

## Assessment of Rational Antibiotic Use in Pediatric Ward in A Teaching Hospital

*Dr. Sachin Vahadane<sup>1</sup>, Dr. Makarand Dharma<sup>2</sup>, Dr. Suresh Waydande<sup>3</sup>, Dr. Abhijit Shinde<sup>2</sup>*

*<sup>1</sup>Associate Professor, <sup>2</sup>Assistant Professor, <sup>3</sup>Professr & Head, Department of Paediatrics, DVVPF's Medical College & Hospital, Ahmednagar-414111, Maharashtra, India*

### Abstract:

**Introduction:** Antibiotics are a class of natural and synthetic compounds that inhibit the growth of or kill other microorganisms. These are among the most frequently prescribed medications in modern medicine. The use of antibiotics has contributed to the dramatic fall in morbidity from communicable and infectious diseases over the last 50 years globally. Overuse of antibiotic is one of the most important factors for the development and spread of resistance in the hospital, as well as in the community. **Methodology:** The present study was conducted in pediatric ward of a tertiary care institute. The study population included 250 children. The group consisted of 250 consecutive children admitted in one unit of the pediatric ward and they were analyzed for antibiotic use without any prior priming of the members of the unit regarding rationality of antibiotic use. **Results:** Age and sex wise distribution of 250 children included in the study. Of these 166(57%) were males and 84 (43%) were females. 60 received antibiotics for respiratory tract infections, this being the commonest disease for which antibiotics were received. 55 (44%) children received antibiotics in rational way. **Conclusion:** From this study it is clear that there is lack of proper rational antibiotic usage by unit doctors. To conclude it can be stated that inappropriate use of antibiotics is increasing and is responsible for rapidly developing antimicrobial resistance. To increase rational use of antibiotics the members of the unit (treating physicians) should be motivated regarding correct uses of antibiotics and hazards of their inappropriate use. A proper workshop should be arranged for this.

**Keywords:** Educational intervention, Antibiotic, Antimicrobials

### Introduction:

Antibiotics are a class of natural and synthetic compounds that inhibit the growth of or kill other microorganisms. These are among the most frequently prescribed medications in modern medicine. The use of antibiotics has contributed to the dramatic fall in morbidity from communicable and infectious diseases over the last 50 years globally. Overuse of antibiotic is one of the most important factors for the development and spread of resistance in the hospital, as well as in the community. Antibiotic resistance among common pathogenic bacteria in communities has been identified as an emerging threat to public health.[1] The Centers for Disease Control and Prevention

(CDC) has identified drug-resistant organisms as a particular threat, and has recommended increased surveillance, risk factor identification, and promotion of judicious antibiotic prescribing.[2]

From a clinical standpoint, there are three principal concerns surrounding the use and management of antimicrobial drugs:

1. They are necessary for treatment of most bacterial infections. If they are not available in hospital pharmacies, lives may be jeopardized.
2. They may be prescribed inappropriately by physicians and drug sellers and especially by the general public (self-prescribing) over the counter.
3. Adverse drug reactions (ADRs) constitute the third critical area of antimicrobial drug use.

**Corresponding Author:** Dr. Makarand Dharma

**Email ID:** makaranddharma@gmail.com

**Address:** Department of Paediatrics, DVVPF's Medical College & Hospital, Ahmednagar-414111, Maharashtra, India

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Such reactions include nephrotoxicity and allergic reactions as well as antibiotic associated diarrhea. It is estimated that 25 percent of ADRs are caused by antimicrobial drugs. It is recommended that hospitals must ensure availability of antimicrobial drugs while at the same time controlling and improving prescribing practices of physicians and minimizing untoward side effects.[3]

Inappropriate use of antibiotics is common in pediatric practice, and effective interventions are needed to promote judicious antibiotic use and reduce antibiotic resistance. It is unlikely that a single intervention will result in a dramatic, sustained drop in antibiotic use for children. Rather, a more gradual change in prescribing rates resulting from continued focus on patient education and physician behavior change may be the best long-term solution to the problem of antibiotic overuse. Clearly inappropriate indications such as cold, upper respiratory tract infection, and bronchitis accounted for smaller fractions of antibiotic use but may be most amenable to change. However, interventions that encourage use of strict criteria for diagnosis and treatment of common infectious illnesses in children will likely have the greatest impact on overall antibiotic use.

Three major approaches to improve antibiotic use are **educational, managerial, and regulatory intervention**. [4] Educational intervention includes CME-groups, work-shops, audit and feedback. Monitoring defined populations longitudinally will allow assessment of the effectiveness of such national and local initiatives.

One tool to address this problem is the elaboration of therapeutic and prophylactic protocols developed by examining each hospital's most prevalent infections, together with the local rate of bacterial resistance.

The WHO conference on the rational use of drugs in 1985 marked the beginning of efforts to improve the use of drugs, especially in developing countries.[5]

Present study was designed to assess rational antibiotic use in pediatric ward.

#### **Methodology:**

The present study was conducted in pediatric ward of a tertiary care institute. The study population included 250 children. The group consisted of 250 consecutive children admitted in one unit of the pediatric ward and they were analyzed for antibiotic use without any prior priming of the members of the

unit regarding rationality of antibiotic use.

Details of history and examination were recorded in a pre-designed proforma. It included presenting complaints, vital parameters and general and systemic examination findings at the time of admission. Investigations done were recorded.

Children who received antibiotics were evaluated further based on certain drug use indicators as shown below.[6]

#### **Drug Use indicators**

*Indicator 1:* Percentage of hospitalizations with one or more antimicrobial drugs prescribed

*Indicator 2:* Average number of antimicrobial drugs prescribed per hospitalization with antimicrobial drugs prescribed

*Indicator 3:* Average cost of antimicrobial drugs prescribed per hospitalization with antimicrobial drugs prescribed

*Indicator 4:* Route of antimicrobial administration

*Indicator 5:* Mean duration of hospital stay of patients who receive antimicrobial drugs

*Indicator 6:* Number of various culture tests reported per hospital admission including antimicrobial treatment

Antibiotics were divided into 1<sup>st</sup> line; 2<sup>nd</sup> line and 3<sup>rd</sup> line to assess rationality based on the spectrum used.

<b>1<sup>st</sup> line Antibiotic</b>	<b>2<sup>nd</sup> line Antibiotic</b>	<b>3<sup>rd</sup> line Antibiotic</b>
Ampicillin	Cefotaxime	Vancomycin
Chloramphenicol	Ceftriaxone	Piperacillin-Tazobactam
Gentamicin	Amikacin	Cefipime
Amoxicillin	Amoxicillin – clavulanic acid	Meropenam
Crystalline Penicillin	Ciprofloxacin	

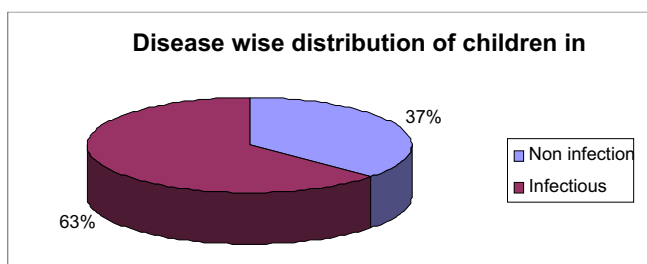
Further assessment for rationality was based on the nature, extent and severity of disease state and seniors' evaluation. Antibiotic use was said to be rational if the diagnosis warranted antibiotic use and correct drug was used for optimum duration with regards to patient's age and diagnosis.

Antibiotic use was said to be irrational if it was unindicated and/or wrong drug was selected considering patient's age and diagnosis, if duration was not appropriate, wrong combination was used or more antibiotics were used than indicated.

**Results:****Table 1:** Age and Sex wise distribution of the study children

Age	Males No. (%)	Females No. (%)
1 mo - 1 year	55 (33.1)	9 (10.2)
1 - 3 year	40 (24.1)	24 (27.3)
3 - 6 year	22 (13.2)	19 (21.6)
6 - 9 year	31 (18.7)	11 (12.5)
9 - 12 year	18 (10.9)	9 (10.2)
<b>Total</b>	<b>166</b>	<b>84</b>

Table 1 shows age and sex wise distribution of 250 children included in the study. Of these 166(57%) were males and 84 (43%) were females. Amongst these 250 patients, 64 (35.6%) were below 1 year of age. This group had the highest number of patients. Male to female ratio was 1.8:1.

**Graph 1:** Disease wise distribution of children

Graph 1: depicts disease wise distribution of children. Infectious illnesses were diagnosed in 151 children (60.4%). Ninety-nine (39.6%) were diagnosed to have non infectious diseases.

**Table 2:** Number of children who received antibiotics

Antibiotics received No. (%)	Antibiotics not received No. (%)	Total
125 (50)	125 (50)	250

Table 2: demonstrates the number of children who received antibiotics. 125 (50%) children received antibiotics.

**Table 3:** Number of antibiotics received by children

No of antibiotics	No. (%)
One antibiotic	89(71.2)
Two antibiotics	20 (16.0)
Three antibiotics	11 (8.8)
Four antibiotics	5 (4.0)
Five antibiotics	0 (0)
Six antibiotics	0 (0)
<b>Total</b>	<b>125</b>

Table 3 shows the number of antibiotics received by the children. one antibiotic was given to 89 (71.2%) children. Two antibiotics were used in 20 (16%) children . The mean number of therapeutic antibiotics given per patient was 1.4.

**Table 4:** Disease wise distribution with Rationality of antibiotic use

Diseases	Indicated	Unindicated
Respiratory tract infections	49	11
Gastroenteritis	8	7
Bacillary dysentery	2	0
Urinary tract infection	8	0
Meningitis	3	0
Leptospirosis	0	0
Dengue	0	5
Enteric fever	4	0
Viral fever	0	3
Others	18	1
<b>Total</b>	<b>98</b>	<b>27</b>

Table 4 demonstrates disease wise distribution of children who received antibiotics. 60 received antibiotics for respiratory tract infections, this being the commonest disease for which antibiotics were received.

**Table 5:** Rational use of antibiotics:

Rationality No. (%)	Irrationality No. (%)	Total
55(44.0)	70(56.0)	125

Table 5 gives an idea about rational practice of antibiotic use. 55 (44%) children received antibiotics in rational way.

**Discussion:**

Antibiotics are among the most frequently prescribed medications in modern medicine. The World Health Organization has established antibiotic use as a priority in its campaign for the rational use of medications.[6] Antibiotics account for a significant proportion of total hospital drug expenditures. Furthermore, it is estimated that 50% of all physician orders for antibiotics are for the wrong drug, or an inappropriate dosage or duration. In addition, inadequate antibiotic use increases costs by increasing the length of stay in the hospital.[7, 8]

This study has brought out many interesting aspects in the issues of antimicrobial prescriptions. On analyzing our findings, we could reach to some meaningful conclusions which are described in detail.

Table 1 shows age and sex wise distribution of 250 children included in the study. Of these 166(57%) were males and 84 (43%) were females Amongst these 250 patients, 64 (35.6%) were below 1 year of age. This group had the highest number of patients. Male to female ratio was 1.8:1.

The discrepancy in the ratio of male to female could not be avoided as the study design demanded an inclusion of consecutive admissions in the wards, which could not be controlled. When looking at the various illnesses that these children were suffering from for which they were hospitalized, Infectious illnesses were diagnosed in 151 children (60.4%). Ninety-nine (39.6%) were diagnosed to have non infectious diseases.

Thus, infectious illnesses accounted for almost two-thirds of the admissions to pediatric ward. Campbell J et al [9] noted similar observations. They reported infectious diseases as the primary cause of hospitalization among children. In another study by G/mariam A et al[10] diagnosed infectious illnesses in 61.3% of children admitted to pediatric ward. In a study by Accorsi et al[11], infectious diseases accounted for 7 of the 10 leading causes of pediatric admissions.

As seen in various studies antimicrobial drugs are the most frequently prescribed therapeutic agents, accounting for 30 to 50 percent of drug prescriptions.[12] In the present study, 125 (50%) children received antibiotics as seen in table 4. This figure is similar to the 55.4% prevalence of antibiotic use, as described by Fonseca L et al.[13] The use of antibiotics was as high as 69.9% in a study described by Shankar P et al[14]. They have studied prescribing patterns among pediatric inpatients in a teaching hospital in western Nepal.[14] As opposed to these high figures, in a study conducted in The Netherlands by van Kasteren M et al[15], antibiotic use was much lower at about 30%. These data suggest that the rate of antibiotic use among hospitalized patients in developing countries is relatively higher than in the developed ones. Table 4 demonstrates disease wise distribution of children who received antibiotics. disease wise distribution of children who received antibiotics. 60 received antibiotics for respiratory tract infections, this being the commonest disease for which antibiotics were received.

Ten [3.6%] children had viral fever and they were treated with antibiotics. Similar observation was

noted by Fonseca L et al[16] who found that amongst children who received antibiotics, the incidence of respiratory tract infection was 49.5% and gastroenteritis was 11%; antibiotic prescriptions for viral illnesses in the study accounted for 9.2%. This is in contrast with the results of Jonathan A et al[17] who reported Otitis media (62.1%) accounting for the majority of antibiotic prescriptions.

Antimicrobial control measures are commonly perceived to lead to an improvement in quality of prescribing, cost-effectiveness and reduction in resistance. Table 5 gives an idea about rational practice of antibiotic use. 55 (44%) children received antibiotics in rational way,

A targeted educational intervention can improve antibiotic prescription practices for respiratory infections in children and decrease unnecessary antibiotic use as reported by another worker.[18]

To increase rational use of antibiotics the members of the unit (treating physicians) should be motivated regarding correct uses of antibiotics and hazards of their inappropriate use. A proper workshop should be arranged for this.

#### **Conclusion:**

From this study it is clear that there is lack of proper rational antibiotic usage by unit doctors. To conclude it can be stated that inappropriate use of antibiotics is increasing and is responsible for rapidly developing antimicrobial resistance. We believe that it is unlikely that a single intervention will result in a dramatic, sustained drop in antibiotic use for children. Rather, a more gradual change in prescribing rates resulting from continued focus on patient education and physician behavior change may be the best long-term solution to the problem of antibiotic overuse.

#### **Recommendations:**

To increase rational use of antibiotics the members of the unit (treating physicians) should be motivated regarding correct uses of antibiotics and hazards of their inappropriate use. A proper workshop should be arranged for this.



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