Correlation between colonized bacteria of ET tube among suspected pneumonia patients of ICU

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Background: Secondary infection from invasive devices has become great problem in Intensive Care Unit (ICU) set ups throughout the world. Respiratory tract infection is an important cause of increasing mortality or morbidity with prolonged hospital stay. Against this background we studied the microbial colonization of endotracheal tube and tried to evaluate the outcome among the suspected pneumonic patients admitted in our Intensive Care Unit (ICU) Hospital. Lot of therapeutic problems occur which automatically increased mortality rate as well as cost of the treatment. This above study was designed to determine the frequency of microorganisms isolated from endotracheal tube in patients admitted in ICU of MGM Medical College and LSK Hospital, Kishanganj, Bihar from July 2009 to February 2013. Materials and Methods: Endotracheal tube aspirate samples taken from 541 suspected pneumonic patients and culture isolation of the organism were carried out. Results: The age distribution of most patients was between 65 to 85 years with the mean age of 70.7±10.3, all most 71% were male in comparison to 29% were female. Hospital stay time was 5-25 days with mean time 17.5 days. The median time of intubation was 6 days. The most common microorganism was Klebsiella spp. 36% Staph aureus 24%, E. coli 18%, Pseudomonas aureginosa 12%, Acinetobacter spp. 8%, Enterobacter spp. 1% and Staph. epidermidis 1%. Conclusion: There were predominance of Klebsiella and Staph aureus colonization in ET tube. However no earlier study was done in Bihar. We recommend further study among different hospitals of Bihar to determine the epidemiologic pattern of microorganism frequency.

Keywords: ICU, Endotracheal tube, pneumonia.

INTRODUCTION

Hospital acquired infection is an important health-care problem. 5-10% of hospitalized patients of developed countries and about 25% of developing countries were affected by a nosocomial infection in 2005 as reported by WHO(1). Use of different types of catheters, endotracheal tubes, and different surgical apparatuses are the most important ways of nosocomial infection transmission. Respiratory tract infections, urinary tract infections, and superficial or deep ulcer infections are responsible for 80% of nosocomial infections (2). Of which, 1% of nosocomial infections are lethal and it costs about 10 billion dollars per year (3). In nosocomial pneumonia mortality rate is 50 % (4). In ICU, incidence of nosocomial infection is high. Irrational and overuse of newer generation antibiotic often results in multidrug resistance of microorganisms in hospital setup. Hospital personnel can be the microbial source. Use of invasive
diagnostic and therapeutic methods has saved many lives but on the other hand, it can cause some life threatening consequences due to severe, persistence and resistant infections (2-6). As per reported statistics, there are 2 million nosocomial infections per year in the United-States, which lead to an increase in cases of morbidity and mortality rate, as well as increased cost burden for the patient following long hospital stay. The purpose of this study was to determine the prevalence of bacterial species present in tracheal tubes in patients of suspected pneumonia admitted to MGM Medical College and LSK Hospital ICU during the 2009-2013.

MATERIAL AND METHODS

study which was set to determine the prevalence of bacterial species present in endotracheal tubes in MGM Medical College and LSK Hospital ICU, Kishanganj, Bihar during 2009-2013. Rejection criteria from ET tube of adult patients were primarily screened by direct microscopy, which include more than 10 Squamous epithelial cell/ lpf, with no bacteria were seen on gram stain. Samples were also rejected when there was poor documents regarding the sample, where the container was externally soiled or there was leakage.

Specimen

Specimens were obtained from tracheal tubes of ICU patients with endotracheal aspiration, when they had symptoms and signs of pneumonia (cough, purulent respiratory secretion, fever and new or progressive infiltration of lung in Chest X-ray) and were referred to the laboratory in the sterile container. The samples were cultured on chocolate agar, MacConkey agar, and blood agar as soon as they were received, and were put in incubator for 24 h in 37°C. After 24 h the colony character and gram staining were studied and the bacterial strains were determined according to biochemical tests. Out of 541 suspected pneumonia patients 271 cases were studied and rest 270 are excluded because of negative culture and poor documents. In data analysis, percentage and frequencies per year were reported. Pneumonia was defined as presence of fever, WBC more than 12K or less than 4K, infiltrate on CXR-PA, purulent sputum with positive lower airway culture.

METHODS

Aseptically collected aspirated material and ET tube tips were at first rolled over blood agar (BA) media and MacConkey media agar (MA). The ET tube tips put into peptone water, incubated for 2 hrs in 37°C and reinoculated in BA and MA. The plate were incubated at 37°C for 24 hrs. and the colony morphology was studied. Grams Stain was performed and motility study by hanging drop preparation was done. Different biochemical examination together with catalase and coagulase test was carried out to identify the organism. Simple and cheap techniques were followed as below. After gram stain cocci were identified and processed as follow. Catalase positive cocci include micrococci and staphylococci. Now on the basis of mannitol fermentation Staph aureus were identified (positive). Mannitoll non fermenters were tested with OF test. Staph spp were fermentative they were again put to Coagulase test (tube Coagulase) and Novobiocin sensitivity test to confirm Staph epidermidis. Gram negative bacilli those were lactose fermentative were tested for VP test. VP positive strain were Klebsiella and Enterobacter spp. By performing motility test they were separated. Enterobacter were motile but Klebsiella were non motile. VP negative bacteria were tested for growth in Simon’s citrate media to rule out Citrobacter spp and then tested with indole. Indole positive strain was E. coli and confirmed by positive motility test. For non fermenters like Pseudomonas aeruginosa and Acinetobacter spp Gram negative rods were put into OF test in two tubes of which one tube with paraffin over lay. OF negative and Oxidase negative were either Acinetobacter or Stenotrophomonas. However non motile strain were Acinetobacter. Non fermenters those were oxidative in OF, Oxidase positive with fluorescent pigment production and grows at 42°C were considered as P. aeruginosa.

RESULTS

In this study 271 patients who had tracheal tube aspirate positive culture were studied. The age average was found to be 70.7±10.3 (between 65 to 85 yr). A total of 192 cases were male (71%) and 79 cases were female (29%). The hospital stay duration average was 17.5 days (between 5 to 25 days). Day of intubation was also evaluated; it was shown that duration of being intubated had a median of 6 days. We cared also for any underlying disease whether present or not. Underlying diseases taken into consideration were DM (diabetes mellitus), HTN (hypertension), hyperlipidemia, cardiovascular diseases, pulmonary diseases, and renal diseases. 65% of patients had at least one underlying disease. In this study bacterial species present in endotracheal tubes were isolated and the results showed that the most common bacteria present in the tracheal tube were Klebsiella spp (36%), S. aureus (24%), E. coli (18%), P. aeruginosa(12%), Acinetobacter (8%), Enterobacter (1%), S. epidermidis (1%). The results suggested that, the most common microorganism was Klebsiella spp. (36%) and the least common were Enterobacter spp. (1%) and S. epidermidis (1%). Frequency distribution of bacterial species present in tracheal tubes of suspected pneumonic patients admitted in ICU has been given in (Table 1).
**DISCUSSION**

Out of 541 patients hospitalised with the signs and symptoms of pneumonia only 271 cases shows culture positivity when the microorganism were identified by routine laboratory procedures our study showed the isolation of Klebsiella spp as the most frequent colonizer followed by Staph aureus E. coli, P. aeruginosa etc. The microbiology of endotracheal tube culture has definite role in proper diagnosis not only in adult but also in new born ICU. Subglottis stenosis, bronchopulmonary dysplasia and ventilator associated pneumonia are diagnosed following ET tube infection in new born. So, a detection system of a biofilms in ET tube by using biomarkers could aid but kit is not easily available. So an early diagnosis could contribute unnecessary prescription of antibiotics to all.

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