthcare costs and minimize the potential for side effects associated with inappropriate antibiotic use. The study notes that in most cases, a treatment program was implemented without much cultural sensitivity testing, which can lead to irrational prescribing. Empiric treatment of viral infection and the use of antimicrobial agents can be reduced by rapid diagnostic methods to distinguish between viral and bacterial infection. Because most patients in many studies are treated with two or more antibiotics, it appears that inappropriate empiric and inappropriate final antibiotic prescriptions were more common than appropriate empiric and appropriate final prescriptions. Healthcare

professionals are encouraged to be cautious about antibiotic selection, including dose, route and interval, and clinical response assessment, taking into account the development of antibiotic resistance.

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