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A RETROSPECTIVE STUDY TO ANALYSE THE ANTIBIOTIC TRENDS IN PEDIATRIC PNEUMONIA IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Study objective: To assess Antibiotic treatment pattern in pediatric pneumonia, to evaluate the appropriateness of antibiotics, to study risk factors of pneumonia in children. Inappropriate use of antibiotics leads to antibiotic resistance and related complications which is a major problem faced worldwide.

Methodology: A single centered hospital based retrospective study was performed by collecting data of 148 pediatric patients with pneumonia for the last 3 years from the Department of Pediatrics.

Result: The mean age of pediatric population was found to be 2.5±1.9 yrs. Majority (57%) of them were boys. Infants (49%) and incompletely immunized (53%) were predominantly having the risk of developing infections. Amoxicillin-clavulanic acid (75%) was found to be the most commonly prescribed antibiotics. 70.9% of patients were prescribed with single antibiotic. In this study, 51.4% of prescription was found to be inappropriate. Among them, higher proportion was due to incorrect choice (78.8%) by using Gyssens criteria.

Conclusion: Incorporation of clinical pharmacist must be brought into practice in India for providing proper guidance on the usage of antibiotics and thereby preventing complications.

Keywords: Pediatrics, pneumonia, antibiotics, appropriateness

INTRODUCTION

Pneumonia is an illness, usually caused by infection, in which the lungs become inflamed and congested, reducing oxygen exchange and leading to cough and breathlessness. It affects individuals of all ages but occurs most frequently in children and the elderly. Among children, pneumonia is the most common cause of death worldwide. Historically, in developed countries, deaths from pneumonia have been reduced by improvements in living conditions, air quality, and nutrition. In the developing world today, many deaths from pneumonia are also preventable by immunization or access to simple, effective treatment **[1]**.

Pneumonia is caused by number of infectious agents including viruses, bacteria and fungi. The most common are *Streptococcus pneumonia, Haemophilus influenzae* type b [second most common cause of pneumonia], Respiratory Syncytial Virus, in infants infected with HIV, *Pneumocystis jiroveci* one of the most common causes of pneumonia responsible for atleast one quarter of deaths in HIV infected infants **[2].** Pediatric pneumonia also leads to more in prescribing antibiotics. The antibiotic prescribing by clinicians is based on the assessment of infecting pathogens and seriousness of illness. Pediatric pneumonia caused by bacterial pathogens now following use of protein conjugated vaccines for *H. influenzae* type b. Antibiotics should be used accordingly otherwise leads to serious side effects, drug interactions which leads to antibiotic resistance **[3]**.

Treatment of pneumonia depends on the age of the child, the severity of illness, the likely etiological agents and their resistance pattern. The etiological agents vary with age and possibly geographic location. The burden of pneumonia is significant in infants from developing countries. Attempts to isolate etiological agents may not be cost-effective and therefore empirical treatment of pneumonia is justified **[4]**. Inappropriate administration of antibiotics can lead to unnecessary adverse event, treatment failure and antimicrobial resistance. So there is pressing need to develop initiative to improve antibiotic prescribing to prevent antibiotic associated patient and community harms **[5]**.

Since pneumonia is still ranked among the top causes of child morbidity and mortality, effective strategies and interventions to reduce the incidence of pneumonia should not be ignored especially in developing countries. Identifying risk factors and quantifying the strength of their association with the disease could guide such strategies and interventions **[6]**.

METHODOLOGY

Study design

A retrospective study was conducted in the department of pulmonology at tertiary care hospital consisting of 900 beds and offer complete range of health care services.

Study Population

Patients who received antibiotic therapy in the Department of Pulmonology IP during the study period of 2019 – 2021 and who satisfied the inclusion and exclusion criteria were recruited for the study**.**

Inclusion Criteria

Patients of both gender and below 18 years with the diagnosis of pneumonia were included in the study.

Exclusion criteria

Subjects who were on antibiotic treatment for other disease and those with incomplete data records were excluded from the study

Data Collection

Data were collected through direct examination of the patients medical records. The study protocol was approved by Institutional Ethics Committee before screening of patients for enrolment. Requirement of patient consent was waived since it was a retrospective study. A well-designed data collection form was used to collect necessary information such as demographic details of the patients, medical, symptoms, laboratory data, antibiotics prescribed, duration of treatment, culture and antibiotic susceptibility. Oral and IV antibiotics regimen prescribed was compared with hospital antibiotic policy.

Data Analysis

The information recorded on the data collection forms were uploaded in an Excel sheet and data was analysed. For all the continuous variables, the results are either given in Mean ± SD. And for categorical variables as percentage.

RESULTS AND DISCUSSION

Mean age of subject was 2.5 ±1.9 years and nearly 57% were males. Risk factors of pneumonia are summarised in table 1. Infants 1month-2year (49%), male gender (57%) and incompletely vaccinated (53%) were found to significantly increase likelihood of pneumonia. With regard to antibiotic use, Amoxicillin+Clavulanic acid (75%) was most commonly prescribed drug, ceftriaxone was used in (20.94%) of prescriptions administered. Major percentage of the antibiotics prescribed belongs to the class of penicillin (61%) followed by cephalosporin (22%), macrolide (11%), aminoglycosides (5%). From the prescription received 70.9% was single therapy, two antibiotics were used in 22.9% of cases and combination of multiple antibiotics in 6.20% of cases. Among the total

prescription, 62.79% of antibiotics were administered by injections, 29.16% as syrups and remaining as tablets (8.05%). In this study, antibiotic route- no switch (56.82%) was maximum followed by parenteral to oral route (42%) and oral to parenteral route (1.80%). Of the total 148 cases sensitivity test was performed in only 13.50%. Higher percentage of participants encountered inappropriate use of antibiotics due to incorrect choice (78.8%), followed by missing data (20%) and incorrect use (1.1%). The overall inappropriateness of antibiotics was found to be 51.4%.

Table 1: Risk Factors of Pneumonia

RISK FACTOR	PERCENTAGE
AGE	
• **Neonates**	• **5%**
• **Infants**	• **49%**
• **Children**	• **35%**
• **Adolescents**	• **12%**
GENDER	
• **Males**	• **57%**
• **Females**	• **43%**
IMMUNIZATION	
• **Immunized**	• **47%**
• **Incompletely immunized**	• **53%**

In this retrospective study, we found that a substantial portion of our study population were found to be infants which is similar to study conducted by Khaja Moinuddin **[7]**. Infants (1 month-2yrs) were found to have more likelihood of developing pneumonia when compared to other age group. The above finding was in line with other previous studies **[7-9]**. This can be elucidated by small airways and not fully developed immune system of this age group that make them more prone to develop pneumonia. Also, the present study revealed that male gender account for remarkable predictor of acquiring pneumonia. This result correlates with the study done by Khaja Moinuddin **[7]**. The gender variation can be explained by sex hormone in the regulation of immune system. There is also evidence that peripheral airways are narrower during early years of life in boys, which may predispose them to lower respiratory tract infection **[10]**. Partially immunized subjects were found to be more prone to develop pneumonia compared to up to date/completely immunized subjects. When comparing this finding to previous findings, the association was consistent **[7]**. Among the patients who were not completely immunized as per age, vaccines not given were PCV, HIB, and Hepatitis B vaccine. A report by WHO has mentioned that an important cause of Pneumonia is the lack of *Haemophilus*

*influenza*e Type B (HIB) and Hepatitis B vaccination. The most commonly used antibiotics in the study population were amoxicillin + clavulanic acid, Ceftriaxone, azithromycin and Cefpodoxime. Amoxicillin + Clavulanic acid combination provides broad spectrum of antibacterial activity and is a safe and effective agent for the treatment of pneumonia. This is similar to the study of Khaja Moinuddin where 43.8% of prescribed antibiotics were Amoxicillin + Clavulanic acid followed by Ceftriaxone 36.2%. Penicillin was the leading class of antibiotic prescription received which contradict the results of study conducted by Derek. J. Williams where Cephalosporins was the most prescribed class of drug **[17]**. In Pediatric pneumonia one of the major pathogens identified is *Streptococcus pneumonia*, so Amoxicillin may be used as the first line agent which provide coverage for organism. Out of total prescriptions received majority consist of single antibiotic of which most commonest was Amoxicillin+Clavulanic acid. Such findings are in concordance of other studies by Mariles A in Netherland where a high percentage of patients are prescribed with one antibiotic **[18]**. In this study population, antibiotic route no switch was maximum followed by parenteral to oral route. Similar reports were published by Das MS *et al* in which no switch followed by parenteral to oral route **[19]**. The most prescribed type of dosage form was injection followed by syrup and tablet. This is similar to the study done by Sushanta Kumar Das *et al* **[20]**. Limited availability of oral formulation in Pediatrics, poor compliance towards oral therapy and emergent action in severe condition are the few reasons associated with the increased prescription of injectables. In our study 51.4% of antibiotic prescriptions were inappropriate, of which incorrect choice is higher which is mainly due to inappropriate duration or inappropriate selection of antibiotics (2 broad or 2 narrow). Incorrect use may be due to inappropriate dosage, dosage interval and route of administration.

CONCLUSION

This study focused on antibiotic prescribing pattern in pediatric patients with pneumonia. The risk of developing infection should be lowered, especially in case of male infants and incompletely immunised, as they are more prone to develop pneumonia. Therefore, predominantly maximum care should be given to such sections and take adequate measures to ensure immunisation is completed in pediatric population. Antibiotics are very effective and useful tool in prevention and management of symptoms and many diseases. However, if these drugs are not

properly administered, it may worsen the condition of patients due to its sub optimal or adverse effect. Antibiotics should be used with at most care else it can lead to antibiotic resistance. This condition may jeopardize the life of patients. Providing antimicrobial regimen based on culture report is an important intervention to prevent resistance and subsequent complications. In this study, it is noted that around 51.4% of antibiotic prescriptions were inappropriate. This can be minimized through educational interventions, periodic survey to monitor appropriateness of antibiotic prescriptions. Our data clearly shows importance of establishing Antimicrobial Stewardship Programme in the hospital, key element of which would be the up-dation of existing antimicrobial guidelines available in the hospital. Regular periodic audit should be conducted by clinical pharmacists to rationalize prescription, reduce errors thus to save lives**.**

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Conflict Of Interest

The authors declared no potential conflict of interest with respect to research, authorship and/or publication of this article.

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Ethics Statement

The study has been performed with the approval of appropriate ethics committee with reference number:

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