



EPIDEMIOLOGY AND MICROBIOLOGY OF INFECTIONS IN TRAUMATIC BRAIN INJURY PATIENTS

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ABSTRACT

Objective: Traumatic brain injury (TBI) exposes a patient to higher risk of infections in convalescence period. This communication aims to study the epidemiology and microbiology of such infections. **Material & Methods:** A retrospective surveillance of the patients admitted in neurotrauma intensive care unit (ICU) of department of neurosurgery, Medical college hospital, Trivandrum, India; from 1st January 2016 to 31st December 2016 was carried out. Six hundred and forty patients of TBI were included, 498 male and 142 female. **Results:** One hundred and fifty five infections were observed amongst 106 subjects, 80 male and 26 female. Their mean age was 47.9 years. Respiratory infections had the highest incidence rate (11.9%), followed by urinary tract infections (4.4%), wound infections (2.2%), meningitis (2%) and blood stream infections (1.9%). Most common organisms isolated were *Acinetobacter* (32.3%), *Klebsiella* (21.35%) and *Pseudomonas* (11.5%). **Conclusion:** The leading offending microbes responsible for various nosocomial infections must be scrutinized institution by institution for delineating streamlined protocols. Significant morbidity and mortality can be prevented by adhering to these institutional guidelines.

KEYWORDS : Trauma, Head injury, Infections, ICU

Introduction

Incidence of nosocomial infections increase significantly in patients with traumatic brain injury because of suppressed immune defences.^{1,2} These infections increase hospital stay, financial costs and poor outcomes.³ Apurpose, we carried out this retrospective appraisal to assess incidence and microbiology of infections in the TBI patients.

Materials and Methods

Patients with TBI admitted to the neurotrauma ICU of our hospital were assessed retrospectively from 1st January 2016 to 31st December 2016. Total 640 patients were included. Demographic characteristics like age and gender were collected and analyzed. Sufficient information to calculate incidence rates of overall infections, ventilator associated pneumonia (VAP), urinary tract infections (UTI), wound infections, meningitis and blood stream infections (BSI) was extracted. We also made note of culprit pathogens in the culture reports.

Microsoft Excel was used to analyze all the medical records. Statistical analysis was performed using STATISTICA 12.5. For calculating statistic significance we used chi square test, $p < 0.05$ was considered statistically significant.

Results

Out of 640 patients observed over the year, 106 subjects developed 155 nosocomial infections (22.4%). There were 75.5% males and 24.5% females in the study. There were statistically significant more males than females. The age of critiqued population ranged from 8-86 years. The mean age was 47.9 years and median age was 47 years. Eight subjects (7.5%) were under the age of 25 years, 52 (49%) were in the age group of 25-50 years whilst, 46 (43.5%) were more than 50 years old (Table 1).

Characteristics	No. of patients	Percentage
Gender		

Male	80	75.5%
Female	26	24.5%
Age		
<25 years	8	7.5%
25-50 years	52	49%
>50 years	46	43.5%

Table 1: Demographic data of patients with TBI and nosocomial infections

The collected data revealed VAP to be the most prevalent infection (11.9%), it was trailed by UTI (4.4%), wound infections (2.2%), meningitis (2%) and BSI (1.9%). (Table 2) Most prevalent pathogen in the cultures overall were *Acinetobacter* (32.3%), *Klebsiella* (21.3%) and *Pseudomonas* (11.5%).

Microbe isolated	Type of Sample				
	Sputum	Urine	Wound	CSF	Blood
Acinetobacter	31	4	7	4	4
Klebsiella	22	4	1	4	2
Pseudomonas	14	0	0	3	1
MRSA	2	0	0	1	4
E.coli	0	5	1	1	1
Enterococcus	0	5	0	0	0
Proteus	0	1	0	0	0
Candida	3	8	0	0	0
Mixed	10	4	6	1	1

Table 2: Microbiology of principal pathogens found in culture samples of TBI patients with nosocomial infections

Microbiology of respiratory infections was similar to that of overall infection; Acinetobacter (37.8%), Klebsiella (26.8%) and Pseudomonas (17.0%); were chief offenders. Cultures of urine were positive for Candida (25.8%), E.coli (16.0%) and Enterococci (16.0%). Wound sites tested positive for Acinetobacter as leading pathogen (46.6%), followed by mixed bacterial growth (40%). Meningitis was caused mainly by Acinetobacter and Klebsiella (28.5% each). Blood cultures showed Methicillin resistant staphylococcus aureus (MRSA) and Acinetobacter as chief transgressors, both causing 30.7% of BSIs (Table 3).

Infection Type	No. of Infections	Principal Pathogens
VAP	82	Acinetobacter (37.8%) > Klebsiella (26.8%) > Pseudomonas (17.0%)
UTI	31	Candida (25.8%) > E. coli = Enterococci (16%)
Wound Infection	15	Acinetobacter (46.6%) > Mixed bacterial growth (40%)
Meningitis	14	Acinetobacter = Klebsiella (28.5%) > Pseudomonas (21.4%)
Blood stream infection	13	Acinetobacter = MRSA (30.7%) > Klebsiella (15.4%)

Table 3: Most common pathogens found in various sites in patients of TBI with nosocomial infections.

Discussion

TBI patients admitted in ICUs have high propensity of developing nosocomial infections. The increased vulnerability can be explained by the immunosuppression that occurs post brain injury and post iatrogenic trauma caused by intubation, invasive procedures and surgery.⁴

The incidence of nosocomial infections amongst ICU patients ranges from 9%-37%.⁵ In neurotrauma patients it can be as high as 50%. In a study by Helling et al 41 out of 82 (50%) patients with severe head injury developed infectious complications.³ A recent study by Valencic et al recorded an even higher percentage i.e. 67.74%.⁶ The landmark study by Kourbeti et al noted an incidence rate of 24.76%.⁷ Our assessment is in accordance with the above mentioned studies, an incidence rate of 22.5% was observed.

A higher incidence of nosocomial infections was noted in males, (75.5%), Valencic et al too found 76.08% of the afflicted in their study to be males. These findings can be explained by the appraisal by Kraus et al, which revealed that males have 1.4 times higher risk of developing TBI.⁸

Mean age of patients who developed infection was 47.9 years in our study, while it was 41.9 years in that conducted by Kourbeti et al and 57.8 years in that of Valencic et al. Forty nine percent of patients in our observation belonged to the age group of 25-50 years, this age group comprises of working people, who by virtue of their lifestyle are at increased risk of sustaining accidents and injuries.

Literature quotes respiratory tract infections as most common site of nosocomial infection in TBI as well as general ICU patients, followed by UTIs, wound infections, BSIs and meningitis.¹⁸ We noticed an almost same pattern in our critique. Reasons for respiratory tract infections in TBI patients include neurogenic pulmonary edema, dysfunction of autonomic system, neurotransmitter induced stress and mechanical ventilation. The incidence was respiratory tract infection in our study was highest 11.9% and chief pathogen isolated was Acinetobacter spp, which has been most common offender even in world literature.^{8,9}

UTI was encountered in 4.4% of the cases. C. albicans was the most common culprit pathogen, evincing colonisation of urinary tract due to eclectic drug use. Fifteen patients i.e. 2.2% patients were diagnosed with superficial surgical site infections as compared to the figure of 1% quoted in literature.¹⁰ Wound cultures were positive

for Acinetobacter mainly. The incidence rate of meningitis in our critique was 2% which is conformity with other publications.¹¹ BSI in our cohort incidented at 1.9%, MRSA, Acinetobacter and Klebsiella were the commonly cultured organisms.

Conclusion

The incidence rates of infections found in our Neurosurgery trauma mirrored the global trends. Additional prospective studies may be directed to investigate the impact of varying infection prevention and management protocols on the outcomes. It is evident that strict hygiene strategies should be employed by ICU personnel to increase longevity and quality of life of patients and decreasing hospital stay, poor outcomes and financial costs. Emerging Acinetobacter resistance and urinary candidial colonization needs to be countered with logical and justifiable antibiotic regimens.

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