



Polymicrobial Infections in Ventilated Associated Pneumonia Patients and its Out Come in Intensive Care Unit.

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ABSTRACT

Context (Background): Aim of the study was to determine infections in intensive care unit and evaluate the relationship between the ICU acquired infections and the mortality.

Material and Methods: The study was conducted in a patients occupying ICU bed for > 48hrs developing signs of symptoms of nosocomial pneumonia. Total of 80 patients admitted in ICU developed ventilator associated pneumonia (VAP) were included in the study. Total of 432 number of broncho-alveolar lavage (BAL) sample and 458 blood samples were collected from all the patients. Samples were processed by standard microbiological method and also by rapid method, Calcofluor white stain (CFW) for direct demonstrations of fungal elements and culture according to the need.

Results: The results states that the sensitivity of conventional direct microscopy, KOH was 41.1% where as the sensitivity of CFW was 75.2% in BAL sample for fungal pathogens. The most frequently isolated species in BAL samples were *Candida albicans* 42.3%, followed by *C. tropicalis* 40%, *Geotrichum* sp 10.5%, *C. krusei* 3.5% and *Trichosporon* sp 3.5% in BAL sample.

Among the different bacterial isolates *Pseudomonas aeruginosa* was most common isolate (46%) followed by *Acinetobacter* sp. (31.1%), *Escherichia coli* (11.4%), *Klebsiella* species (8.3%) and *Staphylococcus aureus* and *Enterobacter* sp. (1.1% each).

Among the blood fungal isolates 10.2% (47 out of 458 samples). *Candida tropicalis* was most common (54.1%) followed by *C. albicans* (18.7%), *C. glabrata* and *C. parapsilosis* (6.2% each).

Blood culture positivity for bacteria were 42.1%. The species isolated were again *Pseudomonas aeruginosa* was the commonest (43.0%) followed by *Acinetobacter* sp. (23.8%), *Klebsiella* sp. (15.0%) and *E. coli* (8.8%). In this study aerobic bacterial culture positivity was 46.5%. There was a high incidence 14.3% found to have polymicrobial infections. While only 27.1% had monomicrobial fungal infection.

Out Come: The overall mortality due to VAP in this study was 50%. There was high mortality (72.2%) in-patients with blood stream infection.

Conclusions: This study suggest that the spectrum of the fungal infections are shifting towards the non-*albicans candida* from sterile sites. The Mortality was 50% in patients having nosocomial pneumonia whereas it was 85.7% patients is having systemic infections.

KEYWORDS

monomicrobial, polymicrobial infections, Critically ill patients, Out come.

Introduction

The intensive care units have become integral part of most hospitals in recent years.

The incidence of fungal Infections, namely candidosis, is substantially increasing and there is shift towards non-*albicans* species of *Candida*^{1,2,3}. The rising incidence is caused by marked increase in population of patients with risk factors for fungal infections. 90% of Nosocomial pneumonia epidemic has been reported in ICU, Ventilated Associated Pneumonia (VAP) is one of the common clinical presentation in the literature⁴. Incidence of (VAP) widely varies from 18-20%, the fungal infections contribute significantly to ICU infection⁵. Mortality is as high as 58.8% in ICU patient having nosocomial pneumonia⁶. Clinical diagnosis of fungal infection this group of patients are difficult due to presence of nonspecific symptoms. The repeated isolation from respiratory samples helps in diagnosis of nosocomial pneumonia in symptomatic and severely compromised patients^{7,8}. Definitive diagnosis is often difficult and relies on combination of clinical observations and different diagnostic test. Therefore we have added the Calcofluor white stain for direct demonstration of fungal elements which can be the rapid and reliable in comparison

to conventional method for diagnosis of (VAP). To see the spectrum of the disease, all the samples were cultured and speciated by standard microbiological method.

Material and Methods

Study population

This study was conducted at patients admitted to intensive care unit of all India institute of medical sciences new Delhi. Total of 80 patients who develop sign and symptoms of infection 48 hours after ventilatory support were included in the study.

Total 432 samples of bronchoalveolar lavage (BAL) and 458 blood samples were collected from 80 patients. Samples were collected from each registered patient twice a week until recovery or death. BAL were collected by double catheter technique of nonbronchoscopic bronchoalveolar lavage described by Rouby et al⁹. All the samples were processed for both fungal and bacterial etiology to see the prevalence. For direct microscopy, KOH mounts and rapid method Calcofluor white staining method were used. For culture 5 to 10 ml blood samples were collected by venepuncture with all aseptic precautions and inoculated in biphasic medium containing Brain

heart infusion agar and broth with antibiotic .

Results

Demographic features of the patients

Out of 80 patients, 63 (78.7%) patients were male while 17 (21.3%) patients were female. Age and sex wise distribution of the patients was described in (Table 1).

Among 80 patients , 28 were cases of gastrointestinal diseases , 11 of renal diseases , 13 cases of trauma, 7 of malignancy and 6 each of chronic respiratory diseases and endocrine disorders and 9 other patients. Among the 80 patients 52 underwent some surgery while 28 were medically treated patients (Table 2).

Microbiological finding

In 432 BAL samples, 64 were positive by direct microscopy in 35 patients, 85 samples were positive for yeast among 41 patients where as 263 samples positive for bacterial growth. By conventional method KOH mount , 35 sample were positive for fungal elements in 21 patients, additional 21 were positive by Calcofluor white stain in 14 patients (Table 3). Among the fungal isolates *Candida albicans* was leading isolates in 36 cases followed by *C. tropicalis* in 34, *C. krusei* and *Trichosporon sp* in 3 cases. While *Geotrichum sp* in 9 cases were not established as pathogen because of not isolation from successive sample.

Among the bacterial isolates *Pseudomonas aeruginosa* was leading isolate in 122 cases followed by *Acinetobacter sp* 83, *E. coli* 30 , *Klebsiella sp* 22. Total of 62 samples had both bacterial and fungal growth where as 201 and 23 samples have only pure bacterial and fungal growth respectively.

In 457 blood samples 47 were positive for fungal culture, while 193 were positive for bacterial growth, 9 patients had polymicrobial infection. Among the fungal isolates *C. tropicalis* was leading osolates in 26 cases followed by *C. albicans* 9, *C. glabrata* 3 , *C. parapsilosis* 3 and *Trichosporon sp* 2 cases.

Among the bacterial isolates *Pseudomonas areuginosa* was the leading pathogen as it was in BAL samples in 83 samples followed by *Acinetobacter sp* 46, *Klebsiella sp.* 29 , *E. coli* 17, 9 cases of *Staphylococcus aureus* and other bacteria in 9 samples.

Culture positivity was high in surgical patients than the medical patients both for bacterial and fungal infections . Out of total 80 patients 52 were surgical ,among these 38 develop infections while among 28 medically treated only 14 develop infections (Table 4)

Out Come: The overall mortality due to VAP in this study was 50% . high mortality was detected in patients with fungemia 72.2%.

Discussions

During the past decade increasing incidence of systemic candida infections in critically ill patients is obvious because of underlying risk factors.

In this study all the 80 patients were on ventilator, and either on oral endotracheal tube or tracheostomised. All had central venous catheter, indwelling urinary catheter and nasogastric tube. All these factors contribute to increase the risk of fungal infections as observed in this study showing high incidence of fungal infections in ventilated patients in ICU.

For diagnosis VAP, BAL is one of the best sample, for direct demonstration of fungal elements. KOH mount preparation is widely used in BAL sample in VAP cases. Use of Calcofluor white stain has been reported by chakraborty et al in 1993 in corneal scraping they found the positivity was 95% in comparison to KOH which was 75%, which proved the CFW stain can help in scanty sample for diagnosis of infections ¹⁰. In present study considering culture as gold standard, sensi-

tivity of KOH was 41% where as Sensitivity of CFW staining was 75.2% in BAL sample. In this study culture positivity in BAL sample was 19.6% which was slightly higher than results of Flanagan et al who reported fungal infection in ICUs as 8-15% by culture ⁶. Among the different isolates, *Candida albicans* was the most common etiological agent (42.3%) followed by *C. tropicalis* (40.0%), *Geotrichum sp.* (10.5%) and *C. krusei* (3.5%).

Voss A et al also reported slightly higher, 60% of *C. albicans* as most common followed by *C. tropicalis* (21%), *C. parapsilosis* (9.5%) and *C. glabrata* (8%)¹¹.

It is known that pneumonia may be due to polymicrobial agents ¹². Fungal infections always are not the sole entity to cause VAP in susceptible patients of ICUs. Many times these patients have fungal infection associated with one or more bacterial infection. In this study aerobic bacterial culture positivity was 46.5% .Out of which 14.3% were found to have polymicrobial infections. While only 27.1% had monomicrobial fungal infection. This reveals the high incidence of fungal and polymicrobial infection in this group of patients.

Among the different bacterial isolates *Pseudomonas aeruginosa* was most common isolate (46%) followed by *Acinetobacter sp.* (31.1%), *Escherichia coli* (11.4%), *Klebsiella species* (8.3%) and *Staphylococcus aureus* and *Enterobacter sp.* (1.1% each). Resistance of *Pseudomonas* to disinfectants and its ability to survive in hospital environment and to grow in disinfectants would be probable causes for high incidence of *Pseudomonas sp.* as agent in nosocomial infections.

Barsic et al has reported an incidence of 24.2% as nosocomial bacteremia in ICU patients ¹³. The common etiological agents were *Acinetobacter sp.*25.1% followed by *Pseudomonas aeruginosa* 14.9%, *Klebsiella sp* 14.2% and *Enterococcus sp.*11.6%.

The incidence of blood stream fungal infection was 10.2% (47 out of 458 samples). Which was comparable to findings of Urli et al who reported fungemia in ICU as 11.1% ¹⁴. Among the isolates in this study *Candida tropicalis* was most common (54.1%) followed by *C. albicans* (18.7%), *C. glabrata* and *C. parapsilosis* (6.2% each).. The more invasive nature of *C. tropicalis* as reported in literature, that would be probable reason for high isolation of it from blood samples ⁶.

In this study blood culture positivity for bacteria were 42.1%. The species isolated were again *Pseudomonas aeruginosa* was the commonest (43.0%) followed by *Acinetobacter sp.* (23.8%), *Klebsiella sp.* (15.0%) and *E. coli* (8.8%).

Doczi et al has reported more fungal infections in surgical group 39.3% as compare to medical group 28.3%. The presence of various yeast sp. on body surface like skin and mucous membrane of GIT and urogenital tract and dislodging during surgical intervention would be probable causes for high incidence of fungal infections in this group of patients ¹⁵. The results of this study also showed high incidence of fungal infections in surgical patients as compared to medical patients .

In this study mortality of nosocomial pneumonia in ICU patients was 50.0% as by Fagon et al which is 58.8% ⁵. In our findings there was high mortality (72.2%) in-patients with blood stream infection, also been reported by Vincent et al ¹⁶. Fungi are opportunistic pathogens, normally present on body surfaces as normal flora not causing disease in immunocompetent individuals. However following fungal infections due to association of some risk factors, morbidity and mortality is significantly higher than other patients. There is a threat of shift towards non-albicans in blood stream infections. Any method for rapid and reliable diagnosis by direct microscopy, culture and speciation of *Candida* in the clinical specimen from the patient with association of risk factors would justify starting antifungal therapy

Table 1

Age group	Male	Female	Total
10-20 years	5	2	7
21-40 years	19	10	29
41-60 years	20	3	23
Above 60 years	18	3	21
Total	62	18	80

* Age wise distribution of patients

Table 2

Disease	Number of cases
Gastrointestinal surgery/disease	28
Chronic respiratory disease	6
Trauma	13
Renal/urinary disease	11
Malignancy	7
Endocrine disease	6
Others	9
Total	80

* Distribution of clinical diagnosis of the patients

Table 3

Calcofluor	KOH		Total
	Negative	positive	
Negative	368	00	368
Positive	29	35	64
Total	397	35	432

AGREMENT= $368+35/432 = 93.5\%$

* Comparison of Calcofluor with KOH

Table 4

Group	Surgical	Medical	Total
Negative	14	14	28
BAL positive	24	10	34
Blood positive	8	3	11
Both BAL & Blood positive	6	1	7
Total	52	28	80

* Fungal culture positive in Surgical and Medical patients

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