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A Study of Bacteriological Profile of Ventilator Associated Pneumonias in A Tertiary Care Government General Hospital

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Abstract: *Ventilator-associated pneumonia (VAP) is common in the intensive care unit (ICU), affecting 8 to 20% of ICU patients and up to 27% of mechanically ventilated patients (Alvaro Rea-Neto et al 2008). Several risk factors have been reported to be associated with VAP, including the duration of mechanical ventilation, and the presence of chronic pulmonary disease, sepsis, Acute Respiratory Distress Syndrome (ARDS), neurological disease, trauma, prior use of antibiotics and red cell transfusions (Tejerina E et al 2006). VAP is also associated with considerable morbidity, including prolonged length of stay in ICU, prolonged mechanical ventilation, and increased costs of hospitalization (Rello J et al Delayed diagnosis and subsequent delay in initiating appropriate therapy may be associated with worse outcomes in patients with VAP (Iregui.M et al 2002). On the other hand, an incorrect diagnosis may lead to unnecessary treatment and subsequent complications related to therapy (Klompas M 2007). Early and accurate diagnosis is, therefore, essential in the management of patients with VAP (Dellinger RP et al 2004).*

Objectives of the present study are: *1. To know the prevalence of VAP 2. To know the most prevalent Bacterial agents associated with VAP 3. To study susceptibility pattern of these organisms to antibacterial agents,.4.To correlate the length of ICU stay with occurrence of VAP. The present study was undertaken on 90 cases of pneumonia which included 60 cases of VAP admitted in Government General Hospital (25) and other ICU's (35) in the city taken as a study group and 30 cases of community acquired pneumonia, which were investigated in the Department of Microbiology Guntur Medical College Guntur were taken to compare the isolates and their susceptibility pattern.*

In Ventilator Associated Pneumonia positivity was 63.33% and in Community Acquired Pneumo In both the groups highest no of cases were found in the age group of 30-49 years .the other significant results of study are discussed in the article

Keywords*: Vap-Ventilator Associted Pneumonia Cap-Community Acquired Pneumonia*

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I. Introduction

Ventilator-Associated Pneumonia (Vap) Ventilator-associated pneumonia is defined as parenchymal lung infection occurring more than 48 hours after initiation of mechanical ventilation. . (Richard Scott Morehead et al 2000)A recent multicenter European study has shown that pneumonia is now the most common infection acquired in the ICU, and when acquired during mechanical ventilation it has an associated mortality of 24% to 71%. (Richard Scott Morehead et al 2000) Gram-negative bacillus pneumonia was recognized as a significant cause of morbidity and mortality in hospitalized patients during the 1950's. (Rogers D, 1959 and Kneeland Y et al 1960) Coinciding with increasing use of mechanical ventilation and antibiotic drugs, contaminated respiratory care equipment was initially implicated as the source of these pathogens; however, despite implementation of infection control measures, pneumonia has remained the most common ICU-acquired infection, with an incidence of 9% to 24% in patients mechanically ventilated for longer than 48 hours. (Papazian et al 1996) A recent multicenter Canadian study evaluated 1014 mechanically ventilated patients and found the following independent predictors and risk factors of ventilator-associated pneumonia; (Cook DJ&, Cook RJ, et al. 1998).

Risk factors:

1. The most obvious risk factor is the endotracheal tube (ET), which bypasses the normal mechanical factors preventing aspiration.
2. While the presence of an ET may prevent large-volume aspiration, micro aspiration is actually enhanced by secretions pooling above the cuff.
3. The ET and the concomitant need for suctioning can damage the tracheal mucosa, thereby facilitating tracheal colonization.

4. In addition, pathogenic bacteria can form a glycocalyx biofilm on the ET surface that protects them from both antibiotics and host defenses.
5. The bacteria can also be dislodged during suctioning and can reinoculate the trachea, or tiny fragments of glycocalyx can embolize to distal airways, carrying bacteria with them.
6. In a high percentage of critically ill patients, the normal oropharyngeal flora is replaced by pathogenic microorganisms.
7. The most important risk factors are antibiotic selection pressure, cross-infection from other infected/colonized patients or contaminated equipment, and malnutrition.
8. Almost all intubated patients experience microaspiration and are at least transiently colonized with pathogenic bacteria.
9. However, only around one-third of colonized patients develop VAP.
10. Severely ill patients with sepsis and trauma appear to enter a state of immunoparalysis several days after admission to the ICU—a time that corresponds to the greatest risk of developing VAP. The mechanism of this immunosuppression is not clear, although several factors have been suggested.
11. Hyperglycemia affects neutrophil function, and recent trials suggest that keeping the blood sugar close to normal with exogenous insulin may have beneficial effects, including a decreased risk of infection.
12. More frequent transfusions, especially of leukocyte-depleted red blood cells, also affect the immune response positively.

Clinical Manifestations

The clinical manifestations of VAP are generally the same as for all other forms of pneumonia: fever, leukocytosis, increase in respiratory secretions, and pulmonary consolidation on physical examination, along with a new or changing radiographic infiltrate. The frequency of abnormal chest radiographs before the onset of pneumonia in intubated patients and the limitations of portable radiographic technique make interpretation of radiographs more difficult than in patients who are not intubated. Other clinical features may include tachypnea, tachycardia, worsening oxygenation, and increased minute ventilation.

Material And Methods

Present study consisted of 60 patients admitted in ICU both in a tertiary care Government General Hospital Guntur and other ICUs. The study period extended from August 2007 to August 2009. Another group of 30 patients attending GGH with Pneumonia (Community Acquired Pneumonia) was analyzed for bacteriological profile.

Inclusion criteria for patients in study group

1. Patients admitted in ICU for diseases of various organ systems requiring ventilator support.
2. Patients more than 48 hrs on ventilator.
3. Running temperature of $> 38^{0}$ C

Exclusion criteria:

1. Patients with ET tube through Tracheostomy.
2. Patients with immunodeficiency .

Laboratory Diagnosis Of Ventilator Associated Pneumonias (Bailey And Scotts Diagnostic Microbiology)
Specimen Collection And Transport

1.Endotracheal or Tracheastomy suction specimens.
2Bronchoscopy
3.Broncho alveolar lavage (BAL)
4.Protected catheter bronchial brush.
5.Transtracheal aspirates
6.Other invasive procedures

The **Endotracheal tube secretions** are collected under sterile precautions and transported immediately in a sterile container and studied by standard Micro Biological techniques (Ref. Mackie and McCartney Practical Micro Biology and Bailey and Scots Diagnostic Microbiology).

The group of CAP included **sputum samples** received from various medical wards and processed in the lab for the Diagnosis of Pneumonia.

Presence of 25 or more polymorphonuclear leukocytes per 100x field, together with few squamous epithelial cells, implies an excellent specimen.

Laboratory methods for bacteriological identification

Macroscopic examination:

Samples were inspected for color, odour and macroscopic appearance. i.e. purulent, blood stained muco purulent, mucoid or clear.

Bacteriological culture methods:Culture media: The media employed were(A) 5% sheep blood agar (B) chocolate agar (C) MacConkey agar plates for aerobic and facultative anaerobic organism.

Sabourauds Dextrose agar was also inoculated for any fungal isolates.

Mycological culture methods:

Direct smears were made and observed with grams stain for the presence of yeast cells and fungal elements.

Procedure for fungal elements: secretions were inoculated on to a Sabouraud's dextrose agar plates and incubated at room temperature observed after 24 hours and 48 hours and also after 72 hours.

Antibiotic sensitivity Tests

The antibiotic susceptibility test was done by standard technique of Kirby- Bauer's disc diffusion method using filter paper disc of 6.0 mm in diameter. (Bauer et al 1966)

II. Results

The present study was undertaken on 90 cases of pneumonia which included 60 cases of VAP admitted in Government General Hospital (25) and other ICU's (35) in the city taken as a study group and 30 cases of community acquired pneumonia, which were investigated in the Department of Microbiology Guntur Medical College Guntur were taken to compare the isolates and their susceptibility pattern. The results of the present study are presented herewith. The Table I show the distribution of cases in the study and culture positivity in both the groups. In Ventilator Associated Pneumonia positivity was 63.33% and in Community Acquired Pneumonia 73.33%.

TOTAL NO OF CASES	**VAP**			**CAP**		
	NO	POSITIVITY	%	NO	POSITIVITY	%
90	60	38	63.33	30	22	73.33

Age wise distribution of the subjects in both groups was shown in Table II. In both the groups highest no of cases were found in the age group of 30-49 years.

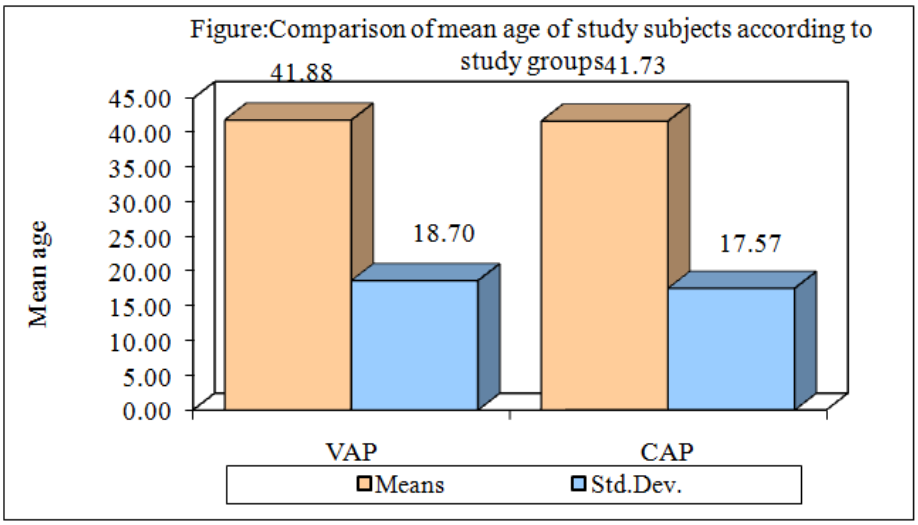
Table II DISTRIBUTION OF STUDY SUBJECTS BY GROUPS AND AGE GROUPS

Age group	VAP	%	CAP	%	Total
10-29	19	31.67	6	20.00	25
30-49	22	36.67	15	50.00	37
50-69	12	20.00	5	16.67	17
70-85	7	11.67	4	13.33	11
Total	60	100.00	30	100.00	90

The mean age in the study group VAP and control group CAP was same (41.88), with a standard deviation of 18.69 in the study group VAP and 17.57 in CAP and 18.23 in the entire group as shown in Table III.

TABLE III MEAN AND SD AGE OF STUDY SUBJECTS ACCORDING TO STUDY GROUPS

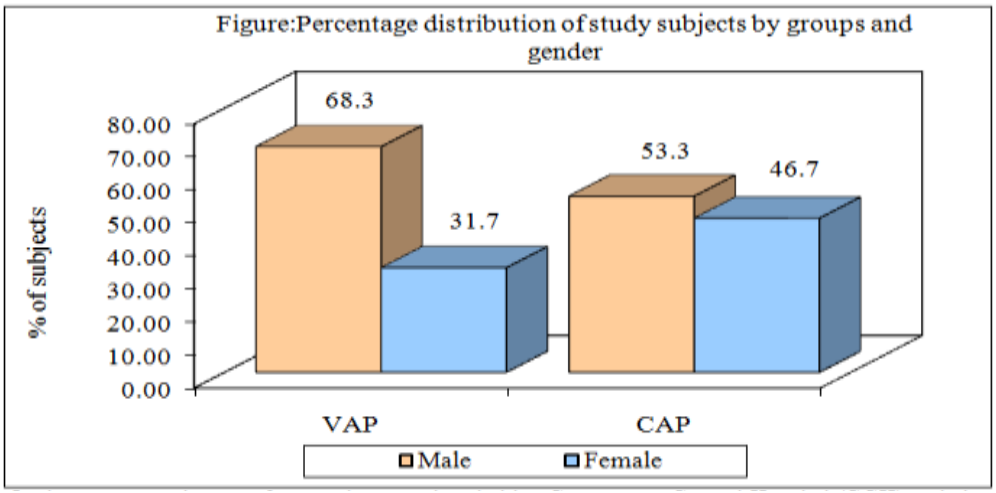
Group	Means	Std.Dev.
VAP	41.8833	18.6957
CAP	41.7333	17.5734
Total	41.8333	18.2303



Gender wise distribution of cases was shown in Table IV. Maximum number of cases in VAP were in males (n = 41) 68.33% compared to females (n=19) 31.67%

Table Iv: Distribution of study subjects by groups and gender

Gender	VAP	%	CAP	%	Total
Male	41	68.33	16	53.33	57
Female	19	31.67	14	46.67	33
Total	60	100.00	30	100.00	90



In the present study cases from tertiary care hospital i.e. Government General Hospital (GGH) and also cases from other ICU'S under private management which also refers their cases to Department of Microbiology Guntur Medical College were included. Out of 60 cases 25 from GGH gave positivity of 72% and 35 form outside I

Table Vcategorisation Of Cases Of Vap Basing On The Source Hospital And Culture Positivity

TOTAL CASES			TERITIARY CARE HOSPITAL			OUTSIDE ICU		
TOTAL	POSITIVE	%	TOTAL	POSITIVE	%	TOTAL	POSITIVE	%
60	38	63.33	25	18	72	35	20	57.14

Outside ICU's gave positivity of 57.14%.

When categorization was done according to the underlying disease and culture positivity, more number of medical cases were registered (43) followed by trauma (15) and surgical (2). Culture positivity rate was more for Trauma cases i.e. 66.6% followed by Medical 62.79% and surgical 50% as shown in tableVI

Table vi: categorization cases of vap according to underlying disease and culture positivity.

UNDERLYING DISEASE	TOTAL	POSITIVE	%
MEDICAL	43	27	62.79
SURGICAL	2	1	50
TRAUMA	15	10	66.66

In the present study an attempt was made to find out the influence of duration of stay in ICU and duration of ventilator support on the development of ventilator associated pneumonia. It was found that longer the stay in ICU and the longer the patient was kept on Ventilator support the more was the positivity culture. This was found to be statistically significant (P leve l= 0.0407 calculated according to spearman's

Table Vii: Correlation among Stay in ICU, VP support and Culture positivity by spearman's rank correlation coefficient method

Variables	N	Spearman Rank correlation	t-value	p-level
Stay in ICU & VP support	60	0.8888	14.7731	0.0000*
Stay in ICU & Culture positivity	60	-0.1348	-1.0358	0.3046
VP support & Culture positivity	60	-0.2650	-2.0934	0.0407*

Table 1X shows different isolates from cases of VAP and CAP 11 out of 60 cases of VAP were sterile on culture and 11 yielded culture of nonpathogenic organisms out of 60 cases (18.33%). Maximum number of isolates form VAP were Staphylococcus saprophyticus followed by Methicillin Resistant Staphylococcus aureas (MRSA)(7), Klebsiella oxytoca (6), Klebsiella pneumonia (4), Pseudomonas aeruginosa (3), Methicillin sensitive Staphylocccus aureas(MSSA) (2), Escherichia coli (2), Acinetobacter (1) a mixture of coagulase negative staphylococci and Proteus mirabilis (1) and a mixture Staphyloccus aureus and Candida (1). In cases of CAP Pseudomonas aeruginosa (5) and Klebsiella pneumoniae (5) were predominant organisms followed by Streptococcus pneumoniae (3), Staphyloccus saprophyticus (3), Escherichia coli (2), Candida (2), Beta Hemolytic Streptococci was isolated form 1 case of CAP and mixture Methicillin Resistant Staphyloccus aureus and Klebsiella in 1 case.

table ix: Comparison of the organism profile in the study group and control group.

SL NO	REPORT	VAP	%	CAP	%	Total
1	Staphylococcus saprophyticus	11	18.33	3	10	14
2	MRSA	7	11.67	0	0	7
3	Klebsiella oxytoca	6	10	0	0	6
4	Klebsiella pneumoniae	4	6.67	5	16.66	9
5	Psedomonas aeruginosa	3	5	5	16.67	8
6	Staphylococcus aureus(MSSA)	2	3.33	0	0	2
7	Escherechia coli	2	3.33	2	6.67	4
8	Acinetobacter	1	1.67	0	0	1
9	CONS, Proteus mirabilus	1	1.67	0	0	1
10	Staph, Candida	1	1.67	0	0	1
11	Streptococcus pnemoniae	0	0	3	10	3
12	Klebsiella & MRSA	0	0	1	3.33	1
13	Beta haemolytic Streptococci	0	0	1	3.33	1
14	Candida	0	0	2	6.67	2

15	NPO*	11	18.33	7	23.34	18
16	Culture Sterile	11	18.33	1	3.33	12
	TOTAL	60	100	30	100	90

***NPO: Non pathogenic organisms includes Aerobic spore bearers, Diphthiroids, Micrococci**

Table Xshows the distribution of isolates in cases of VAP in GGH and outside ICUs. Out of 38 culture positive cases of VAP, 18 cases were from GGH and 20 were from other ICUs. Staphylocccus saprophyticus was the predominant isolate in both the groups (4 out of 18 in GGH and 7 out of 20 in other ICUs). This was followed by MRSA(7 out of 38, 2 form GGH 5 from other ICU's). Klebsiella oxytoca was isolated from 6 cases 3 each from GGH and outside. Klebsiella pneumoniae was isolated in 4 cases 2 from each GGH and outside ICUs. Acinetobacter species was isolated from 1 case of GGH. 1 case from GGH yielded a mixture of Proteus and Coagulase Negative Staphylococci and 1 case from other ICUs yielded Staphylococcus aureas and Candida.

Table X: Distribution Of Study Subjects By Report Of Organism And Icu Type

TOTAL ISOLATES			**GGH**		**OTHER ICU**	
ORGANISM	**NO**	**%**	**NO**	**%**	**NO**	**%**
Acinetobacter	1	2.63	1	100	0	0
Escherichia coli	2	5.26	2	100	0	0
Klebsiella pneumonia	4	10.53	2	50	2	50
Klebsiella oxytoca	6	15.79	3	50	3	50
MRSA	7	18.42	2	28.57	5	71.42
MSSA	2	5.26	1	50	1	50
Pseudomonas aeriginosa	3	7.9	2	66.66	1	33.33
Staphylococcus saprophyticus	11	28.95	4	36.36	7	63.63
Staph+ Candida	1	2.63	0	0	1	100
Proteus +CONS	1	2.63	1	100	0	0
Total	38	100	18	47.36	20	52.63

Bacteriological isolates of proven ventilator- associated pneumonia reported by different authors.						
ORGANISMS	**Present study 2009**	**Fagon et al 1989**	**Kollef and Ward, 1998**	**Papazian et al 1996**	**Rello et al 1997**	**Timsit et al 1996**
Streptococcus pneumoniae	NIL	4%	1%	NS	7%	4%
Staphylococcus aureus	15%(MRSA+MSSA	20%	30%	21%	9%	26%
Staphylococcus saprophyticus	28.94%	NR	NR	NR	NR	NR
Pseudomonas aeruginosa	5%	19%	29%	27%	50%	16%
Acinetobacter species	1.67%	10%	4%	5%	NS	12%
Stonotrophomonas maltophila	NIL	NS	7%	3%	NS	NS
Enterobacter species	NIL	1%	6%	8%	NS	NS
Haemophilus influenzae	NIL	6%	1%	8%	10%	13%
Other GNB	26.66%	24%	10%	28%	4%	10%

All the isolates were subjected to Antibiotic susceptibility test. Table XI shows that maximum number of isolates from VAP were found to be sensitive to Ciprofloxacin [(9) 15%] followed by Vancomycin, Piperacillin and Tazobactum , Amikacin [(7) 11.67%], Cefoperazone 6 (10%), Azithromycin [(5)8.33%],

Ceftazidime (4) and Gentamycin (4) each [6.67%], Ampicillin+Sulbactum(4), Erythromycin 3, Levofloxacin 2, Methicillin 2 , Penicillin 2 ,Ceftriaxone 1,Imepenem 1.

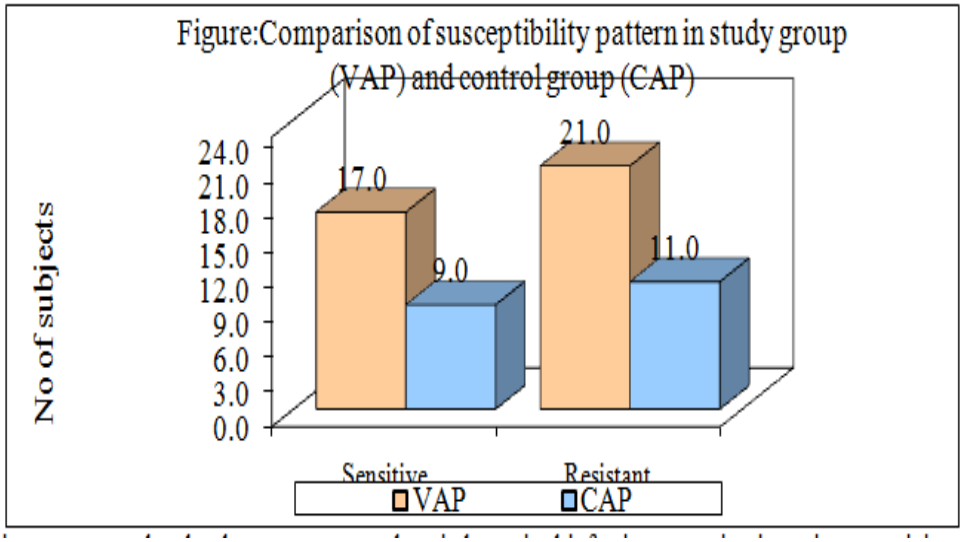
Maximum number of isolates in CAP were sensitive to Ceftriaxone(7) followed by Amikacin, Ceftazidime, Ciprofloxacin 5 each, Cefaperazone 4, Erythromycin 3, Levofloxacin 2, combination of Ampicillin+ Sulbactum 2, Imipenum 1, Methicillin 1, Vancomycin 1, Tetracycline 1. The susceptibility pattern of the isolates form both VAP and CAP was compared (Table XIV & Fig. V). Resistance was observed in isolates form VAP as well as CAP, almost equally. The susceptibility was 45% in both VAP and CAP and resistance was 55%. Difference in susceptibility pattern of the isolates from VAP& CAP was not statistically significant as shown in table XIand fig VI.

Table Xi Susceptibility pattern of the isolates in both the groups

Sensitogram	VAP	%	CAP	%	Total
Ampicillin	3	5.00	0	0.00	3
Amikacin	7	11.67	5	16.67	12
Ampicillin+sulbactum	4	6.67	2	6.67	6
Azithromycin	5	8.33	0	0.00	5
Ceftazidime	4	6.67	5	16.67	9
Ciprofloxacin	9	15.00	5	16.67	14
Ceftriaxone	1	1.67	7	23.33	8
Cefoperazone	6	10.00	4	13.33	10
Erythromycin	3	5.00	3	10.00	6
Gentamycin	4	6.67	2	6.67	6
Imipenum	1	1.67	1	3.33	2
Levofloxacin	2	3.33	2	6.67	4
Methicillin	2	3.33	1	3.33	3
Penicillin	2	3.33	0	0.00	2
Piperacillin+tazobactum	8	13.33	0	0.00	8
Vancomycin	8	13.33	1	3.33	9
Tetracycline	0	0.00	1	3.33	1

Table Xii: Comparison of susceptibility pattern in study group (VAP) and control group (CAP)

Drug susceptibility	VAP N=38	%	CAP	%	Total
Sensitive	17	44.74	9	45.0	26
Resistant	21	55.26	11	55.0	32
Total	38	100.00	20	100.00	90



III. Discussion

Ventilator associated pneumonia was reported to be the most common hospital acquired infection occurring in patients receiving mechanical ventilation. (Richard et al 2000).VAP has an impact on the patient's outcome increasing the morbidity and mortality Vincent J. et al 1995, Cook Dj et al 1998 found that approximately 20% of the critically ill patients receiving mechanical ventilation developed VAP.

Infection with multidrug resistant strains of common pathogens and high risk pathogens was found to be common in VAP (study by Canadian critical care study group 2006).

In view of the above facts and due to lack of availability of any data relating to VAP in our area, present study was undertaken to know the prevalence of VAP in Government General Hospital(GGH) and other ICUs outside GGH in Guntur and the Aerobic and facultative microbial flora in these cases were analyzed. Due to technical constraints anaerobes could not be studied. Simultaneously a group of 30 cases of community acquired pneumonia which were processed for routine diagnosis were also analyzed and flora from VAP and CAP were compared for their prevalence and susceptibility.

This study is mainly an observational study and not designed for comparison of different sampling techniques nor the follow up. This study is aimed at mainly the identification of the bacterial pathogens prevailing in VAP cases and their susceptibility pattern to have a good guide for appropriate antibiotic stewardship for cases of clinically suspected VAP. From cases of VAP Endotracheal secretions (ETS) were collected from the most possible distal site through a suction cannula introduced through the endotracheal tube and were processed immediately. Nonquantitative cultures of ETS was found to be as good as quantitative culture of Brochoalveolar lavage (BAL) sample as reported by the Canadian critical care trial group studies 2006 and many other studies. Hence as it is easy, time saving, bedside technique which does not require special training, ETS sample was chosen for the present study and semi quantitative cultures were done. Any growth of $> 10^3$/ml is taken as positive on culture. Table I reveals a positivity rate of 63.3% from ETS sample in VAP group and 73.33% from sputum samples from CAP group.

There is no comparable data available. Because of the paucity of well controlled comparison trials, the value of sputum culture in community and Hospital acquired pneumonia is still being debated. Similarly there are many controversies regarding the clinical diagnosis and microbiological diagnosis of VAP. Fagon et al in 1988 conducted a study on 147 patients on mechanical ventilation who were clinically diagnosed as having bacterial pneumonia. Only less than 50% of patients were found to be positive on culture from bronchoscopic specimens. Much of these controversies about the clinical relevance of various diagnostic strategies arise from a lack of gold standard against which the techniques can be compared. Under diagnosing nosocomial pneumonia increases the risk of not treating the patients with serious infections.

In the present study common age group which required admission in ICU with mechanical ventilation was 30-49 yrs as shown in Table II. Age is one of the factors which predispose any individual to infection more so when there is an underlying cause. Rello. J et al 2002 reported a mean age of 61.7± 19.2 in patients with VAP. A mean age of 58.7 yrs with a standard deviation of ± 18.0 was reported in the Canadian study group 2006. In our study the mean age was 41.83±18. Sex preponderance in this study as shown in Table III was male (68.33%) Vs female (31.67%). Craven 1986, Kollef MH 1993, Craven 1986, Cook et al 1998, Rello.J et al 2002 have identified male gender as a risk factor for VAP. In our study also there was a male preponderance which was correlating with the other reports.

The type of admission into ICU requiring mechanical ventilation also has an effect on the development of VAP and its outcome as shown in Table IV. In the study by Canadian critical care trial group, 24 % of admissions were trauma, followed by CVS disease (23.8%) respiratory disease (19.5%) CNS disorders (13.6%), Gastro intestinal disease (6.4%) other 6.7% and 4.8% due to sepsis and 1.1% were due to renal disease.In our study admission due to underlying medical problem was more (43/60) where as admissions due to Trauma was 15/60. A higher positivity rate on culture was found in Trauma cases than in medical group in contrast to the other studies.

In the study by Rello .J et al on the "Epidemiology and outcomes of Ventilator associated pneumonia" in a large US database 2002, three hundred and eighty one episodes (45.2%) of VAP occurred during the first 2 days of hospitalization compared to 245 episodes (29.1%) occurring between days 3 to 6 and 216 episodes (25.7%) diagnosed after 6 days of hospital stay. Similarly 532 episodes (63.2%) of VAP developed within 48 hrs of mechanical ventilation compared to 135 episodes (16.0%) between 48 hrs and 96 hrs of mechanical ventilation and 175 episodes (28.8%) after 96 hrs of mechanical ventilation.In our study also it was found that the longer the stay in ICU and longer the patient was kept on ventilator support the more was the positivity on culture which was statistically significant**. (P level 0.0407)** calculated according to spearman's rank correlation coefficient method.

Patients with VAP had a significantly longer duration of mechanical ventilation (14.3±15.5 days Vs 4.7± 7 days $P < 0.001$), a greater number of ICU days (11.7±11.0 days Vs 5.6± 6.1 days $P < 0.001$) and a longer hospital length of stay (25.5± 22.8 days Vs 14.0±14.6 days, $P < 0.001$) compared to patients without VAP as reported by Canadian critical care study group 2006. In the study by Jorde Rello J et al (2002) VAP was a common hospital acquired infection occurring in 9.3 % of patients requiring mechanical ventilation for > 24 hrs. Male gender, trauma admission, and intermediate predicted risks of mortality were identified as independent risk factors associated with VAP. Observations in our study are correlating with these authors.

In the present study the correlation between smear positivity and culture positivity as shown in Table VIII was found to be highly significant **(P Value 0.0000)** A similar observation was reported by Prekates A et al 1998, Delfo F et al 2001, Davis KA et al 2005. The presence of bacteria in gram stains of Bronchoalveolar specimens had a sensitivity of 44% to 90% and specificity of 49% to 100% in identifying patients with VAP. Davies et al 2005 showed that the accuracy of grams stains was slightly better for gram positive than for gram negative microorganisms. Although the presence of bacteria on gram stain appears to have a reasonable accuracy compared to quantitative culture available two to three days later, the agreement between smear and culture positivity ranging from 79.4 to 86%.

In our present study, the organism profile and positivity on culture as shown in Table X is as follows. 18.33% of cultures were sterile and 18.33% of cultures yielded non pathogenic organisms (N.P.O) in 63.33% we could isolate different pathogenic organisms of which gram positive cocci was the predominant isolate with Staphylococcus sapropyticus(18.33%) Methicillin Resistant Staphylococcus aureas(MRSA) in (1.67%) and Methicillin sensitive Staphylococcus aureas (MSSA) in 3.33% and other isolates were gram negative bacilli which includes Klebsiella oxytoca in 10%, Klebsiella pneumonia 6.67%, Pseudomonas aeruginosa in 5%, Escheresia coli in 3.33%, Acinetobacter in 1.67% and mixture of coagulase negative Staphylococci and Proteus mirabilis in 1.67% and mixture of Staphylococus and candida in 1.67%.

This when compared to other studies by different authors as shown in Table XII showed that bacteriological profile in different studies is highly variable. Many factors like cause for admission into ICU, underlying medical disease and prior antibiotic therapy for reasons other than VAP etc might be the reasons for the high variability in organisms' profile. Gram positive cocci and the conventional gram negative pathogens were predominant isolated in all the studies.

In the recent study as shown form Table XIII most of the isolates had maximum susceptibility to Ciprofloxacin (15%) followed by Vaccomycin (13.33%) a combination of Piperacillin and Tazobactum (13.33%) Amikacin in (11.67%), Cefaperazone in 10%, Azithromycin 8.33%, Ceftazidime, Gentamycin and Ampicillin + Sulbactum 6.67% each. Erythromycin was found to be effective in only 5% of isolates. Levofloxacin, Methicillin and Penicillin in 3.33% each and Imipenum, Ceftriaxone in 1.67% of isolates. A comparison of susceptibility and resistant pattern of isolates of VAP and CAP is almost the same in both the groups with no statistical significance. But previous studies proved that the study of the susceptibility pattern of the organism is a must as empirical antibiotic treatments were shown to result in the emergence of Multidrug resistant pathogens (MDR) as reported by Mnuel Ireguei et al 2002. Luna CM et al 1997, Alvanaz - Lerma F 1996, Kolle F MH, 2000 have shown that 62.2% of the isolates from VAP were resistant microorganisms which included gram negative bacteria like Pseudomonas aeruginosa, Acinetobacter species, Klebsiella species and Stapphylococcus aureas especially MRSA. Rello J et al 1999 & Namias N et al 2000 recognised that the predominant pathogens associated with hospital acquired infections and their susceptibility may vary between the hospitals as well as among the specialized units within the hospital.

IV. Summary And Conclusions

Present study on "The Bacteriological Profile of Ventilator Associated Pneumonias" is aimed at determining the prevalence of VAP in mechanically ventilated patients and clinically diagnosed as having pneumonia. As previous studies proved that non quantitative cultures of Endotracheal secretions (ETs) yielded results comparable to specimens obtained by more invasive procedures like protected bronchial brush specimen and BAL , ETS sample were chosen for the present study as it was easy and non invasive bedside procedure. A positivity of 63.33% was obtained in this study and there was good correlation between direct smear examination and culture positivity (P value 0.0000).

Correlation of the culture positivity with duration of ventilator support is also shown to have statistical significance. The specimens from cases on prolonged ventilator support yielded more positivity (P level = 0.0407). The predominant isolates in the present study were staphylococcus aureus both MRSA & MSSA and Staphylococous saprophyticus, followed by conventional pathogens in gram negative bacilli like Klebsiella species, Escherechia coli and Proteus. Multi drug resistant and uncommon pathogens like Pseudomonas aeruginosa, Acinetobacter species etc were also isolated in the present study. The only fungal isolate in present study was Candida species. The bacteriological profile was correlating with that of other authors but in different numbers as was observed in many studies. The susceptibility pattern of the isolates was also variable and about 55% of the isolates were multidrug resistant. The same was observed with the isolates form cases of CAP also.

V. Conclusions

1. VAP is common in mechanically ventilated critically ill patients.
2. The longer the Ventilatory support, the more is the risk of developing VAP.
3. ET secretions with direct smear examination and semi quantitative culture yield reliable results with good statistical significance.(In the present study P value = 0.0000)

4. Laboratory diagnosis is also important in clinically suspected cases of VAP as VAP may be over estimated when only clinical criteria are used for diagnosis.
5. The rapid availability of results of direct smear examination may help in initiating the empirical treatment but should always be accompanied by the results from culture and sensitivity pattern for appropriate antibiotic therapy.
6. Multi drug resistance is a common observation with the isolates from VAP as well as CAP. Hence all cases of pneumonia should be subjected to culture and antibiotic sensitivity test as irrational antibiotic therapy may result in emergence of more and more multidrug resistant strains.

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