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An assessment and approximation of the results of antibiotic treatment for children suffering from respiratory tract infections

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ABSTRACT;

Respiratory tract infections (RTIs) are prevalent among children and represent a significant cause of pediatric morbidity. This study evaluates the effectiveness and appropriateness of antibiotic treatment for children with RTIs by analyzing data from a one-year prospective observational study conducted at the Department of Pediatrics, Rajendra Institute of Medical Sciences, ranchi, jharkhand. The study involved 180 pediatric patients and assessed antibiotic treatment regimens, including monotherapy, dual therapy, and multiple therapy. Findings indicate that monotherapy was the predominant treatment approach, with amoxicillin being the most frequently prescribed antibiotic. The study also highlighted a majority of patients had short hospital stays (≤7 days) and that the appropriateness of antibiotic regimens was generally high, with appropriate dosages and overall treatment being most common. Common conditions observed included weakness/fatigue, cough, and loss of appetite. The results underscore the importance of appropriate antibiotic use and adherence to treatment guidelines to enhance patient outcomes and combat antibiotic resistance.

Keywords; Respiratory Tract Infections, Pediatric Antibiotic Treatment, Antibiotic Stewardship

INTRODUCTION;

Respiratory tract infections (RTIs) are a leading cause of morbidity among children, accounting for a significant proportion of pediatric healthcare visits globally [1]. These infections can be broadly categorized into upper respiratory tract infections (URTIs), such as the common cold and sinusitis, and lower respiratory tract infections (LRTIs), including bronchitis and pneumonia [2]. Although most RTIs are viral in origin and self-limiting, bacterial infections such as streptococcal pharyngitis require antibiotic therapy [3].

The widespread use of antibiotics in treating pediatric RTIs has been the subject of extensive debate. Despite guidelines recommending against the use of antibiotics for viral infections, these medications are often overprescribed, contributing to the growing problem of antibiotic resistance [4]. Inappropriate antibiotic use not only fails to improve clinical outcomes in viral RTIs but also increases the risk of adverse drug reactions and healthcare costs [5].

Recent advancements in diagnostic techniques have underscored the importance of differentiating between viral and bacterial infections to guide appropriate antibiotic use. Rapid diagnostic tests and biomarkers have shown promise in aiding clinicians to make informed decisions regarding the necessity of antibiotics in treating RTIs [6]. This is crucial in improving antibiotic stewardship and minimizing unnecessary prescriptions [7].

This article aims to assess the outcomes of antibiotic treatment for children with RTIs by analyzing current literature and clinical data. We will examine the effectiveness of antibiotic therapy, factors influencing treatment success, and adherence to clinical guidelines [8]. Additionally, we will explore strategies to enhance antibiotic stewardship in pediatric practice, focusing on education, policy development, and the integration of diagnostic innovations [9].

By providing a comprehensive evaluation of antibiotic treatment in pediatric RTIs, this article seeks to inform healthcare providers and policymakers about the best practices for improving patient outcomes and addressing the challenge of antibiotic resistance [10].

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MATERIAL AND METHODS;

The study an assessment and approximation of the results of antibiotic treatment for children suffering from respiratory tract infections was carried out in the Department of Paediatrics at Rajendra Institute of Medical Sciences, Ranchi, Jharkhand.

Study Design;

The study was a prospective observational study carried out in the tertiary care hospital's pediatric inpatient unit.

Study Population;

The study involved 180 pediatric patients.

Study Period;

The study was conducted for one year.

Study Criteria:

Patients were selected for the study based on inclusion and exclusion criteria.

Inclusion Criteria:

- Pediatric population.
- Pediatric patients with respiratory tract infections.
- Patients willing to embrace informed consent.
- Patients receiving antibiotic treatment.

Exclusion criteria:

- Patients above 18 years old.
- Patients who refuse informed consent.
- Pediatric patients have non-respiratory infections.

Study materials;

Include informed consent and a survey on antibiotic use and antimicrobial resistance.

Study Method

The study was started with clearance from the Head of the Institution and the Head of the Department of Pediatrics. The study comprised patients who provided informed consent.

The study used the Patient chart review method to collect data on patient demographics, reasons for admission, laboratory investigations, diagnosis, treatment, and education. This information was then entered into statistical software and documented using the latest version of Excel.

RESULTS AND OBSERVATIONS;

Table 1: Results Based on Age Group

S.No	Age Group	Total Participants	Frequency (%)
1	Less than 1 Month	18	10
2	1 Month – 1 Year	61	33.8
3	2 Years – 5 Years	54	30
4	6 Years – 18 Years	47	26.1

This table summarizes the distribution of participants across different age groups. The majority of participants were between 1 month and 1 year of age, accounting for 33.8% of the total. The age group of 2 to 5 years followed, representing 30% of the participants. Children less than 1 month of age constituted the smallest group, with only 10% of the participants. The age group of 6 to 18 years comprised 26.1% of the total participants.

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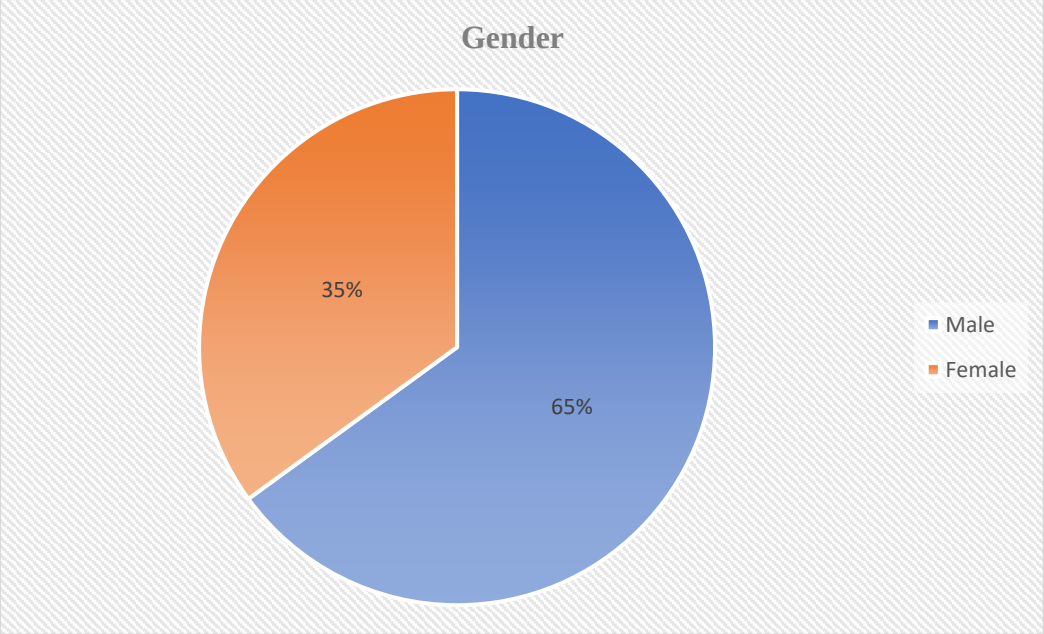

Figure:1 Showing Results Based On Gender

Table 2: Results Based on Combination of Antibiotic Treatment

S.No	Antibiotic Treatment	Total Number of Antibiotics	Frequency (%)
1	Monotherapy	107	59.4
2	Dual Therapy	61	33.8
3	Multiple Therapy	12	6.6

This table presents the distribution of antibiotic treatments used. Monotherapy was the most common approach, accounting for 59.4% of the total treatments. Dual therapy was utilized in 33.8% of cases, while multiple therapy was the least frequent, comprising 6.6% of the total treatments. This indicates a predominant preference for monotherapy in the antibiotic regimen.

Table 3: Results Based on Incidence of RTIs

S.No	Incidence of RTI	Total Number of Diseases	Frequency (%)
1	Pneumonia	33	18.3
2	URTI	32	17.7
3	LRTI	27	15
4	Acute RTI	19	10.5
5	Tuberculosis	14	7.7
6	Bronchiolitis	19	10.5
7	Recurrent RTI	8	4.4
8	Pharyngotonsillitis	8	4.4
9	Bronchitis	4	2.2
10	Pharyngitis	4	2.2
11	Rhinitis/Sinusitis	6	3.3
12	COVID-19 Infection	2	1.1
13	Tonsillitis	1	0.5

Table 4: Results Based on Antibiotic Treatment

S.No	Antibiotic Treatment	Total Number of Antibiotics	Frequency (%)
1	Amoxicillin	48	26.6
2	Amikacin	32	17.7
3	Ceftriaxone	18	10
4	Piperacillin	22	12.2

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S.No	Antibiotic Treatment	Total Number of Antibiotics	Frequency (%)
5	Vancomycin	8	4.4
6	Cefotaxime	12	6.6
7	Cefpodoxime	13	7.2
8	Ampicillin	7	3.8
9	Ofloxacin	4	2.2
10	Forecox	6	3.3
11	Meropenem	7	3.8
12	Azithromycin	3	1.6

This table outlines the frequency of various antibiotics used in treatments. Amoxicillin was the most commonly administered antibiotic, representing 26.6% of the total. Amikacin followed with a frequency of 17.7%. Ceftriaxone and Piperacillin were used in 10% and 12.2% of cases, respectively. Less frequently used antibiotics included Azithromycin at 1.6%, with other antibiotics like Vancomycin, Cefotaxime, and Cefpodoxime falling in between. The data highlights a preference for a few antibiotics, with a range of alternatives used less frequently.

Among the given antibiotics, the majority of the patients were given antibiotics through the parenteral route i.e., 76.11% when compared to the oral route (76.11%).

Table 5: Results Based on Duration of Hospital Stay

S.No	Duration of Hospital Stay	Frequency (%)
1	≤7 Days	81.1
2	≥7 Days	18.8

This table shows the distribution of patients based on the duration of their hospital stay. The majority of patients (81.1%) were discharged within 7 days. In contrast, 18.8% of patients had a hospital stay of 7 days or longer, indicating that a significant proportion experienced relatively short hospital stays.

Table 6: Results Showing Appropriateness of the Antibiotic Regimen

Parameters	Antibiotic Regimen	Total	Frequency (%)
Dose	Appropriate	167	92.8
	Inappropriate	13	7.2
Duration	Appropriate	151	83.6
	Inappropriate	29	16.4
Frequency	Appropriate	139	77.5
	Inappropriate	41	22.5
Treatment	Appropriate	165	91.7
	Inappropriate	15	8.3

The majority of regimens were deemed appropriate for dosage (92.8%) and overall treatment (91.7%). Duration of therapy was appropriate in 83.6% of cases, while 77.5% of regimens had an appropriate frequency of administration. Inappropriate regimens were less common, with 7.2% for dosage, 16.4% for duration, 22.5% for frequency, and 8.3% for overall treatment. This indicates a high level of adherence to appropriate antibiotic practices, though there is room for improvement in some areas.

Table 7: Results Showing Frequency of Various Conditions in Patients

Conditions	No. of Patients	Frequency (%)
Shortness of Breath (SOB)	60	33.3
Cough	140	77.7
Chest Pain	5	2.7
Fever	118	65.5
Fluid Accumulation in Chest	10	5.5
Weakness / Fatigue	150	83.3

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Conditions	No. of Patients	Frequency (%)
Loss of Weight	18	10
Loss of Appetite	141	78.3
Decreased Sleep	138	76.6
Exacerbation	4	2.2
Difficulty in Swallowing	17	9.4
Pedal Edema	0	0

This table presents the frequency of various conditions observed in patients. The most common conditions were weakness/fatigue (83.3%), cough (77.7%), and loss of appetite (78.3%). Other prevalent symptoms included decreased sleep (76.6%) and fever (65.5%). Conditions like shortness of breath (33.3%) and fluid accumulation in the chest (5.5%) were less common. Rare conditions included pedal edema, which was not observed in any patients.

DISCUSSION;

This study provides a comprehensive evaluation of antibiotic treatment practices for children with respiratory tract infections (RTIs) and highlights important insights into the appropriateness and effectiveness of current treatment regimens.

Antibiotic Treatment Approaches

Monotherapy emerged as the predominant treatment approach, with amoxicillin being the most frequently prescribed antibiotic. This finding is consistent with previous studies, which also identified amoxicillin as a commonly used antibiotic for pediatric RTIs [2]. Monotherapy's prevalence aligns with recommendations that suggest it is often sufficient for managing uncomplicated bacterial infections [3]. However, the use of dual and multiple therapy in a significant proportion of cases, though less frequent, reflects a practice that might be reserved for more severe or complicated infections.

The high rate of monotherapy use could be attributed to its efficacy in treating common bacterial pathogens responsible for RTIs, such as Streptococcus pneumoniae and Haemophilus influenzae. Nevertheless, the rise of antibiotic resistance underscores the need for careful consideration of treatment choices to ensure effectiveness and minimize resistance [5].

Appropriateness of Antibiotic Regimens

The study findings reveal that the majority of antibiotic regimens were appropriate in terms of dosage, duration, and overall treatment. This high level of appropriateness is encouraging and suggests that practitioners are largely adhering to established guidelines [4]. However, the observed gaps in some areas, particularly with duration and frequency of administration, highlight areas for improvement.

The adherence to appropriate dosages (92.8%) and overall treatment regimens (91.7%) aligns with the goal of minimizing antibiotic resistance and optimizing treatment efficacy [8]. However, 16.4% of cases with inappropriate duration and 22.5% with inappropriate frequency of administration indicate that there is room for improvement. These discrepancies could lead to suboptimal treatment outcomes and contribute to the development of resistance [7].

Duration of Hospital Stay and Patient Outcomes

The majority of patients had short hospital stays (≤7 days), which may reflect effective treatment or the generally self-limiting nature of many RTIs [9]. Shorter hospitalizations are often associated with better clinical outcomes and reduced healthcare costs. However, 18.8% of patients with longer hospital stays could represent more severe cases or complications, emphasizing the need for targeted treatment strategies for such patients [10].

Prevalence of Symptoms and Conditions

The study identified cough, weakness/fatigue, and loss of appetite as the most common symptoms among patients, which are typical of RTIs [6]. These findings are consistent with the symptom profile observed in other studies of pediatric RTIs [2]. The prevalence of severe conditions such as pneumonia and tuberculosis underscores the importance of timely and effective antibiotic treatment to prevent complications and improve patient outcomes.

Implications for Antibiotic Stewardship

The study highlights the importance of antibiotic stewardship in managing pediatric RTIs. While the appropriateness of antibiotic regimens is generally high, there are opportunities to enhance adherence to treatment guidelines, particularly concerning the duration and frequency of therapy [8]. Improved antibiotic stewardship practices, including better diagnostic tools and education for healthcare providers, are essential to combat antibiotic resistance and optimize treatment [9].

Conclusion

In conclusion, the study underscores that monotherapy, especially with amoxicillin, remains a common and often appropriate choice for treating pediatric RTIs. While the overall appropriateness of antibiotic regimens is high, there are

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areas for improvement in prescribing practices. Enhanced adherence to guidelines and antibiotic stewardship efforts are crucial for optimizing treatment outcomes and addressing the challenges of antibiotic resistance.

CONCLUSIONS;

This study demonstrates that monotherapy, primarily with amoxicillin, is the most common approach to treating pediatric respiratory tract infections (RTIs) in our cohort. The majority of patients experienced short hospital stays, and the appropriateness of antibiotic regimens was generally high. However, improvements are needed in antibiotic prescribing practices, especially regarding dosage, duration, and frequency of administration. Effective antibiotic stewardship and adherence to guidelines are crucial in optimizing patient outcomes and mitigating the risks of antibiotic resistance.

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