

Original Article

Bacterial Colonization in Tracheal Tubes of ICU Patients

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ABSTRACT

Background and Objectives: Nosocomial infections are one of the most important worldwide health and increased patients hospital stay, therapeutic problem and mortality rate. This study was designed to determine the frequency of microorganisms isolated from tracheal tube in patients admitted to ICU Shaheed Mostafa Khomeini Hospital Tehran, Iran, from 2001-2005.

Patients and Methods: In this cross-sectional descriptive study, 352 patients admitted to ICU of the hospital were evaluated from 2001-2005. Information was derived from 18 questions in 2 parts, demographic and clinic/paraclinic. Data were analyzed by SPSS statistical software, and Mean Whitney, chi-square tests.

Results: Most patients were in 70-98 years age group, with the mean age of 62.73 ± 10.03 , 64.2% & 35.8% were male and female, respectively. The highest hospitalization times were 2-30 days with the mean times of 24.06 ± 16.68 days. In addition, the median time of intubation was 9 days. The most common microorganisms were *Staphylococcus aureus* (23.6%), *Klebsiella* spp. (23.3%) *Acintobacter* spp. (20.7%), *Pseudomonas aeruginosa* (18.2%) *Escherichia coli* (7.7%), and *Enterobacter* spp. (5.7%). There was significant association between the time of endotracheal intubation and *S. aureus*, *P. aeruginosa*, *Klebsiella* spp., *Enterobacter* spp. ($P < 0.05$), and between *E-coli* and hospitalization time ($P < 0.05$). No significant association was found between *Acintobacter* spp. and other microorganism with other variants.

Discussion: It seems that there is no difference between our research and other studies about microorganism isolated from patients with endotracheal tube. We recommend a similar study designed in another hospital to determine the epidemiologic pattern of microorganism frequency.

Keywords: Infection, Endotracheal tube, ICU, Iran

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Introduction

Nosocomial infection is an important health-care problem. According to WHO manifestation, 5-10% of hospitalized patients of developed countries and about 25% of developing countries were affected by a nosocomial infection in 2005(1).

Use of different kinds of catheters, endotracheal tubes, O_2 supplying apparatuses and surgeries are the most common pathway of nosocomial infections transmission. Urinary tract infections, ulcer infection and respiratory tract infections are responsible for 80% of nosocomial infections (2). Approximately, 1% of nosocomial infections are lethal and it costs about 10 billion dollars per year (3). Mortality rate of nosocomial pneumonia is 50 % (4).

Incidence of nosocomial infection, especially in ICU and CCU ward, is high. Hospital personnel and the environment can be the microbial source, and because of the overuse of antimicrobial agents, they have become multiple drug resistance organisms. Nosocomial infections are a serious problem for medical society. During these years, 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 resistance infections (2-6). According to 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, and costs and duration of hospital stay (2).

The purpose of this study was to determine the prevalence of bacterial species present in tracheal tubes in patients admitted to Shaheed Mostafa Khomeini Hospital ICU during the 2001-2005 and its correlation with demographic variables.

Materials and Methods

In this descriptive cross-sectional study which was set to determine the prevalence of bacterial species present in tracheal tubes of Shaheed Mostafa Khomeini Hospital ICU, Tehran, Iran, and its correlation with demographic variables during 2001-2005:

Sampling:

Specimens obtained from ICU patients tracheal tube with endotracheal aspiration, when they had clinical manifestation of pneumonia (cough, purulent respiratory secretion, fever & new or progressive

infiltration of lung in CXR) and were referred to the laboratory in the special sterile bottles (Lukens trap). The samples were cultured on chocolate agar, McKongy agar, and blood agar as soon as they were received, and were put in incubator for 24 h in 37°C. Then after 24 h the shape and color of colonies and gram staining were studied and the bacterial strain were determined according to biochemical differential environments. Out of 700 patients hospitalized in the hospital, 348 cases were excluded (because of negative culture or impairment of documents) and 325 cases were studied.

In data analysis, percentage and frequencies per year were reported and in analytic part of study Chi-Square test and Man Whitney test were used. All of the data analysis was done using SPSS software (version 16) under Windows based system.

Results

In this study, the related data of 352 patients who had tracheal tube aspirate positive culture were studied. The age average was 62.73 ± 19.050 (between 11 to 98 yr). A total of 226 cases were male (64.2%) and 126 cases were female (35.8%). The hospital stay duration average was 24.06 ± 16.68 days (between 2 to 87 days). Duration of being intubated was evaluated; it was shown that duration of being intubated had a median of 9 days (Between 2 to 60 days). In this study, we cared that only if any underlying disease was present. Underlying diseases are some diseases such as DM (diabetes mellitus), HTN (hypertension), hyperlipidemia, cardiovascular diseases, pulmonary diseases, and renal diseases. 79.3% of patients had at least one underlying disease.

In this study bacterial species present in endotracheal tubes were determined and the results showed that the most common bacteria types contaminated the tracheal tube were *P. aeruginosa* in 2001 (26.7%), *S. aureus* and *P. aeruginosa* in 2002 (25.6%), *S. aureus* in 2003 (37.2%), *Klebsiella* spp. in 2004 (37.3%), and *S. aureus* in 2005 (27.8%). The results suggested that, overall, the most common microorganism was *S. aureus* (23.6%) and the less common was *Enterobacter* spp. (5.7%). Frequency distribution of bacterial species present in tracheal tubes of patients admitted in ICU is in Table 1.

The correlation between bacterial species with variables of age, sex, duration of hospitalization,

Table 1: Frequency distribution of bacterial species present in tracheal tubes of patients admitted in ICU of Shaheed Mostafa Khomeini Hospital based on year .2001-2005

year	2001		2002		2003		2004		2005	
	F	%	F	%	F	%	F	%	F	%
bacterial species										
<i>S. aurous</i>	9	20	21	25.6	16	37.2	5	7.5	32	27.8
<i>E.coli</i>	2	404	5	6.1	5	11.6	7	10.4	8	7
<i>Acinetobacter spp.</i>	9	20	8	9.8	6	14	22	32.8	28	24.3
<i>P.aeruginosa</i>	12	26.7	21	25.6	4	9.3	8	11.9	19	16.5
<i>Entrobacter spp.</i>	6	13.3	12	14.6	1	2.3	0	0	1	0.9
<i>Klebsiella spp.</i>	7	15.6	13	15.9	10	23.3	25	37.3	27	23.5
Others	0	0	2	2.4	1	2.3	0	0	0	0
Total	45	100	82	100	43	100	67	100	115	100

duration of being endotracheal tube, presence of underlying diseases were analyzed. The results suggested that *S. aurous* had a significant relation with duration of being intubated ($P=0.002$) and hospital stay duration ($P=0.006$) but had no significant relation with age, sex, and presence of underlying diseases. *E. coli* had a significant correlation only with hospital stay duration ($P=0.03$) but not with other variables. *Acinetobacter spp.* showed relation with none of the variables. *P. aeruginosa* had significant correlation with

duration of being intubated ($P=0.048$) and presence of underlying disease ($P=0.041$). *Klebsiella spp.* had a significant relation with duration of being intubated ($p=0.010$). *Entrobacter spp.* had significant relation with duration of being intubated ($P=0.007$) and presence of underlying diseases ($P=0.018$) and showed no relation with other variables. The correlation between bacterial species in cultures obtained from tracheal tube and underlying variables and their significant level and used tests are in Table 2.

Table . 2: Correlation between bacterial species present in tracheal tubes of patients admitted in ICU of Shaheed Mostafa Khomeini Hospital with underlying variables

Variable dependent							Test
Independent	<i>S.a.</i>	<i>E.coli</i>	<i>Acinetobacter</i>	<i>P.a.</i>	<i>Entrobacter</i>	<i>Klebsiella</i>	
Age	0.081	0.64	0.212	0.116	0.333	0.517	Man withney
Sex	0.416	0.358	0.434	0.457	0.383	0.512	Chi square
Hospitalization duration	0.002*	0.034*	0.559	0.544	0.201	0.141	Man withney
Duration of being intubated	0.006*	0.256	0.121	0.048*	0.258	0.007*	Man withney
Underlying diseases	0.202	0.317	0.425	0.041*	0.01*	0.018*	Chi square

*=significant ; S.a: *S.aurous*; P.a: *P.aeruginosa*

Discussion

In this study, 352 patients hospitalized in ICU were studied. All of them had clinical manifestation of pneumonia and positive culture results, patients

with negative culture were excluded. This study of bacterial species evaluation present in ICU admitted patient's tracheal tubes suggested that the most common contaminating bacteria during these years were *P. aeruginosa* (2001) , *S. aurous* and *P.*

aeruginosa. (2002) , *S.aureus* and *Klebsiella* spp. (2003) , *Klebsiella* spp. (2004) , and *S. aureus* (2005) . Similar to the present study , in Molana and Arshi's study the most common contaminating bacteria were *Enterobacter* spp., *E. coli*, *P. aeruginosa* , *Acinetobacter* spp., and *Proteus* spp. in order (6).

In Soltani (7) , Askaryan (8) , Gannat(9), Yoosofi Mash'oo'f (10), and Sharify's(11) studies the most common gram negative bacilli and gram positive cocci included *S. aureus*., *Klebsiella* spp. , *P. aeruginosa* , *E.coli* , which was also the same as our findings .

In Nazari and Kuhpaye's study (12) the most common microbes according to cultures were *Klebsiella* spp. and *P.aeruginosa*. In Zamanzad and Kheradvar's study (13) the most common pathogens were *E.coli*, *P. aeruginosa*, and *Klebsiella* spp. Moreover, in a study set by Merik *et al.* (14), *S.aureus*, and *Acinetobacter* spp. were the most common contaminating microorganisms which suggest totally similar results to those of ours.

In the study of Nalugulile *et al.* (15), the most common contaminating germs included *E.coli*, *Enterobacter* spp., *P.aeruginosa* , *Proteus* spp., and *K. pneumonia*. In addition, in the study of Naseir *et al* (16), the most common affecting bacterium was *P. aeruginosa*, and the most common contaminating bacteria in Gladstone study (17), were *P.aeruginosa* and *Acinetobacter* spp. In Andair study (18) the most common contaminating agents were *S.aureus*, *Enterobacter* spp. and *P.aeruginosa*. That was the same as our findings.

In the study of Tulla *et al.* (19), the most common colonized bacteria in patients tracheal tubes was *E.coli*. According to this study, the most common bacteria which contaminate patient's tracheal tubes in ICU were *S.aureus* , *Klebsiella* spp. , *Acinetobacter* spp. , and *P. aeruginosa* in order.

The results of this study suggested that *S.aureus* had significant relation with hospitalization duration and duration of being intubated, *E.coli* only with hospitalization duration, *P. aeruginosa* with duration of being intubated and underlying diseases, *Enterobacter* spp.with duration of being intubated, *Klebsiella* spp. with duration of being incubated and underlying diseases, and they showed no relation with other variables. Nazari and Kuhpaye's (12) study suggested that there was a correlation between nosocomial infections and patients age but no correlation was found between this and patients sex, which was the same as our findings. In Fried land's

study (20) it had no significance relation with duration of being intubated. It was against our findings that may be due to shorter periods of being intubated in this study.

Conclusion

It seems that there is no difference between our research and other studies about microorganism isolated from patients with endotracheal tube. We recommend a similar study designed in another hospital to determine the epidemiologic pattern of microorganism frequency.

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