COMPARATIVE EFFICACY OF DIAGNOSTIC PROCEDURES IN PNEUMONIA IN CHILDREN

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ABSTRACT

Various investigative methods used in diagnosis, in 200 children with pneumonia, were analyzed to establish the diagnostic superiority. Lung juice aspirate culture yielded 52.4% positivity and laryngeal swab culture 52%. Gastric aspirate culture was positive in 36% cases and blood culture positivity was in 10% cases only. Thus laryngeal swab culture is as effective as lung-juice aspiration culture in the isolation of the organisms causing lower respiratory tract infections. Gastric aspirate smear examination for polymorphonuclear leucocyte count is helpful in screening bacterial pneumonias.

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KEY WORDS : Pneumonia; Children; Laboratory diagnosis.

Introduction

Pneumonias are responsible for 20-60% of all paediatric out patient attendance, 12-45% of hospital bed occupancy and 15-20% of the deaths in our country. Analysis of under five mortality due to respiratory infections revealed that bacterial pneumonias contributed to 96.6% of deaths [1,2].

The identification of specific organisms responsible for acute lower respiratory tract infection is mandatory for proper treatment.

The present study was under taken to evaluate the utility of various diagnostic procedures in pneumonias in children such as (a) examination of peripheral blood smear (PBS) for toxic granules in WBCs, (b) blood culture, (c) laryngeal swab culture, (d) lung juice aspiration culture and (e) gastric aspirate direct smear examination and culture.

Materials and Method

Two hundred children of either sex below the age of 12 years suffering from pneumonia were randomly selected. The diagnosis was based on detailed history, thorough physical and systemic examination, microbiological and immunological (Mantoux and BCG diag-

nostic tests) investigations and radiograph of chest. Blood, laryngeal swab, lung aspiration and gastric aspiration cultures were done by inoculation into glucose and taurocholate broths and subsequently on blood and chocolate agars [3]. Antibiotic sensitivity was carried out by Stokes method [4]. Direct smear examination of gastric aspirate was carried out by standard method using Leishman stain. A count of more than 12 polymorphonuclear leucocytes per high power field was taken as significant and indicative of bacterial infection [5].

Observations

A total of two hundred cases comprising of 122 boys and 78 girls in the age group from birth to 12 years were studied. Maximum number of patients were observed in the age group of 1 to 5 years (40%) followed by 1 month to 1 year (31%). Male preponderance was seen in all age groups (Table 1).

Haematological evidence of infection as indicated by the presence of toxic granules in the polymorphonuclear leucocytes in the peripheral blood was seen in 26% of cases. Low blood culture positivity was the striking

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TABLE 1
Showing age and sex distribution

Age	Sex		Total (%)
	Male	Female	
Birth to 1 month	14	8	22 (11)
1 month to 1 year	44	18	62 (31)
1 year to 5 years	44	36	80 (40)
5 year to 12 years	20	16	36 (18)
Total	122	78	200 (100)

observation in the present study (10% cases only). Laryngeal swab culture yielded a positivity of 52% of all the cases studied. Gram positive cocci were isolated in 41% of these (Table 2). Lung juice aspiration being a traumatic procedure was feasible in only 84 patients yielding 52.4% positivity on culture.

Gastric aspirate smear for polymorphonuclear leucocytes exhibited a significant count in 52% cases. Gram stain detected microorganisms in 42% cases. Majority (35%) were Gram positive cocci. Gastric aspirate culture revealed a positivity of 36% where Gram positive cocci could be isolated in 30% cases. *Strept pneumoniae* were the commonest organism detected in 12% cases. *Staphylococcus aureus* were grown in 8% cases.

Of the Gram negative organisms isolated, *E coli* was the commonest, detected in all the new borns (11% cases). Gastric aspirate culture yielded next best results, where the culture was positive in 36% cases.

Discussion

Etiology of lower respiratory tract infection continues to offer an intriguing challenge to the clinician. The various diagnostic procedures used for bacteriological study, though sensitive, are invasive and time consuming.

The maximum number of cases suffering from pneumonia in the present study were observed in the age group of 1 to 5 years (40% cases). A similar age range has been reported by other workers [6,7]. The present study revealed a uniform male preponderance in all the age groups. Narain [8] has also observed a similar male bias supporting our observations.

Evidence of bacterial infection in the form of presence of toxic granules in the peripheral blood has been advocated by various workers [9,10]. In the present series, only 26% cases of pneumonias had demonstrated toxic granules. Xantheu and Zipurasky [11,12] had reported almost similar findings. However Monroe [13] had reported a higher incidence of 56% in his study. The blood culture was positive in only 105 cases in our study. Various workers have documented blood culture positivity almost similar to this study [14,15].

Laryngeal swab culture is of immense value in the identification of organisms of lower respiratory tract infections. Its utility is further enhanced in situations where cough is either non productive or sputum collection is not possible. Laryngeal swab culture was positive in 52% of our cases, Gram positive

TABLE 2
Comparison of various methodology in isolation of organisms

Various culture methods	Total cases	Gram positive organisms			Gram negative organisms			Total isolates
		<i>Pneumo-cocci</i>	<i>Strep tococci</i>	<i>Staph aureus</i>	<i>E. coli</i>	<i>H. influenzae</i>	<i>Pseudo-monas</i>	
Lung aspirate	84	18	14	6	4	2	—	44(52.4)
Laryngeal swab	200	34	26	22	14	6	2	104(52)
Gastric aspirate	200	24	20	16	10	2	—	72(36)
Blood culture	200	2	—	14	4	—	—	20 (10)
Total isolates		78	60	58	32	10	2	

Figures in parenthesis indicate percentages.

cocci being the commonest isolate. Gram positive cocci in majority of cases have been reported by other workers as well [16,17]. Laryngeal swab culture positivity of 58% by Disney et al [18] and 62.6% by Kalra et al [17] agree well with our findings.

The utility of lung juice culture was established with positivity in 52.4% of cases which was the highest among all the cultures. Growth of Gram positive cocci could be demonstrated in 38 (45.25%) cases where only 6 (7.15%) cases grew Gram negative organisms. Our observations are in accordance with others [17-19]. *Strept pneumoniae* was the commonest organism isolated in other studies as well as in ours [14,15,17].

The utility of gastric aspirate analysis has been well established in the diagnosis of neonatal sepsis and in pneumonias [5,20]. The gastric aspirate smear examination is a simple, reliable and quick procedure in identifying causative organism. Significant polymorphonuclear leucocyte count (more than 12/HPE) was observed in 53% cases. Of 22 neonates with pneumonias, gastric aspirate exhibited a significant count in 10 cases (10/22). A significant polymorphonuclear leucocyte count in 51.5%, 60%, 61.5% cases had been reported by various investigators [20-22]. Of 200 cases subjected to gastric aspirate culture in this study, growth was detected in 36% cases. Gram positive cocci were isolated in 30% cases where pneumococci was the commonest organism seen. Contrary to our observations Yadav et al had reported a positivity of 82.3% in their study on gastric aspirate culture [23].

A comparative analysis of various cultures applied for the detection of micro-organisms in the present study revealed that laryngeal swab culture was as good as lung juice culture. The culture positivity was 52.5% in former (Table 2). Disney et al [18] and Silverman et al [4] have documented that laryngeal swab culture was positive in 58% and 73% cases, compared to lung aspirate culture which was positive in 56% and 79% cases respectively, supporting our observations.

In the comparative analysis of gastric aspirate culture versus blood culture, the former exhibited a higher positivity (36%) in contrast to the latter (10%). In neonates gastric aspirate culture was positive in 45% whereas only 18.2% blood cultures were positive. Thus gastric aspirate culture is superior to blood culture. This has also been found by Kumari et al [24].

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