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A Study of Clinical Profile and the Causative Organism in Patients with Nosocomial Pneumonia.

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Conflicts of Interest: Nil.

Abstract

Aim: To study the clinical profile of nosocomial pneumonia, the bacterial pathogens causing nosocomial pneumonia, the demographic and other risk factors associated with the occurrence of nosocomial pneumonia.

Materials and Methods: 50 patients admitted in YENEPOYA MEDICAL COLLEGE HOSPITAL who developed nosocomial pneumonia over a period of 2 years from October 2013 to October 2015 were included. Relevant clinical data was obtained from the patient. Patients (aged above 12 years) of both sexes, who developed nosocomial pneumonia according to the definition was included. A detailed clinical examination was performed. Routine investigations like Complete blood count, Gram staining of sputum/trachea- bronchial secretions/BAL, Culture& sensitivity of sputum/trachea bronchial secretions/ BAL, HIV (ICTC), Blood culture, Chest X-ray, Urine routine, RBS, Serum creatinine, Blood urea, Serum electrolytes, CT (optional), Bronchoscopy (optional) was perfomed.

Results: In our study, among 50 diagnosed nosocomial patients, 25 were in early onset and 25 were in late onset, which showed no significant difference between the onset of both HAP and VAP. 38% of patients were above the age group of 40 years among them 68% were males. 24% of patients with CAD developed Nosocomial pneumonia. 72% of patients had respiratory illness, 42% had Diabetes, 38% had Hypertension and 20% had Ischemic Heart Disease.83.3% of patients who developed VAP had a GCS scale less than 12. Most common organisms isolated were Acinetobacter (40%) followed by Pseudomonas (30%), and Klebsiella (20%).

Conclusion: Nosocomial pneumonia occurs in both developed and poor countries. Diagnostic delays and hospital stay should be shortened in order to reduce these infections. Commonest organism isolated from Nosocomial Pneumonia patients was Acinetobacter followed by Pseudomonas and Klebsiella which belong to gram negative group of bacilli.

Keywords: Nosocomial pneumonia, ICU, Hospital acquired pneumonia, Intubation, Mechanical ventilation.

Introduction

Nosocomial pneumonia is the second most frequent hospital acquired infection and the most frequently

acquired infection in the ICU (Intensive Care Unit)(1). Hospital acquired pneumonia remains the commonest cause of mortality and morbidity in spite of latest diagnostic and management modalities(2).

Hospital acquired pneumonia is defined as pneumonia occurring >48 hours after admission and excluding any infection that is intubating at the time of admission(3). Pneumonia is currently the second most common nosocomial infection but has the highest morbidity and mortality and its presence increases hospital stay by an average of 7 – 9 days per patient(4). Studies have estimated that between one third to half of hospital acquired pneumonia deaths are the direct results of infection(5). The American Thoracic Society statement suggests the categorization of nosocomial pneumonia as early onset which occurs after 4 days of hospital admission and late onset which occurs after 5 days of hospital admission(6). Most cases of nosocomial pneumonia in the ICU occur in the patients who are on tracheal intubation and receiving mechanical ventilation. Ventilator Associated Pneumonia occurring with mechanical ventilation is categorized as early onset Ventilator Associated Pneumonia (within 48 hours of mechanical ventilation) and late onset (which occurs after 4 days of mechanical ventilation)(7). Ventilator Associated Pneumonia is the most common nosocomial infection found in the intensive care unit with a reported incidence of 9% to 24%(8).

The organisms causing Hospital Acquired Bacterial Pneumonia (HABP) and Ventilator Associated Bacterial Pneumonia (VABP) require prompt and appropriate choice of empirical treatment to prevent poor clinical outcomes especially for increasing incidence of infections due to MRSA and non-fermentative gram negative bacilli in Ventilator Associated Pneumonia(9).

Objectives

To study the clinical profile of nosocomial pneumonia, the bacterial pathogens causing nosocomial pneumonia.

Materials and Methods

50 patients admitted in YENEPOYA MEDICAL COLLEGE HOSPITAL who developed nosocomial pneumonia over a period of 2 years from October 2013 to October 2015 were included in the study.

Relevant clinical data (demographic- name, age, sex, place, occupation) including history was obtained from the patient. A detailed clinical examination was performed.

Investigations or interventions conducted included: Complete blood count (Hemoglobin%, total leucocyte count , Differential Counts, ESR), Gram staining of sputum/trachea- bronchial secretions/ bronchioalveolar lavage(BAL), Culture & sensitivity of sputum/trachea bronchial secretions/ BAL, HIV , Blood culture, Chest X-ray, Urine routine, Random blood sugar, Serum creatinine, Blood urea, Serum electrolytes, Computed tomography (optional), Bronchoscopy (optional).

Inclusion criteria-

Patients (aged above 12 years) of both sexes, who developed nosocomial pneumonia according to the definition.

Diagnosis of Ventilator associated pneumonia in patients on ventilator for more than 48 hours: presence of a new, persistent or progressive infiltration on chest x-ray & 3 of four criteria:

1. Body temperature above 38.5 degree centigrade or < 36 degree centigrade.
2. Blood leucocytosis of >12,000/ cubic mm or leucopenia of < 4,000 / cubic mm
3. >10 leucocytes/ high power field in gram staining of tracheal aspirate.
4. positive culture from culture aspirate.

Diagnosis of Nosocomial pneumonia in patients not on ventilator: New infiltrates on chest X-ray not attributed to another disease process & at least two of the following criteria.

1. Cough or increasing severity of coughing.
2. Purulent or mucopurulent sputum or trachea-bronchial secretions or change in character of sputum.
3. Body temperature > 38degree centigrade or < 35 degree centigrade.
4. Auscultatory findings, rales, or evidence of pulmonary consolidation.
5. Respiratory rate >30/min &dyspnoea
6. Spo2 < 90% on room air.
7. WBC count > 10,000/cumm or ,<4,500/cubic mm.

Exclusion Criteria-

Patients below 12 years

Patients who came with respiratory infection , those who developed respiratory infection less than 48 hours , those who were discharged from intensive care unit less than 48 hours or died within 48 hours.

Statistical analysis:

Statistical analysis was done using SPSS V20. Results expressed in number and percentages. Chi–square test was applied to assess the age, gender and other socio-demographic factor related differences in outcome variables.

Results

Total 50 patients were diagnosed with Nosocomial Pneumonia including both HAP/VAP. Our study shows that nosocomial pneumonia is more commonly occurring in patient age group above 40 years. 26% of the cases were in the age group 51-60 years, and 38% were above the age of 60 years. As the age advances incidence of nosocomial pneumonia also increases. 68% were males and 32 % were females patients, which shows a male predominance. Among 50 Nosocomial pneumonia patients, 25 had an early onset and 25 had late onset disease. The study showed that patients with CAD and COPD had a high risk of developing nosocomial pneumonia during hospitalization. 72% of patients who developed nosocomial pneumonia had pre respiratory illness, 42% had Diabetes Mellitus, 38% with Systemic Hypertension and 20% with IHD. All the patients who developed ventilator associated pneumonia had a duration of intubation of more than or equal to 5 days. This indicates that increased duration of intubation is a risk factor for VAP. the most common organism isolated is Acinetobacter (40%) with pseudomonas (30%) and Klebsiella (20%) in the descending order.

Discussion

The Nosocomial Pneumonia is one of the most common hospital acquired infection. The timely diagnosis and accurate initial empirical antibiotic therapy has been shown to have a major impact on mortality from nosocomial pneumonia. This study was done to assess the clinical profile, risk factors, causative organism and the treatment outcome with nosocomial pneumonia in Yenepoya Medical College, Mangalore.

A total of 50 patients were diagnosed with nosocomial pneumonia within a time period of one year. Out of 50 patients there were 20 HAP patients and 30 VAP patients, among them 25 were in the early onset and 25 were in the late onset category i.e., 50 % were early onset and 50 % were late onset. Our study showed that there was no significant difference between the onset of disease of both HAP and VAP which correlates with other studies done by Emad H Ibrahim et al(10) which showed that in their study 56% had early onset and 44% had late onset, Dey et al(11) had 47.7 early onset and 52.3 late onset disease. Our study relied on the CDC criteria which is based on clinical and radiological criteria combinedwith culture

positivity from either an endotracheal aspirate, sputum in case of HAP patients, blood or both.

Our study included 34 (68%) male and 16 (32%) female patients, which showed a male predilection for the incidence of nosocomial pneumonia similar to another study done by Greenaway et al[12] which also showed a male predilection to nosocomial pneumonia. More incidence in males can be due to addictions such as tobacco smoking, alcohol intake etc which compromises the immune status.

The age distribution of nosocomial pneumonia was studied. In the present study the distribution of nosocomial pneumonia was more in the age group above 40 years ranges showing 41-50(18%), 51-60 (26%), >60 (38%) which is supported by other studies done by Fagon JY et al[13] and Dr.Girish L Dandagi et al. (1). This shows that incidence of nosocomial pneumonia is age dependent.

Comorbid illness and incidence of VAP was studied. Out of 50 patients 36 patients (72%) had pre respiratory illness including COPD, 21 patients (42%) had Diabetes, 19 patients (38%) had Hypertension and 10 patients (20%) had Ischemic Heart Disease which showed that pre respiratory illness is an important pre disposing factor for the development of nosocomial pneumonia. Relation between pre respiratory illness and nosocomial pneumonia was consistent with a study done in JIPMER by Noyal Maria Joseph etal[15].

Out of 30 ventilated patients all the patients had a duration of intubation of more than 5 days before the onset of VAP. The result was statistically significant with p value 0.001, i.e. as the duration of mechanical ventilation increases there is increased incidence of VAP. The result was consistent with the study done byFagon et al (13)which showed 7% incidence in less than 10 Days and 19% at 20 days so prolonged mechanical ventilation is an important risk factor for development of VAP.

Several authors have examined the relation between duration of endotracheal intubation and the development of VAP. Fagon et al (13)estimated an increased risk of 1% per day of mechanical ventilation.Torres et al using multivariate analysis reported an increased incidence of VAP among patients ventilated for more than 5 days compared with less than 5 days (16) There is a similar trend of increasing lengths of endotracheal intubation and a high rate of acquisition of VAP in the first 10 days of intubation in our study.

The reason for this is not clear but probably could be explained by interaction of several risk factors that are both host and environment related during the initial days of intubation. Prolonged duration of ventilation and increased incidence of VAP has been studied by several authors. Fagon et al had reported risk of VAP to be 7% at 10 days, 19% at 20days and 28% at 30 days of mechanical ventilation (13). It has also been found that respiratory devices and its components like ventilatory circuits and humidified chambers are potential sources of colonization.

Among 30 VAP patients 25 had a GCS <12 (83.3%). The result was statistically significant with P value 0.001. This was similar to study done by AlokGupta(14). Increased incidence of VAP in unconscious patients is due to increased risk of micro aspiration and decreased local immunity.

We observed that Gram negative organisms were the predominant causative flora in our Nosocomial pneumonia patients. Most common organisms isolated in our patients is Acinetobacter (40%) and Pseudomonas (30%) followed by klebseilla (20%), Escherichia coli (6%), Enterobacter (2%) and Streptococcus pneumonia (2%) as compared to other studies done by Rakshith et al[17] Fagon et al(13) and Torres et al[16].

Trivedi et al(18) reported 38% of his patients had VAP. The organisms were Pseudomonas (55%), Acinetobacter

(20%), Staphylococcus (14.5%) and Klebsiella (15%). In this study the most common offending organisms isolated were Acinetobacter (40%) and Pseudomonas (30%).

The morbidity and mortality associated with Gram negative bacteria was found to be significant. In our study we found highest morbidity with Acinetobacter infection and the mortality being 70.6% followed by Pseudomonas i.e. 17.6% followed by Klebsiella 11.8%.

The patients were followed up for clinical outcome of Nosocomial Pneumonia. Out of 50 patients 17 expired (34%), among them15 were late onset VAP and 2 were early onset VAP. 33 patients (66%) were improved and discharged.

The reason for high prevalence of HAP/VAP may be due to the presence of co morbid illness and most of the patients were seriously ill. The health seeking behaviour in our patients is different when compared to that of the western population. By the time the patient is referred to the tertiary care center his underlying disease would have progressed and may be irreversible. This may necessitate longer duration of hospital stay or mechanical ventilation, which is directly proportional to the development of HAP/VAP.

Conclusion

Nosocomial pneumonia occurs in both developed and poor countries. Diagnostic delays and hospital stay should be shortened in order to reduce these infections.

In our study most of the patients were above the age group of 40 years with a male predilection.

Patients with CAD and COPD had a high risk of developing nosocomial pneumonia during hospitalization. Prolonged duration of ventilation is associated with increased incidence of VAP**.** Comorbid illness like pre respiratory illness (COPD), diabetes is associated with increased incidence of NP. Decreased level of consciousness increased the incidence of VAP.

Commonest organism isolated from Nosocomial Pneumonia patients was Acinetobacter followed by Pseudomonas and Klebsiella which belong to gram negative group of bacilli.

Most of the patients showed resistance to commonly used antibiotics, so Nosocomial pneumonia suspected patients in our hospital either ward or in ICU can be empirically started on antibiotics which are having gram negative bacilli coverage.

Multidrug resistant strains are increasing most commonly Acinetobacter strain. Thus polytherapy with multiple antibiotics will be effective thereby improving the outcome of the patients. Most patients with VAP have poor clinical outcome compared to HAP group thus effort should be made to reduce risk factors like use of mechanical ventilation, total parenteral nutrition and long stay in the hospital especially intensive care.

Initial antibiotic therapy should be given promptly because delays in administration may add to excess mortality resulting in from HAP/VAP. In selecting empiric therapy for patients who have recently received an antibiotic, an effort should be made to use an agent from a different antibiotic class, because recent therapy increases the probability of inappropriate therapy and can predispose to resistance to that same class of antibiotics. Clinical improvement usually takes 48–72 hours, and thus therapy should not be changed during this time unless there is rapid clinical decline. Non response to therapy is usually evident by Day 3, using an assessment of clinical parameters. The responding patient should have de-escalation of antibiotics, narrowing therapy to the most focused regimen possible on the basis of culture data. Non-responding patient should be evaluated for noninfectious mimics of pneumonia, unsuspected or drug-resistant organisms, extrapulmonary sites of infection, and complications of pneumonia and its therapy. Diagnostic

testing should be directed to whichever of these causes is likely.

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Table 1: Age Distribution of HAP and VAP

AGE	Nosocomial Pneumonia				Total	%
	HAP		VAP			
	Number	%	Number	%		
12-20	1	5%	2	6.7%	3	6%
21-30	2	10%	1	3.3%	3	6%
31-40	0	0.0%	3	10%	3	6%
41-50	4	20%	5	16.7%	9	18%
51-60	7	35%	6	20%	13	26%
>60	6	30%	13	43.3%	19	38%
Total Number (n)	20	100%	30	100%	50	100%

Table 2: Gender Distribution of HAP/VAP

GENDER	Nosocomial Pneumonia				Total	%
	HAP		VAP			
	Number	%	Number	%		
Male	17	85%	17	56.7%	34	68%
Female	3	15%	13	43.3%	16	32%
Total	20	100%	30	100%	50	100%

Table 3: Onset of Disease of HAP/VAP

ONSET OF DISEASE	Nosocomial Pneumonia				Total	%
	HAP		VAP			
	Number	%	Number	%		
Early	10	50.0%	15	50.0%	25	50%
Late	10	50.0%	15	50.0%	25	50%
Number	20	100%	30	100%	50	100%

Table 4: Comorbidities and HAP/VAP

COMORBIDITIES	Nosocomial Pneumonia				Total	%
	HAP (n=20)		VAP (n=30)			
	Number	%	Number	%		
Diabetes Mellitus	10	50%	11	52.4%	21	42%
Systemic Hypertension	5	25%	14	73.7%	19	38%
Ischemic Heart Disease	2	10%	8	80.0%	10	20%
Pre Respiratory Illness	16	80%	20	55.6%	36	72%

Table 5: Duration of Intubation and VAP

DURATION OF INTUBATION	VAP		Total	%
	Number	%		
≤4 Days	0	0.0%	0	0.0%
5 Days Or More	30	100.0%	30	100.0%

Table 6: Bacterial Isolate in HAP/VAP

ORGANISM ISOLATED	Nosocomial Pneumonia								Total	%
	HAP (20=N)				VAP (N=30)					
	EARLY	%	LATE	%	EARLY	%	LATE	%		
Pseudomonas	4	20%	4	20%	4	13.3%	3	10%	15	30%
Klebsiella	5	25%	2	10%	2	6.6%	1	3.3%	10	20%
Acinetobacter	0	0%	2	10%	7	23%	11	37%	20	40%
Enterobacter	0	0%	0	0%	1	3.3%	0	0%	1	2%
E. Coli	0	0%	2	10%	1	3.3%	0	0%	3	6%
Streptococcus Pneumonia	1	5%	0	0%	0	0%	0	0%	1	2%
Non Fermenting Gram Negative Bacilli	0	0%	0	0%	0	0%	0	0%	0	0%

ANNEXURE

Competing Interests

The author(s) declares that he/she/they has/have no competing interests.

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Statement

The manuscript has been read and approved by all the authors, that the requirements for authorship as stated earlier in this document have been met, and that each author believes that the manuscript represents honest work.