

Bacterial Aetiology of Childhood Pneumonia

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Summary

Adedoyin MA and Fagbule D. Bacterial Aetiology of Childhood Pneumonia. *Nigerian Journal of Paediatrics* 1987; 14:37. Lung puncture aspirates were obtained from 108 children aged 1 month-14 years, admitted with a diagnosis of pneumonia, to the University of Ilorin Teaching Hospital between June 1985 and March 1986. Seventy-two of 108 aspirates were culture-positive; an isolation rate of 66.7%. *Staphylococcus aureus*, *Streptococcus pyogenes*, and *Klebsiella* species were the three commonest organisms isolated, accounting for 30.6%, 25% and 19.4% respectively. *Staphylococcus aureus* and *Klebsiella* were isolated only in children aged 2 years and below. A complication rate of 0.9% with no mortality was recorded following lung puncture aspiration. The study re-affirms the safety of lung puncture aspiration and its usefulness in the aetiological diagnosis of childhood pneumonia.

Introduction

INFECTION of the lower respiratory tract is one of the commonest causes of morbidity and mortality in early childhood in most developing countries^{1 2}. Efficient treatment of such a hazardous condition is therefore crucial to the reduction in childhood mortality and morbidity. Aetiological diagnosis which should enhance the efficiency of treatment has unfortunately, been neglected in many instances, because of the difficulty involved in getting suitable materials for culture^{3 4}. Bacteriological diagnosis using throat swabs and tracheal washings yield the

causative agent in only 10-30% of cases⁴. Tracheal aspirate may be convenient and safe particularly in the newborn but the yield is again, less than that of lung aspirate⁵ which yields culture-positive rates of 54-70%^{4 6-11}. A higher culture-positive rate (83%) may be obtained from lung biopsy¹⁰, but the attendant morbidity and mortality outweigh this advantage. Therefore, a simple lung aspirate which can be done in any hospital by any doctor seems to be the procedure of choice.

The purpose of this study was to use lung aspiration to ascertain the bacterial aetiology of childhood pneumonia in Ilorin.

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Materials and Methods

Children admitted to the University of Ilorin Teaching Hospital (UITH) with clinical and radiological evidence of pneumonia between June

1985 and March 1986, were studied. Cases with clinical and radiological evidence of tuberculosis were excluded. Informed consent was obtained from the parents after the nature of the procedure had been fully explained to them and only those whose parents consented, were included in the study. The cases reported in this study were the consecutive cases of pneumonia admitted to our units whose parents consented to participate in the study.

Two resident doctors and two consultant paediatricians performed all the aspirates. Having cleaned the skin of the chest well over the area of maximum clinical and radiological evidence of pneumonia with hibitane and spirit, a gauge 20 bevelled needle attached to a 10cc syringe was used to aspirate the lung. As soon as the skin was pierced, vacuum was created by pulling on the plunger of the syringe. The needle was advanced towards the area of consolidation and the syringe withdrawn, the plunger still being pulled. As soon as the tip of the needle was to be withdrawn from the skin, the plunger was released. Sternal area and anterior chest wall were avoided.

The aspirate whose volume ranged between 0.2ml and 0.6ml in most cases, was immediately inoculated into a Stuart's transport medium and delivered at the microbiology laboratory for microscopy, culture and sensitivity. No attempt was made to culture anaerobic organisms.

After the aspiration, all the patients were kept under observation. They all had a repeat chest X-ray within 18 hours following the aspiration. No patient was discharged home sooner than four days post-aspiration. A final X-ray was taken at the time of discharge from the hospital to ensure complete resolution of the pneumonic consolidation.

Results

There were 108 patients (56 males and 52 females) aged 1 month to 14 years (Table I). Cultures were positive in 38 (67.8%) of the

males and 34 (65.3%) of the females, with an overall culture-positive rate of 66.7%.

TABLE I
Age Distribution in 108 Cases of Pneumonia

Age (yrs)	No(%) with Positive Culture	No with Negative Culture	Total
0-2	66(78.6)	18	84
3-6	2(18.2)	9	11
7-10	2(28.6)	5	7
> 10	2(33.3)	4	6
Total	72(66.7)	36	108

Eighty-four (77.8%) of the patients were aged two years and below. Sixty-six (78.6%) of the 84 lung aspirates from children two years and below were positive for specific organisms. Culture positive rates for the age groups 3-6, 7-10 and those above 10 years of age were 18.2%, 28.6% and 33.3% respectively (Table I).

Of the 72 positive cultures, 22 (30.6%) grew *Staphylococcus aureus*: these were all in children aged two years and below (Table II), *Streptococcus pyogenes* accounted for 18 (25%), while *Klebsiella* species accounted for 14 (19.4%). Other organisms were *E coli* and coliforms; both were isolated in children two years of age and below and each accounted for 8.3% of the positive cultures. *Pseudomonas* and *Proteus* accounted for only 5.6% and 2.8% respectively.

One hundred and two (94.4%) of the 108 cases apparently had not received any antibiotics prior to admission. Seventy two (70.6%) of these were culture-positive. By contrast, none of the aspirates from the six who were known to have received antibiotics, was culture-positive. Final chest X-ray showed satisfactory resolution in all the cases.

TABLE II
Organisms isolated at Different Age Groups

Organisms	Age (yrs)				Total	% of Total
	0-2	3-6	7-10	>10		
Staph aureus	22	0	0	0	22	30.6
Strept pyogenes	14	0	2	2	18	25.0
Klebsiella	14	0	0	0	14	19.4
E coli	6	0	0	0	6	8.3
Coliforms	6	0	0	0	6	8.3
Pseudomonas	2	2	0	0	4	5.6
Proteus	2	0	0	0	2	2.8
Total	66	2	2	2	72	100.0

Sensitivity Reports

Staphylococcus aureus showed 100% sensitivity to erythromycin, minocycline, *Floxapen* and *Suprapen*, but was totally resistant to ampicillin and penicillin. *Klebsiella* was sensitive to gentamycin, streptomycin, clindamycin and nalidixic acid but was resistant to erythromycin and penicillin. *E coli* was sensitive to streptomycin and cefotaxime while *Pseudomonas* was sensitive to cefotaxime, streptomycin and *Pyopen*.

Complications

Only one (0.9%) of the 108 cases had pneumothorax, and this resolved spontaneously. There was no mortality attributable to lung aspirate in this series.

Discussion

Efficient treatment of pneumonia is enhanced by a knowledge of its precise aetiology. Lung aspirate as performed in this study, is useful for definitive aetiological diagnosis as well as giving

an accurate epidemiological guide to the aetiology of pneumonia in a specified locality. Studies such as this, when performed throughout the year, can provide information about the seasonal variations and patterns of childhood pneumonia in a locality. This could guide clinicians in deciding which antibiotics to choose for treatment. Also, when pneumonia fails to respond to the usual treatment, a lung aspirate is indicated, to establish the aetiology of the disease, thus helping to decide on the best chemotherapeutic agent.

An isolation rate of 66.7% in the present study is higher than those reported by Mimica *et al* in Santiago⁴ and Diakparomre and Obi from Benin,¹² but similar to that of Fagbule *et al* (unpublished observation). The isolation rate of 70.6% among the patients who did not receive antibiotics prior to admission, compares favourably with 73.9% from Benin¹² and 79% from Zaria¹¹ and is much higher than the 56.8% reported by Mimica *et al*.⁴ The commonest pathogen in our study was *Staphylococcus aureus*; this is in agreement with the findings from Benin¹² but at variance with the finding reported from Zaria¹¹ where *Streptococcus pyogenes* was the commonest organism.

Surprisingly, *H influenzae* which constituted 4.8% of the cases from Benin¹² was not recovered from any of our patients. This most probably reflects local variation since we do culture *H influenzae* successfully from cerebrospinal fluid in cases of meningitis.

While it is accepted that cultures of lung aspirates, when positive, are very useful in the management of pneumonia, false negative cultures do arise frequently. When a negative result is obtained, the clinician cannot rule out bacterial pneumonia and the patient must be treated in the standard way⁶. This study suggests that needle aspiration of the lung is a safe procedure and can enhance the aetiological diagnosis of pneumonia in childhood, thus promoting efficient therapeutic intervention.

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