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A retrospective study on evaluation of drug treatment in Bronchopneumonia among Pediatrics in a Tertiary care hospital

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Background: Bronchopneumonia deals with the air sacs filled with pus. Lobar pneumonia affects one or more sections (lobes) of the both lungs. **Aim:** Carrying out a retrospective study on evaluation of drug treatment in bronchopneumonia among paediatrics in a Tertiary Care Hospital and examining the pattern of drug usage and its therapeutic outcomes were the principal objectives of this study. **Methods:** A retrospective observational was carried out from February 2018 to March 2020 in the paediatrics department of Virudhunagar Government Medical College and Hospital. This study includes 130 paediatric inpatients. This includes both male and female children. Patients in critical care, adults, and those who were not willing to participate were excluded from this study. **Results:** Out of 130 paediatric inpatients, 72 (55 %) patients were between the age group 1 to 6 years. Male patients outnumbered female patients in our study. Among the clinical manifestations, 117 patients experienced dyspnoea, 104 patients experienced fever and chills. Ampicillin and Gentamicin were given as first-line treatment. Cephalosporin, amikacin, and Azithromycin were preferred for second-line treatment. About 70 patients showed resistance towards first-line antibiotics. No patients were resistant to second-line antibiotics. **Conclusion:** Bronchopneumonia is the most common type of pneumonia in children. Now-a-days it has been reduced by pneumococcal vaccination. Paediatric pneumonia is also commonly caused by *S. Pneumoniae*, and treated with first-line antibiotics amoxicillin followed by cephalosporins or macrolides. In our study, we have concluded that patients who developed resistance towards the initial therapy are more sensitive to the secondary treatment with Cephalosporins (Cefotaxime, Ceftriaxone).

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INTRODUCTION:

Bronchopneumonia is one of the most prevalent types of pneumonia in the pediatric population^[1]. It is a leading infectious cause of mortality in children under 5 years of age^[2]. In 2013, 935,000 children under the age of 5 lost their lives to bronchopneumonia^[3]. Etiological agents of bronchopneumonia include bacteria, viruses, parasites and fungi. Clinical features are frequently non-specific and influenced by a variety of circumstances since the

pediatric population is particularly sensitive and specific [4]. These factors include certain age groups, presence of comorbidity, exposure to risk factors, carried out immunization etc. The most genuine way to diagnose bronchopneumonia is through chest X-ray, but that is not enough to determine the causative agent, so the treatment of bronchopneumonia is clinical rather than etiological in most cases [5]. Since bronchopneumonia is an infectious disease, antimicrobial agents must be used in the treatment, along with additional supportive and symptomatic treatment [6]. However, antibiotic resistance increases with repeated usage [7]. Antibiotic resistance frequently results in severe clinical features and poor therapeutic outcomes, which increases the number of treatment days and the over use of antimicrobials [8]. Carrying out a retrospective study on evaluation of drug treatment in bronchopneumonia among pediatrics in a Tertiary Care Hospital and examining the pattern of drug usage and its therapeutic outcomes were the principal objectives of this study.

MATERIALS AND METHODS:

Study site and Design:

This was a population-based randomized retrospective observational study performed in Viruthunagar Government Medical College Hospital, India during the period from February 2018 – March 2020. The case sheets of pediatric inpatients required for this study were collected during ward rounds duly permitted by the authorities of the above-mentioned hospital.

Data Size:

This work included one hundred and thirty (130) patients, including both male and female pediatric inpatients with bronchopneumonia from the pediatric ward of the hospital. Young in-patients with serious illness were excluded from this study. This was a systematic randomized sampling study done by considering the margin of error of ±5 % with a confidence interval of 95 % though the population data was taken accurately enough for the study.

Data Analysis:

The case sheet of every 130 pediatric patients with bronchopneumonia was followed up weekly twice by doctors of pharmacy students of our Institution until patients get discharged. The subjective evidence, objective evidence, treatment plan was collected from the case sheets. The demographic factors like age, gender; disease prevalence and drug treatment given to

all the 130 inpatients, especially antibiotic usage, had been considered as important for this work. The data collected were separated in MS Excel spreadsheets and analyzed for assessment and interpretation.

RESULTS:

In this study, we have collected the cases of 130 patients with bronchopneumonia in the pediatric department for the purpose of scrutinizing the prescription pattern of antibiotics among them. Tables 1, 2, and Fig 1 and 2 indicate the age-wise and gender-wise classification of the pediatric patients. In this the patients under age group of ≤12 months are 32 (22 males and 10 female) in it. The patients around the age group of 1 to 6 years are 72 (36 males and 36 females) in it. The patients around the age group of 7-12 years are 26 (14 males and 12 females) in it (Table 1 and 2; Fig 1 and 2).

Table 1. Age wise classification.

Age Group	No. of Patients	Percentage
≤12 months	32	25
1-6 years	72	55
7-12 years	26	20

Table 2. Gender wise classification.

Age group	No. of male patients	No. of female patients
≤12 months	22	10
1 – 6 years	36	36
7 – 12years	14	12

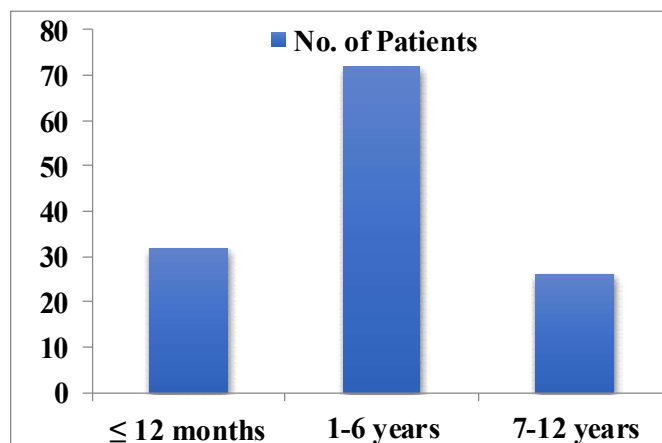


Fig 1. Age wise classification of children with bronchopneumonia among pediatric patients.

The Table 3 and the Fig 3 shows common symptoms experienced by the patients with bronchopneumonia including breathing difficulty for 117 patients, fever, and chills for 104 patients, cough with or without mucus for

78 patients, chest pain/ abdominal pain for 26 patients, vomiting for 11 patients, cold for 18 patients, and wheezing for 8 patients (Table 3 and Fig 3).

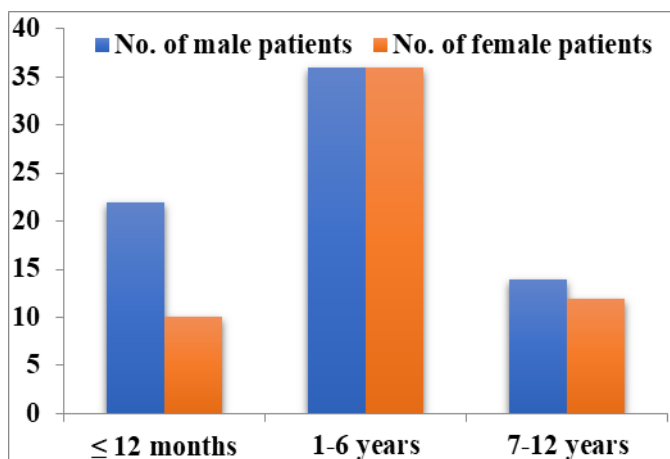


Fig 2. Gender wise classification with bronchopneumonia among paediatric patients.

Table 3. Symptoms associated with bronchopneumonia.

Symptoms	No. of Patients (N=130)
Breathing difficulty	117/130
Fever +/- Chills	104/130
Cough with or without mucus	78/130
Chest pain / Abdominal pain	26/130
cold	18/130
vomiting	11/130
wheeze	8/130

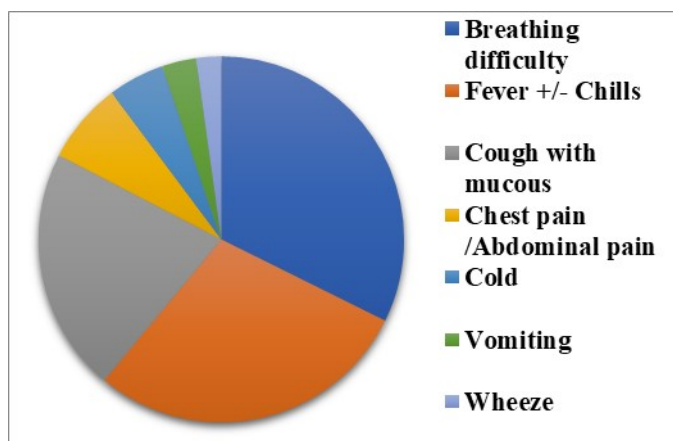


Fig 3. The symptoms occur in the pediatric patients with bronchopneumonia.

The table 4 and the figure 4 shows that the age group under ≤ 12 months category were prescribed with an Antibiotics (Ampicillin and Gentamicin) for 32 patients in which 16 patients were cured and 16 shows resistance to the drug , followed by 72 patients in the age

group of 1 to 6 years were prescribed with an Antibiotics (Ampicillin and Gentamicin) in which 34 patients were cured and 38 patients shows resistance to the drug and 26 patients in the age group of 7 to 12 years were prescribed with an Antibiotics (Ampicillin and Gentamicin) in which 10 patients were cured and 16 patients shows resistance to the drug (Table 4 and Fig 4).

Table 4. List of antibiotics used in initial treatment.

Age group	Antibiotics prescribed	No. of patients	No. of patients cured	Patient shows resistant
≤ 12 Months	Ampicillin and Gentamycin	32	16	16
1-6 Years	Ampicillin and Gentamycin	72	34	38
7-12 Years	Ampicillin and Gentamycin	26	10	16

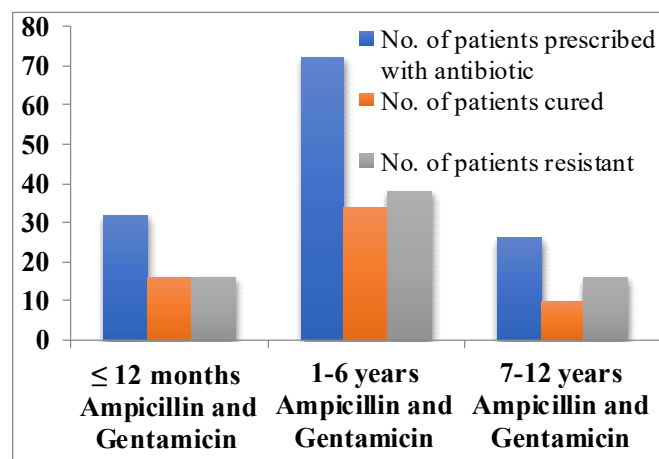


Fig 4. Antibiotics prescribed for the patients during Initial therapy.

Table 5 and Fig 5 show the positive outcome when cephalosporin is added to the patients who show resistance to the initial antibiotic drug therapy. In that the patients with age group under ≤ 12 months category were prescribed with an Antibiotics cephalosporin (Ceftriaxone and Cefotaxime), amikacin, and Azithromycin for 16 patients in which all 16 patients were cured, followed by 38 patients in the age group of 1 to 6 years were prescribed with an Antibiotics cephalosporin (Ceftriaxone and Cefotaxime), Amikacin, and Azithromycin in which all 38 patients were cured and 16 patients in the age group of 7 to 12 years were prescribed with an Antibiotics cephalosporin

(Ceftriaxone and Cefotaxime), Amikacin, and Azithromycin in which all 16 patients were cured and in all the age group no one shows resistance to the drug therapy when cephalosporins added to the drug therapy. The curation rate of the drug therapy is 22, 54, and 22 % (Table and Fig 5). From the above listed antibiotics, patients who were taking cephalosporins (Ceftriaxone and cefotaxime) show more improvement and faster recovery rate than other antibiotics.

Table 5. List of antibiotics used in the secondary treatment.

Age group	DP	NOP	PC	PR	CR (%)
≤ 12 Months	CPS and AMK	16	16	0	22
1-6 years	CPS, AMK, and AZM	38	38	0	54
7-12 years	AZM, CPS, and AMK	16	16	0	22

CPS- Cephalosporins, AZM – Azithromycin, AMK - Amikacin NOP - No. of patients, PC – Patients cured, PR – Patients resistant, DP – Drugs prescribed and CR – Curation rate.

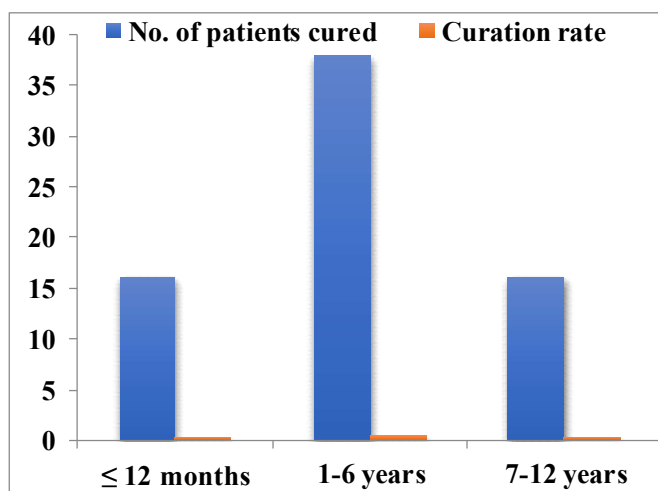


Fig 5. Antibiotics prescribed for the patients during secondary therapy.

DISCUSSION:

A third-generation cephalosporin or Ampicillin should be given to newborns instead of ceftriaxone because the former can displace bound Bilirubin and cause kernicterus [9,10].

Infants aged 1 to 3 months frequently develop atypical pneumonia, thus erythromycin or clarithromycin should

be used as a supplementary antibiotic to treat this condition [9,10].

S. pneumoniae is the most prevalent infection in infants and kids older than three months, and the best treatment for it is high-dose oral amoxicillin or another beta-lactamantibiotic [9,10].

Atypical drugs have a more significant role in treating children beyond the age of five, and macrolides antibiotics are typically used as first-line therapy [9,10].

In this study, we analysed 130 inpatient case sheets from paediatric wards with diagnosis of bronchopneumonia. The data was collected from the age groups of ≤ 12 months – 12 years. In total, 72 were males and 58 were females. From this data the male patients are more prone to bronchopneumonia than female patients.

The reason for male children's high vulnerability could be genetic, or mothers may report male children more frequently owing to gender prejudice, which could lead mothers to become aware of symptoms because male children may receive medical attention much more quickly than female children. [11] Nevertheless, according to numerous researches from Bangladesh, boys are more likely than girls to be affected by or seek care for common acute respiratory illnesses in general. Another explanation for why male children is more likely to contract infections is that testosterone suppresses the immune system [12-14].

In the initial treatment of antibiotics, Penicillins and aminoglycoside were exclusively administered intravenously in 130 patients during initial therapy of antibiotics. In the penicillin group of antibiotics, Ampicillin is used more often with the duration of 5 to 7 days and in aminoglycoside antibiotics the more often used drug was Gentamicin with the duration of 5 to 7 days.

In the secondary treatment, those who were resistant to the initial therapy were given a third-generation cephalosporin along with aminoglycoside and macrolides (amikacin and Azithromycin) antibiotics. The most commonly used third generation cephalosporins were Cefotaxime and ceftriaxone which was administered intravenously with the duration of 5 to 7 days.

In our study, 130 pediatric patients with bronchopneumonia were collected in an urban setting. Among this antibiotic resistance was developed to Penicillins and Macrolides.

Penicillin resistance to pneumococci in various studies from India have been reported from 0 to 15.4 % [10,11]. In

2010 and 2011, a study in Bangalore identified 41.5 % resistant to co-trimoxazole and 16.9 % resistant to penicillin were reported [14]. Studies from urban areas of south East Asia have found a much higher proportion of penicillin resistance, sometimes up to 60 % [15]. In our study 54 % showed resistance to penicillin and aminoglycoside.

According to the results of our study, we recommend the administration of third generation cephalosporin along with macrolides and aminoglycoside shows promising positive outcomes with no resistance when compared to the initial antibiotic treatment.

CONCLUSION:

Bronchopneumonia is the most common type of pneumonia in children. The pneumococcal immunisation has helped to decrease it in modern times. Amoxicillin is the first-line antibiotic used to treat pediatric pneumonia, which is frequently caused by *S. Pneumoniae* and is then followed by cephalosporins or macrolides. The Pediatric Infectious Diseases Society and the Infectious Diseases Society of America developed Evidence-based Guidelines for the management of pneumonia in infants and children. Penicillins (Ampicillin) and Aminoglycosides (Gentamicin) were initially used to treat pediatric patients with bronchopneumonia in accordance with recommended treatment guidelines. The Cephalosporins antibiotics (Cefotaxime, Ceftriaxone) along with Aminoglycosides (Amikacin) and Macrolides (Azithromycin), are prescribed if any patient demonstrates resistance to the initial treatment. This shows a positive outcome in our treatment. In our study, we have concluded that patients who developed resistance towards the initial therapy are more sensitive to the secondary treatment with Cephalosporins (Cefotaxime, Ceftriaxone).

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