

Nosocomial Infections in Geriatric Patients Admitted in ICU

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Abstract

Objectives: To analyse the pattern of nosocomial infections and establish their causes, in geriatric patients admitted in ICU.

Methods: Case records of 80 of 405 elderly patients admitted to a multidisciplinary ICU and developed nosocomial infections were systematically analysed.

Results: Incidence of nosocomial infections in geriatric patients was 19.7% (80/405 patients). Urinary tract infections (45%) were the most frequent, followed by pneumonias (30%) and blood stream infections (16%). A direct correlation existed between the use of invasive devices in ICU and the occurrence of nosocomial infections.

Conclusions: Nosocomial infections are common in elderly patients in the ICU setting. More studies are needed to be carried out in Indian population to plan long term strategies for prevention and management of nosocomial infections.

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Introduction

Infections acquired during hospital stay are generally called nosocomial infections. Formerly, they were defined as infections arising after 48 hours of hospital admission. In the year 1994, the National Nosocomial Infection Surveillance System (NNIS) USA, formulated a standardized reporting system to monitor hospital acquired infections for the guidance of medical practitioners to prevent and minimize the occurrence of such infections. NNIS system defines a nosocomial infection as a localized or systemic condition that results from adverse reaction to the presence of an infectious agent(s) or its toxin(s) that was not present or incubating at the time of admission to the hospital^{1, 2}. As incubation period varies with the type of pathogen and patient's underlying condition, each infection must be assessed individually. It may be borne in mind that there are two other special situations in which an infection is considered to be nosocomial; (i) infection that is acquired in the hospital, but does not become evident until hospital discharge and (ii) infection in a neonate that results from passage through birth canal.

The elderly have defective host defenses that compromise their ability to ward off infectious agents.

Factors which influence immunocompetence are immune senescence, changes in nonadaptive immunity, chronic diseases, medications, malnutrition and functional impairments.² T-lymphocyte production and proliferation decline with age, which results in decreased cell-mediated immunity and decreased antibody production to new antigens. Thinning of skin, enlarged prostate, diminished cough reflex and other anatomic or physiologic accompaniments of aging are changes in nonadaptive immunity that render the elderly more vulnerable to infection. Chronic diseases such as cancer, malnutrition, atherosclerosis, diabetes mellitus, and dementia predispose to certain types of infections. Medications such as sedatives, narcotics, anticholinergics, and gastric acid suppressants may further decrease inner defenses. Malnutrition reduces cell-mediated immunity and is common in the Indian population. In addition to these, functional impairments (like immobility, incontinence, dysphagia) associated with aging necessitate the use of urinary catheters, feeding tubes, and other invasive devices enhancing susceptibility to nosocomial infections.²

There has been tremendous increase in the elderly population all over the world. In view of this, there is an urgent need to focus our attention to problems of geriatric patients, specifically infections among ICU admissions. According to published literature^{4, 5, 6}, the most prevalent nosocomial infections among elderly patients in the ICU are urinary tract infection, pneumonia, bloodstream infections, skin and

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soft tissue infections, gastro-enteritis, hepatitis and central nervous system infections like meningitis.^{4,5,6}

Material and Methods

The study was a retrospective analytical study. The methodology involved collection of data of nosocomial infections from patient records, analysis of infections, their causes and distribution pattern of pathogens. To carry out this work, a total of 839 records of geriatric patients admitted to multidisciplinary ICU during 2001-2003 at M S Ramaiah Medical Teaching Hospital, Bangalore were considered and out of these 405 belonged to medical [non surgical] cases. Detailed history and physical examination notes were reviewed in all patients. Diagnostic criteria adopted have been summarized in Table 1.

Results

Eighty of 405 patients (19.75%) admitted to the ICU suffered from nosocomial infection, there were

57 males and 23 females. The mean duration of stay of the patients in the hospital was 14.4 days. Table-2 gives the distribution of the nosocomial infections in these patients.

In our study, we have isolated the pathogens of the various nosocomial infections of our target group and found that most of the nosocomial infections were device related (Table-3). Urinary tract infection was related to urinary catheter; pneumonia was related to ventilator and bloodstream infections was related to CVP catheter (Table-4).

In majority of patients, 62 patients (77.5 %) nosocomial infections were associated with the use of invasive devices. In the remaining 18 patients (22.5%), co-morbidities like diabetes mellitus (9 patients), benign prostatic hyperplasia (5 patients), cancer (4 patients) existed and could have contributed significantly to the development of nosocomial infections.

Table 1: Diagnostic criteria for nosocomial infections

Nosocomial Infection	Clinical features	Laboratory features
Urinary tract infection	<ol style="list-style-type: none"> 1. Fever 2. Lower abdominal pain 3. Change in urine characteristics 	<ol style="list-style-type: none"> 1. Leukocytosis 2. Positive urine culture (10⁵ CFU of a single organism per ml of urine)
Pneumonia	<ol style="list-style-type: none"> 1. Fever 2. Pleuritic chest pain 3. Decreased intensity of breath sounds 4. Presence or increase in rales 	<ol style="list-style-type: none"> 1. Leukocytosis 2. Sputum for Gram stain 3. Positive sputum culture 4. Positive chest x-ray
Blood stream infections	<ol style="list-style-type: none"> 1. Unexplained fever with chills and rigor 2. Pain, tenderness or purulent drainage at the site of insertion of IV access or CVP Catheter 	<ol style="list-style-type: none"> 1. Leukocytosis 2. Positive blood culture 3. Positive CVP catheter culture (after catheter removal)
Skin and soft tissue infections	<ol style="list-style-type: none"> 1. Pain, swelling, tenderness or inflammation and warmth of skin 2. Purulent drainage from skin 3. Fever 	<ol style="list-style-type: none"> 1. Smear for Gram stain 2. Positive swab culture 3. Leukocytosis
Gastroenteritis	<ol style="list-style-type: none"> 1. Increased frequency of stools 2. Change in consistency of stools 3. Fever 4. Dehydration 	<ol style="list-style-type: none"> 1. Leukocytosis 2. Positive stool culture
Meningitis	<ol style="list-style-type: none"> 1. Fever 2. Altered sensorium 3. Head ache 4. Neck stiffness 5. Vomiting 	<ol style="list-style-type: none"> 1. Leukocytosis 2. CSF- cell count, cell type, culture, sugar, protein

Table 2: Distribution of nosocomial infections

Nosocomial infections	No. of patients	Percentage
1. Urinary tract infection	36	45.00
2. Pneumonia	24	30.00
3. Blood stream infections	13	16.00
4. Soft tissue infections	3	3.75
5. Gastroenteritis	3	3.75
6. Meningitis	1	1.25
Total	80	99.75

Discussion

The incidence of nosocomial infections in our study was 19.75 % compared to 33.5% by Beaujean et al.⁷ However, our study population consisting of 80 patients out of 405 MICU admissions is a relatively small sample size. The general distribution pattern of the nosocomial infections that emerged in our study showed urinary tract infection (45%) to be the most common, followed by pneumonia (30%), bloodstream infections (16%), skin and soft tissue infections (3.75%), gastroenteritis (3.75%), meningitis (1.25%). In a similar study done by Richards et al.³, the distribution was found to be urinary tract infections (31%), pneumonia (27%), bloodstream infection (19%) and remaining others to be 23 %. Lee et al.⁸ reported their findings as UTI (47%), pneumonia (26%) and skin infections (14%). Our study population of 80 patients included 57 male and 23 female patients. Due

to male preponderance BPH in association with diabetes and restricted mobility, could have been the principal reasons for higher incidence of UTI in present study.

Similarly with respect to the role played by invasive devices in contributing to nosocomial infections, our study showed that 90% of urinary tract infection, 80% of pneumonia and 80 % of bloodstream infections could be attributed to the use of invasive devices. According to Richards et al.³ these are 95%, 86% and 87% respectively, a finding very similar to our study.

The pathogen distribution of nosocomial infections in our study does not differ significantly with the findings of Richards et al.³ However, we found that *Pseudomonas aeruginosa* to be the predominant cause of nosocomial UTI in contrast to *Candida albicans* reported by Richards et al.³ This could be explained by differences in geographic locations, nutritional status and health care systems.

Conclusions

In conclusion, the geriatric population is highly vulnerable to nosocomial infections. Our findings are similar to observations made in other studies in literature. Urinary tract infections and pneumonias are the common nosocomial infections. Our study also reveals that the incidence of infections increases with use of invasive devices. Early recognition of infections, restricted and short term use of invasive devices can

Table 3: Pathogens isolated in various nosocomial infections

Organisms Isolated	Disease					
	Urinary tract infection	Pneumonia	Blood stream infections	Skin & Soft tissue infections	Meningitis	Gastroenteritis
<i>Pseudo. aeruginosa</i>	16(45%)					
<i>E.coli</i>	9(25%)		2(15%)			
Gram -ve aerobes	6(16%)	18(74%)				
<i>Candida albicans</i>	3(8%)					
<i>Proteus mirabilis</i>						
Coagulase -ive Staph.			8(61%)			
<i>Staph. aureus</i>		5(20%)	2(15%)		1(100%)	
<i>Staph. epidermidis</i>				1(33%)		
Unidentified	2(6%)	1(6%)	1(9%)	2(67%)		3(100%)
Total	36 (45%)	25(30%)	13(16%)	3(3.75%)	1(1.25%)	3(3.75%)

Table 4: Device related Nosocomial infections

Type of Nosocomial infection (n)	Type of Device used	Infection with device	Infection without device
1. Urinary tract infection (36)	Catheter	32 (90%)	4 (10%)
2. Pneumonia (24)	Ventilator support	20 (80%)	4 (20%)
3. Bloodstream infections (13)	CVP catheter	10 (80%)	3 (20%)
4. Others	—	-	7
Total		62(77.5%)	18 (22.5%)

therefore, contribute significantly towards decreasing the incidence of nosocomial infections in elderly.

We suggest that systematic and standardized large scale studies be carried out on elderly Indian population for prevention and management of nosocomial infections. There is an urgent need for creation of centralized surveillance groups in India, in line with NNIS, USA; NINSS, UK; and Swiss noso network, Switzerland.^{9,10}

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