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Microbiological Study of Bronchoalveolar Lavage in Severe Pneumonia

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Abstract

Aim: To assess the microbiological profile of respiratory tract secretions obtained by BAL of patients admitted to PICU in NMCH&RC with severe pneumonia. *Methods:* The patients admitted in PICU of NMCH&RC, Raichur, with severe pneumonia in the age group of 1 month -5 years were evaluated and started on first line of respiratory antibiotics after obtaining samples for relevant investigations, treatment was started as per the respiratory protocol. Among them who failed to respond for the same within 48-72 hours were subjected to BAL. During the period of October-2015 to March-2016 a total of 36 cases underwent BAL. The secretions collected through aseptic method were subjected to gram staining, ZN staining, culture and sensitivity. *Results:* Bacteriological study of the above 36 patients showed- No. of cases 1) Gram positive organisms 39% (14) 2) Gram negative organisms 22% (8) 3) Fungi 14% (5) 4) Pseudomonas 11% (4) 5) Acino bacter baumannii 2% (1) 6) No yield 11% (4) Out 36 cases 26 were ventilated. Out of which Gram positive is more predominant than gram negative. In that 1 was Acino bacter baumannii and 4 were pseudomonas. Remaining 10 cases were managed conservatively. Out which 80% were gram negative and remaining 20% were gram negative. Antibiogram- Gram positive - Linazolide, Amoxiclav Gram negative - Meropenem, Amikacin, Colistine Fungi - Fluconazole, Amphotericin-B Pseudomonas - Colistine + Meropenem Acino bacter baumannii - Piperacillin + Tazobactum No yield. *Conclusion:* The microbiological yield was significantly high (89%). Among that gram positive organisms were high and thus helped in preventing mortality. The yield is good when secretions obtained through BAL. The outcome is good in ventilated patients. Thus we conclude appropriate management of acute severe pneumonia the outcome is excellent.

Keywords: BAL; Antibiogram.

Introduction

In India prevalence of respiratory tract infections is very high. According to a study published in 2015 the estimated mortality 0.35 million out of 3.6 million episodes of severe pneumonia among under five children in India [1]. Due to the severity of the disease prompt diagnosis of the disease is essential for the effective and appropriate treatment of the disease. The identification of intracellular organisms in BAL fluid is a good indicator of pneumonia [2]. Our study focuses on microbiological yield of BAL in ventilated associated severe pneumonia and its management with appropriate antibiotic therapy.

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Materials and Methods

The study has been performed in 5 bedded (high dependency unit) PICU of Navodaya Medical College Raichur. The study was performed over a period of 6 months from October 2015 to March 2016. The patients who were falling under the category of severe pneumonia and very severe pneumonia according to the ARI control program were considered for the study [3]. Patients who were referred were excluded from the study. Patients who expired within 24 hours of admission were excluded from the study.

A written consent has been taken from the parents before performing the BAL from parents. The study has been approved by the hospital ethical committee.

The procedure was performed under all aseptic conditions in PICU by paediatric intensivist qualified to perform bronchoscopy. The instrument used was a flexible bronchoscope and the secretions were collected. The secretions thus collected were subjected to Gram staining, ZN staining, culture and sensitivity.

Before doing the procedure all the subjects were pre-treated with atropine(0.5mg) and Diazepam (10mg) before the BAL procedure [4]. 50ml of normal saline is pushed into bronchial trees four times and gentle suctioning had been done with negative pressure less than 50mm Hg.

The sample which was collected in sterile containers were transported to microbiology lab carefully under aseptic precautions to avoid contamination. Those samples were kept at room temperature of 25°C under fluorescent lighting and appropriate humidity [5]. Sometimes BAL collected got mucous material which not filtered or not removed with any gauge because chance of contamination of the specimen [6].

Table 1: Percentage of positive culture for organisms

Serial no.	Organism	Percentage	No. of cases	
			Ventilated	Non Ventilated
1.	Gram positive organisms	39%	10	4
2.	Gram negative organisms	22%	6	2
3.	Pseudomonas	11%	3	1
4.	Acinetobacter *baumannii*	2%	-	1
5.	Fungi	14%	4	1
6.	No yield	11%	3	1

Table 2: Antibiogram

Serial No.	Organism	Antibiotic
1.	Gram positive organism	Linazolide, Amoxycillin + Clavulonic acid
2.	Gram negative	Amikacin, Meropenem, Colistine
3.	Pseudomonas	Piperacillin + Tazobactum
4.	Acinetobacter *baumannii*	Colistine, Meropenem
5.	Fungi	Fluconazole, Amphotericin-B
6.	No yield	

During the period of study, a total of 120 severe pneumonia cases were hospitalized. Among them the patients not responding to initial antibiotic therapy (36), after obtaining samples for relevant investigations (including blood culture and sensitivity) were subjected to BAL.

It was a prospective study. The results obtained were compared with that of the blood culture results to estimate the sensitivity of the test. The various organisms isolated by BAL were helpful in estimating the prevalence of different micro-organisms causing severe pneumonia.

Results

Among the 36 children, in 32 children BAL has been beneficial in determining the involved micro-organism which couldn't be obtained by blood culture studies for various reasons.

In the Table 1 shows the percentage of positive culture for organisms. Gram positive organisms are 39% positive, gram negative organisms are 22% positive,11% positive for pseudomonas, 14% positive for Fungi, 2 % positive for Acinetobacter baumannii, No yield is 11%.

Out of 36 cases 26 were ventilated, out of which gram positive is more predominant than gram negative. In that 1 was Acinetobacter *baumannii* and 4 were Pseudomonas. Remaining 10 cases were managed conservatively. Out of which 80% were gram positive and remaining 20% were gram negative.

Discussion

BAL was proven to show higher microbiological yield when compared to blood culture studies. This has helped in initiating prompt treatment for those cases. BAL is a much preferred than invasive techniques like Needle biopsy and Thoracoscopy. The BAL contents collected from different paediatrics age group were similar [7].

The culture showed a higher yield for gram positive organisms which were highly sensitive to Amoxicillin Clavulanic acid combination and Linezolid. On

starting the therapy with those particular antibiotics the children have shown drastic improvement. Among the gram negative bacteria isolated pseudomonas was found to be higher at 50% which was susceptible to Amikacin, Meropenem and Colistine. Culture positive for gram negative when treated with combination therapy with Linazolide and Meropenem outcome was good and fast. Monotherapy showed good results in culture positive for Gram Positive organisms. In culture positive for fungi Ceftriaxone was used in combination with Antifungal agents the outcome was good [8].

The drawbacks of the procedure are mainly the requirement of trained personnel [9] and a tertiary care setup which are often not required for blood culture and sensitivity. The higher risk involved in the procedure when compared to blood culture and sensitivity also plays a major part in convincing the parents for BAL. The percentage of gram positive and gram negative organisms isolated may vary when a larger sample size is considered.

Conclusion

The microbiological yield was significantly high (89%). Among that gram positive organisms were high and thus helped in preventing mortality.

The yield is good when secretions obtained through BAL. The outcome is good in ventilated patients.

Thus we conclude appropriate management of acute severe pneumonia the outcome is excellent.

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