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AEROBIC BACTERIOLOGICAL PROFILE OF VENTILATOR-ASSOCIATED PNEUMONIA: A HOSPITAL- BASED STUDY IN BHUBANESWAR, ORISSA, INDIA.

Microbiology

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ABSTRACT

OBJECTIVE: The study aims to detect the aerobic bacteria isolated from cases of Ventilator-Associated Pneumonia (VAP) in the Intensive Care Unit(ICU) of a tertiary care Hospital, along with the outcome and mortality rate.

MATERIALS AND METHOD: The study was conducted in the department of Microbiology in collaboration with the ICU on 130 patients admitted in the Medicine ICU with clinical suspicion of VAP.

RESULT: Of the 130 patients, significant pathogens were recovered from 113. A total of 119 bacteria were isolated.The most predominant organism was *Acinetobacter spp* (37.8%).The mortality rate in patients of VAP was about 41.6%.

CONCLUSION: *Acinetobacter spp* stood out as a significant pathogen with considerable virulence in nosocomial infection.

KEYWORDS

VAP, ICU, *Acinetobacter spp.*

INTRODUCTION

Pneumonia is an infection of the pulmonary parenchyma. At present it is categorized as either Community-Acquired Pneumonia (CAP) or Health Care-Associated Pneumonia (HCAP).HCAP is further classified into Hospital-Associated Pneumonia(HAP) and Ventilator-Associated Pneumonia(VAP)[1]. Ventilator Associated Pneumonia (VAP) is defined as pneumonia occurring in patients admitted to critical care units for more than 48 hours after endotracheal intubation and initiation of mechanical ventilation, including pneumonia developing even after extubation[2]. The condition should not be present at the time of admission and within 48 hours thereafter.In spite of advanced techniques of management of mechanically ventilated patients and effective procedures to disinfect respiratory equipments, VAP continues to pose a threat to patients receiving mechanical ventilation.

VAP is classified as early onset(within 96 hours of mechanical ventilation) and late onset(developing after 96 hours) depending on the time of onset of pneumonia.VAP is the second most common nosocomial infection after urinary tract infection, the incidence of which ranges between 25-30%. It also has the highest fatality rate amongst nosocomial infections[3].India has a crude mortality rate of 67.4% in ICU patients suffering from pneumonia, with 40% of the mortality in these patients attributable to infection alone.[4]Mortality is more commonly associated with certain conditions like resistant microorganisms, blood stream infections and inadvertent use of empiric anti microbials. VAP is frequently associated with patients suffering from ARDS.

The risk is highest early in the course of hospital stay, and is estimated to be 3% per day during the first 5 days, 2% per day during the 5th – 10th day and 1% per day after 10 days ofventilation[5]. VAP occurs in 9-27% of all intubated patients[6].

The pathogenesis of VAP occurs due to:

- Colonization of the oropharynx with pathogenic microorganisms. In a considerable number of patients on mechanical ventilation the normal oropharyngeal flora is replaced by pathogenic organisms and aspiration into the lower respiratory tract.
- Compromise of normal host defense.
- The predominant risk factor is the endotracheal Tube (ET) itself which depresses the normal mechanisms of prevention of aspiration such as cough reflex and mucociliary clearance. Pathogenic bacteria can form a biofilm on the ET surface which protects them both from the action of antibiotics as well as the host defence mechanism.
- Cross infection with MDR pathogens.
- Contaminated equipments..

MATERIALS AND METHOD

This study was conducted in the Department of Microbiology, IMS and SUM Hospital over a period of 18 months;130 patients admitted in the Medicine ICU of the hospital with clinical suspicion of Ventilator Associated pneumonia were included in the study.Exclusion criteria included Paediatric patients, presence of lung infiltration prior to intubation or within 48 hours of intubation.and patients diagnosed to have lower respiratory tract infections at the time of admission.

Collection & processing of sample: The Endotracheal Aspirates were collected non- bronchoscopically using a 22 inch 14F suction catheter fitted with a mucus extractor. Processing was commenced within an hour of receipt of the samples and semi- quantitative cultures were done according to standard laboratory procedure.

RESULTS

A total of130out of the 625 patients on mechanical ventilation were included in the study according to inclusion criteria. Of these 130 patients, significant pathogens were recovered from 113 patients. A total of 119 bacteria were isolated from these patients.

Thus, out of the total of 625 patients , 113 developed VAP, which was about 18.08%.

Among the 113 patients, 80 were males and 33 were females. Thus the percentage of males was 70.8% and that of females was 29.2%.

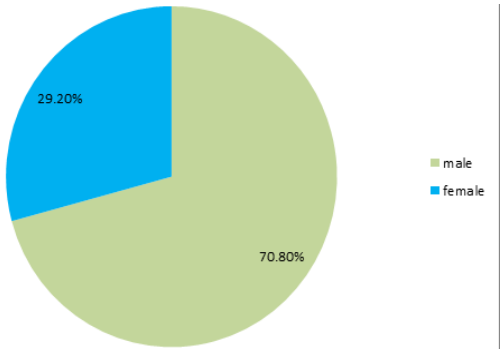

Fig. 1 : Sex distribution pattern of the patients of VAP.

Outcome of vap cases :

Out of the 113 cases, 47 patients expired (41.6%), 42 patients improved and were discharged(37.2%) and the rest 24 patients were discharged on medical advice(21.2%).

Table 1: Outcome of VAP patients

OUTCOME	FREQUENCY	PERCENTAGE
EXPIRED	47	41.6%
DISCHARGED	42	37.2%
DAMA	24	21.2%

The mortality rate in patients of VAP was about 41.6%. Of the survivors, 37.2% were discharged and 21.2% were discharged with specific medical advice.

The high mortality in VAP cases may also be contributed by the underlying disease rather than VAP itself.

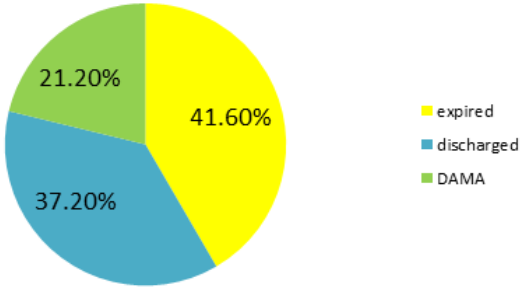

Fig2:outcome of VAP patients.

0ut of the 113 samples, 119 isolates were recovered . The most predominant organism isolated was *Acinetobacter spp* , followed by *Pseudomonas aeruginosa, Klebsiella pneumoniae, Citrobacter freundii, Escherichia coli, Staphylococcus aureus* and *Proteus mirabilis*.113 samples gave pure isolates. Six(6) of the samples produced polymicrobial growth.

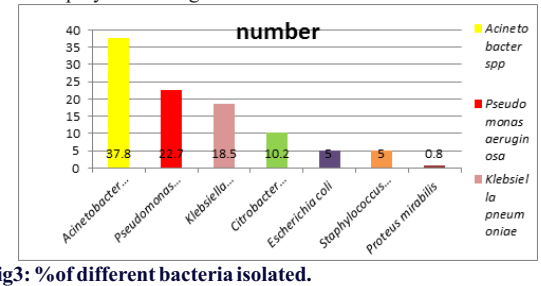

Fig3: %of different bacteria isolated.

Table 2: Distribution of different aerobic bacteria isolated:

ORGANISM	NUMBER(n= 119)	PERCENTAGE
Acinetobacter spp	45	37.8%
Pseudomonas aeruginosa	27	22.7%
Klebsiella pneumoniae	22	18.5%
Citrobacter freundii	12	10.2%
Escherichia coli	6	5.0%
Staphylococcus aureus	6	5.0%
Proteus mirabilis	1	0.8%

DISCUSSION

Amongst nosocomial infections , VAP is a major sub-category and one of the prime cause for increased mortality and morbidity in ICU set-ups. In the European Prevalence of Infections in Intensive Care(EPIC) study, VAP was the most frequent infection; accounting for 45% of all infections in ICUs in Europe(Vincent et al).[7]

In our study a mortality rate of 41.6% was observed. Similar findings were reported in studies done by Panwar et al[8] (37%). Mukhopadhyay et al [9]reported a mortality rate of 61.9%.

The occurrence of VAP in our study was about 18.08%, which is similar to several other studies. Our study finding corroborated with the study of VAP incidence of 17% by Cook D J et al.,[5] and another study by Joseph et al [10], which showed an incidence of 18%.

However our study differed from several studies . A Study by Apostopoulou et al [3] (32%), varied slightly with our study. On the contrary studies conducted by Mukhopadhyay et al [9](42%) , Dey et al [11]varied markedly from our study. In a study done at the John Hopkins School of Public Health by Jaimes et al [12] the incidence (22.2%) was very close to our study.

Among the 113 patients of VAP in our study, 80 were male and 33 female. Thus the percentage of males was 70.8% and that of females was 29.2%. Our study results corroborated with the findings of Eleni Apostopoulou et al [3](71% male and 29% females) and in an Indian study done by Joseph et al [10] (66.7% males and 33.3% females).

In the present study, *Acinetobacter spp* was the most common isolate(37.8%) followed by *Pseudomonas aeruginosa(22.7%), Klebsiella pneumonia(18.5%), Citrobacter freundii (10.2%), Escherichia coli (5.00%), Staphylococcus aureus (5.00%) and Proteus mirabilis (0.80%).* Similar findings were reported by Dey et al [11] where *Acinetobacter spp* was the commonest organism (48.94%). An increased incidence of *Acinetobacter spp* was also found in studies by Singhal et al [13] and Rajashekhar et al [14] In the present study 95 % of the isolates recovered were Gram negative bacilli whereas 5 % were Gram positive cocci. 87% of patients with VAP were infected with Gram negative bacilli as shown in astudy conducted by Chawla et al[4]

Poly-microbial flora was detected in 6 samples.The rate of polymicrobial flora was 5.02%. Rates of polymicrobial infection vary widely. In a study by Singhal et al.,12.3% were polymicrobial[13].

Polymicrobiology of VAP was 4% in study by Combes et al [15]

Acinetobacter spp was the most notorious one, as it showed the maximum incidence of multi-drug resistance with an ESBL percentage of 53.3% and that of MBL of 28.9%. This organism can survive on the hands of health care workers and on inanimate surfaces, thereby posing a threat for patient to patient transmission in ICU set-ups.

SUMMARY AND CONCLUSION

This was a prospective study carried out in the Department of Microbiology in IMS and SUM Hospital. A total of 130 patients were sampled according to the inclusion criteria . Significant pathogens were detected in 113 samples. A total of 119 isolates were recovered from the 113 samples.

The incidence of VAP was clearly in excess in the male sex. The percentage of male patients was about 70.8% , while, that in females was 29.2%.

The mortality rate was about 41.6%. However , the mortality in VAP cases may also be influenced by the under-lying co-morbid cause.

The predominant bacteria isolated was *Acinetobacter spp(* 37.8%), followed by *Pseudomonas aeruginosa* (22.7%), *Klebsiella pneumonia* (18.5%), *Citrobacter freundii* (10.2%), *Escherichia coli, Staphylococcus aureus* (both 5% each), and *Proteus mirabilis* (0.8%, only one isolate).

The judicious use of antibiotics decrease the severity of VAP. International consensus has been raised in this regard; For example in 1999, CDC developed an interagency task force on antimicrobial resistance whose major objective was to provide a blue print for specific coordinated actions to address the threat of emerging antimicrobial resistance (WHO, 2000).[16]

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