

Acute Lower Respiratory Tract Infections in Children

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Acute lower respiratory tract infection (ALRTI) is a common illness, but there have been relatively few studies of the bacterial etiology in developing countries. Nasopharyngeal aspirates of 70 children under 10 years of age with ALRTI were cultured for aerobic bacterial pathogens. *Klebsiella pneumoniae* was the commonest organism (32.2%) isolated followed by *S. pneumoniae* (10%), *E. coli* (10%), *P. aeruginosa* (5.7%), *S. aureus* (2.8%) and *H. influenzae* (1.4%). There were significantly more bacterial pathogens isolated in children <1 year of age (73.7%) than in those >1 year of age (56.2%) (P=0.03). A shift in spectrum from Gram-positive cocci to Gram-negative bacilli in ALRTI was observed in our study.

Keywords: Acute lower respiratory tract infection, Etiology, *Klebsiella*, *Pneumonia*.

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Acute respiratory infections (ARI) result in 1.9 million childhood deaths per year in developing countries, 20% of these deaths are from India(1). A review of 13 studies involving 835 lung punctures from hospitalized children, prior to administration of antibiotics reported bacterial pathogens in 55% of patients(2-4). There is a paucity of studies in the Indian setting to find out incriminating bacterial agents in children. The bacterial etiology may also have changed over the recent past with increased immunization against *Hemophilus influenzae* B. Hence, our aim was to study the aerobic bacterial pathogens of acute lower respiratory tract infections in children and study their antimicrobial susceptibility pattern.

METHODS

This prospective study was conducted at the Departments of Microbiology and Pediatrics, Jawaharlal Nehru Medical College, Aligarh, India from September 2004 to December 2005. A total of 70 clinically diagnosed and radiologically confirmed cases of acute lower respiratory tract infection below

10 years of age admitted to the pediatric ward were selected for the study. The median age was 2.7±2.5 years. Children having received antibiotics in the preceding 48 hours at the time of enrolment were excluded. Acute lower respiratory tract infection was defined as per WHO Guidelines(5).

Nasopharyngeal aspirates (NPA) were collected from all patients within 48 hours of hospitalization using commercially available sterile disposable mucus extractor. For newborns and infants, infant feeding tube with the smaller diameter was connected before the sterile mucus extractor and then passed through nostril. The sample was cultured directly on 2 blood agar plates, 1 chocolate agar and 1 teepol lactose agar for isolation of aerobic pathogenic bacteria. One blood agar and the chocolate agar plate were incubated at 37°C in 5-10% CO₂ and other plates were incubated aerobically without CO₂. Tests for identification of the bacterial isolates were done according to standard techniques. Antibiotic sensitivity test was done by the disk diffusion method, interpretation was done on the basis of guidelines published by the CLSI (2002)(6).

WHAT THIS STUDY ADDS?

- *K. pneumoniae* was the most frequently isolated bacteria (37.1%) from nasopharyngeal aspirates of children having acute lower respiratory tract infection.

ESBL (extended spectrum β -lactamases) detection was carried out by double disk synergy test (DDST). In the DDST test, synergy was determined between a disk of amoxicillin + clavulanic acid and a disk each of ceftazidime, cefotaxime and ceftriaxone(7). These cephalosporins detect most ESBL producing strains.

RESULTS

Among 70 cases of ALRTI studied, typical aerobic bacteria were isolated in 41 (58.6%) cases; 35 (50%) showed isolation of a single bacteria; mixed bacterial growth was present in 6 (8.6%) cases.

There were significantly more bacterial pathogens isolated in children <1 year of age (73.7%) than in those >1 year of age (56.2%) ($P=0.03$). The culture of nasopharyngeal aspirates showed presence of *Klebsiella pneumoniae* in 26 (37.1%) of the cases, followed by *Streptococcus pneumoniae* in 7 (10%), *Escherichia coli* in 7 (10%), *Pseudomonas aeruginosa* in 4 (5.7%), *Staphylococcus aureus* in 2 (2.8%) cases, and *Hemophilus influenzae* in one case (1.4%).

Both the *S. aureus* isolates showed 100% sensitivity to erythromycin, vancomycin, oxacillin

and cefuroxime. All the *S. pneumoniae* isolates were sensitive to ampicillin, ciprofloxacin, cefuroxime and erythromycin but resistant to tetracycline. **Figure 1** shows sensitivity pattern of Gram negative isolates. ESBL production was detected in 19 out of 37 isolates. Of these 12 isolates were of *K. pneumoniae* (46.1%), 4 isolates were of *E.coli* (57.1%) and 3 isolates were of *P. aeruginosa* (75%).

DISCUSSION

In the present study, we could identify etiological agent by the conventional culture studies of NPA in 70% cases. The results of NPA may be misleading because of high rates of carriage of bacterial pathogens. However, NPA culture results if interpreted cautiously can give information regarding the etiology of ALRTI (8). Since no controls were included to detect healthy carriers, isolation of pathogens from NPA may not necessarily correlate with the etiology of pneumonia. Results of the previously published Indian study showed that *H. influenzae* was the commonest isolate whereas studies in Brazilian children have documented Gram negative enteric bacilli as the commonest cause(9-11). Since a single method was used for the identification of fastidious organisms, this may have resulted in their low isolation. The possible reasons for the shift in spectrum from Gram positive cocci to Gram negative bacilli in ALRTI could also be because of increased immunization against *Hemophilus influenzae* b. However, this aspect was not examined in this study.

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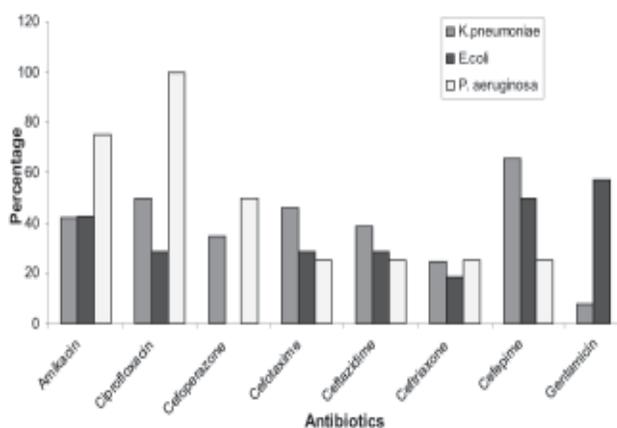


Fig.1 Sensitivity pattern of Gram-negative isolates.

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