

Changing Trends of Nosocomial Infections in Geriatric Patients in a Tertiary Care Hospital

Loveena Oberoi*, N.S.Neki**, Ramanpreet Kaur*, Rajat Oberoi***

*Departments of Microbiology & ***Medicine, Sri Guru Ram Das Institute of Medical Sciences & Research, Vallah, Sri Amritsar. **Department of Medicine, Govt. Medical College, Amritsar, Punjab, India

Abstract: Ageing is an important risk factor for infectious diseases to develop. Defective host defenses, chronic diseases, surgery & medication place elderly in the forefront of nosocomial infections. A total of 720 hospitalized elderly patients (>65 yr age) were evaluated in this study. The prevalence of nosocomial infections was 29.3%. Most frequent nosocomial infections were urinary tract infections (48.3%), skin & surgical site infections (36.9%), lower respiratory tract infections (10.7%) & blood stream infections (4.2%). *Escherichia coli* (28.9%), *Pseudomonas aeruginosa* (22.8%), *Klebsiella pneumoniae* (18.6%) & *Candida* (11.4%) were predominant in urinary, skin & respiratory infections while *Coagulase negative staphylococcus* (33.4%) & *staphylococcus aureus* (19.5%) were commonly encountered in blood stream infections. Risk factors like use of antibiotics, invasive devices, surgery, and time of hospitalization were associated with patients with healthcare associated infections. Majority of the isolates were resistant to commonly used antibiotics. In conclusion, elderly patients are more prone to develop nosocomial infections. Regular infection prevalence surveillance in parallel with effective infection control programs can reduce hospital acquired infections in geriatric population.

INTRODUCTION

Infections in elderly patients are a growing challenge for clinical microbiologists, clinicians and medical administrators. The geriatric patients have impaired host defenses that compromise their ability to ward off infectious agents. Presence of multiple medical problems, nutritional deficiency and regression of immunity contribute to the susceptibility of older people to develop infections¹. In addition to these, functional impairments (immobility, incontinence, dysphagia) associated with ageing necessitate the use of urinary catheters, other invasive devices and antibiotics enhancing susceptibility to nosocomial infections². Nosocomial infections have emerged as an important cause of morbidity & mortality in elderly patients leading to prolonged hospital stay, treatment failure and increased cost of healthcare. Also, extensive & inappropriate use of antimicrobial agents has invariably resulted in the development of antibiotic resistance which, in recent years, has become a major problem worldwide³. These multidrug resistant infections are posing a therapeutic challenge not only for clinicians but also for healthcare institutions. Due to tremendous increase in elderly population all over the world, there is an urgent need to focus our attention to these emerging problems of geriatric patients⁴. In frail elderly patients with age related multiple severe disorders & cognitive impairment, early recognition of infection & prompt treatment are critical in reducing the morbidity and mortality. The objectives of the study were to determine the changing trends in etiological profile of nosocomial infections & their antibiotic resistance patterns in elderly patients.

MATERIALS & METHODS

Study was conducted in S.G.R.D Hospital, Amritsar, a rural tertiary care hospital of Amritsar. Study population consisted of 720 hospitalized patients >65 yrs of age admitted in different ICUs & wards (medical, surgery orthopedic etc.) from July 2010 to Dec 2010. CDC (Centre for disease control & prevention) guidelines were used to identify nosocomial infections⁵. Inclusion criteria of hospitalization for >7 days, clinical evidence of sepsis & presence of invasive devices were taken into account. Clinical and demographic information of each patient was noted. Clinical specimens like urine, pus, blood, sputum, pleural fluid, other fluids & tips of invasive devices were processed in microbiology laboratory. Identification of clinical isolates & their antimicrobial profile was performed by standard microbiological methods⁶.

RESULTS

Out of a total 720 hospitalized patients above >65 yrs of age, 211 (29.3%) developed nosocomial infections. Prevalence of infection was more in males (56.4%) than in females (43.6%). The mean duration of hospital stay was 14 days. Urinary tract

infections (48.3%) were the most common infections followed by skin & surgical site infections (36.9%), lower respiratory tract infections (10.7%) and blood stream infections (4.2%) [Table-1].

Most of the nosocomial infections were device related. Urinary tract infections were present in 70.5% of the catheterized patients. 64% of skin and surgical site infections were post operative wound infections. Most of the respiratory infections (60%) were associated with mechanical ventilators & endotracheal intubation. 55% of the blood stream infections were occurring in patients fitted with CVP catheters. 96 (45.5%) patients were receiving antibiotic treatment either with two or more antibiotics prior to infection. Other associated morbidities like diabetes mellitus, benign prostatic hypertrophy and cancer etc were also present in 42 (19.9%) cases. Majority of the patients with nosocomial infections were from surgical wards (51.2%), medical wards (28.9%), intensive care units (10.7%) & orthopaedic wards (6.7%).

Table-1 : Distribution of nosocomial infections

Type of Infection	No. of patients	%
Urinary tract infection	102	48.3%
Skin & surgical site	78	36.9%
Lower respiratory infection	22	10.7%
Blood stream infection	09	4.2%

Table-2: Micro organisms isolated in various nosocomial infections

Organisms	Urinary tract infections	Skin surgical infections & site	Lower respiratory infections	Blood stream infections
<i>Escherichia coli</i>	52.5%	20.5%	19.3%	23.2%
<i>Pseudomonas</i>	18.6%	26.8%	23.1%	-
<i>Klebsiella pneumoniae</i>	12.8%	18.8%	30.7%	12.4%
<i>Proteus</i>	3.4%	5.2%	-	-
<i>Candida</i>	7.6%	-	15.4%	11.2%
<i>Staphylococcus aureus</i>	0.9%	17.7%	-	19.5%
<i>Coagulase negative Staphylococcus</i>	0.9%	5.2%	-	33.4%
<i>Acinetobacter</i>	0.9%	11.2%	15.4%	-

In urinary tract infections, *Escherichia coli* (52.5%) was the predominant organism followed by *Pseudomonas aeruginosa* (18.6%), *Klebsiella pneumoniae* (12.8%), *Candida sp.* (7.6%) & *Proteus mirabilis* (3.4%). In skin & surgical site infections, isolates were *Pseudomonas aeruginosa* (26.8%), *Escherichia coli* (20.5%) *Klebsiella pneumoniae* (18.8%), *Staphylococcus aureus* (17.72%) & *Acinetobacter* (11.2%) were commonly encountered. Most common organisms in lower respiratory tract infections were *Klebsiella pneumoniae* (30.7%), *Pseudomonas aeruginosa* (23.1%), *Escherichia coli* (19.3%), *Acinetobacter* (15.4%) & *Candida* (15.4%). *Coagulase negative staphylococcus* (30.2%), *Staphylococcus aureus*

(17.3%) *Escherichia coli* (29.3%) & *Enterobacter aerogenes* (16.3%) were the most common isolates in blood stream infections. (Table-2).

86% of the gram negative isolates were resistant to commonly used antibiotics such as 3rd generation and 4th generation cephalosporins i.e. cefdinir (90.8%), cefepime (85.7%), ceftazidime (83.3%), cefotaxime (77.6%), ceftriaxone (73.3%) and other antimicrobials as ofloxacin (75.3%) ciprofloxacin (57.7%) & gentamycin (64.4%). Fairly low resistance was seen with imipenem (10.2%), piperacillin & tazobactam (23.4%) netilmicin (26.8%) & amikacin (29.3%). Majority of the gram positive isolates were susceptible to vancomycin (87.5%), linezolid (87.5%) & gentamycin (76.3%). 93.3% of *Staphylococcus aureus* were methicillin resistant. Resistance was also high for clindamycin (78.2%) & erythromycin (62.8%).

DISCUSSION

Nosocomial infections have become an important public health issue & pose a critical threat to geriatric population. The vulnerability of this age group is related to defective host defenses, chronic underlying disease, poor tolerance to therapeutic procedures, prolonged time of hospitalization & indiscriminate use of antimicrobial agents⁷. In our study, prevalence of nosocomial infections in elderly patients was (29.3%). The relatively high prevalence of nosocomial infections may be due to excess length of hospital stay following high severity of illness, more intervention, irrational use of antibiotics and possibly poor adherence to aseptic techniques. Similar results were reported by a study done by Beaujean et al⁸. A study by Mukherjee et al showed incidence of nosocomial infections in 80 out of 405 elderly patients to be 19.7%⁴. This difference may be related to sample size taken for the study & healthcare setting.

The most frequent infections were urinary tract infections (48.3%) & skin & surgical site infections (36.9%), lower respiratory tract infections (10.7 %) & blood stream infections. In a similar study done by Mukherjee et al, urinary infection (45%) was the most common infection followed by pulmonary infections (30%), blood stream infections (16%) & skin infections (3.75%)⁴. Predominance of skin & surgical site infection in our study could be due to the reason that majority of patients were from surgical ward & were using invasive devices. Another study by Rosineide et al reported, skin & surgical site infection (56%) as the most frequent infection and most of the patients were from surgical wards⁹.

Use of invasive devices was a major risk factor for development of hospital acquired infections in elderly patients in our study. In 140 patients (66.3%) nosocomial infections were associated with use of invasive devices such as urinary & CVP catheters, ventilators & surgery. These findings indicate that nosocomial infections are often associated with the use of invasive devices. Therefore to effectively reduce burden of these infections, the use of invasive devices should be minimized and specific disinfection precautions should be taken during application of devices. The length of hospitalization, which is a well known risk factor related to severity of disease and affects health costs, was also a risk factor for development of hospital acquired infections. Use of antibiotics prior to infection (45.5%) and associated chronic morbidities (19.9%) were other risk factors for nosocomial infections in elderly patients. Similar risk factors were implicated in a study reported by Mukherjee et al.⁴

Microorganism distribution of nosocomial infections in our study was different from findings of other studies^{4,10}. *Escherichia coli* (28.9%), *Pseudomonas*

aeruginosa (22.8%), *Klebsiella pneumoniae* (18.6%) & *Candida* (11.4%) were predominant in urinary, skin & respiratory infections while Coagulase negative staphylococcus (33.4%) & staphylococcus aureus (19.5%) were mostly encountered in blood stream infections. In our study *Escherichia coli* (52.5%) was the predominant cause of urinary infections in contrast to *Pseudomonas* reported by mukherjee et al³ and *Candida* reported by Richards et al¹⁰. These differences could be explained by differences in geographic location & health care system. Our study also revealed that nosocomial infections were more frequently caused by multidrug resistant bacteria. Antibiotic resistance of gram negative isolates was quite high to commonly used antimicrobials such as cephalosporins (82.2%) and fluoroquinolones. Most of gram positive isolates (93.3%) were methicillin resistant. Almost similar antibiotic sensitivity pattern was obtained in a study done by Mohanasundaram et al¹¹. The most likely explanation for this phenomenon can be extensive & indiscriminate use of antibiotics.

In conclusion, the vulnerable geriatric population plays a leading role in the scope of nosocomial & health care associated infections creating a significant burden for the elderly patients & public health. In our study most frequent site of nosocomial infections were urinary tract infections, surgical site infections & lower respiratory infections. Most of infections were resistant to commonly employed antibiotics. It was also observed that incidence of infection increases with use of antibiotics & invasive devices. In frail elderly patients with age related multiple severe disorders & cognitive impairment, early diagnosis and empirical treatment of nosocomial infections is challenging & a sound knowledge of the prevalent epidemiology of bacteria and their resistance pattern is necessary for the same. Hence multifactorial efforts i.e. early recognition of infections, restricted & short term use of invasive devices & implementation of effective infection control measures to reduce cross contamination by resistant organisms can contribute significantly towards decreasing the prevalence of nosocomial infections in geriatrics population.

REFERENCES

1. *NSL Yeung RN, Luk JKH, FHW Chan HB. A study of common infections encountered in a Geriatric extended care Hospital JHK Geriatric Soc 2004; 12:13-17.*
2. *Strausbaugh L. J Emerging Health care associated infections in geriatric population. Emerg Infect Dis 2001; 7:268-71.*
3. *Mahesh E, Medha Y, Indunathi VA, Kumar PK, Khan MW, Punith K. Community acquired urinary infections in the elderly BJMP 2011;4:406.*
4. *Mukherjee T, Pramod K, Gita S, Medha YR. Nosocomial infections in geriatric patients admitted in ICU. J. of Ind. Acad. of Geriatrics 2005;2:61-64.*
5. *Gamer JS, Jarvis WR, Horan TC, Hughes IM. CDC definitions of nosocomial infections. Am J Infect Control 1988; 16:128-140.*
6. *Performance Standards for Antimicrobial Susceptibility Testing: 20th Informational Supplement, Clinical and Laboratory Standards Institute (CLSI) M100-S20: Vol. 30, No.1. Wayne, PA: Clinical and Laboratory Standards Institute; 2010.*
7. *Yoshikawa TT. Epidemiology & unique aspects of ageing & infectious diseases. Clin. Infect. Dis. 2000; 30:931-3.*
8. *Beaujean DJ, Block HE, Vandebroucke Grauls CM et al. Surveillance of nosocomial infections in geriatric patients. J Hosp Infect 1997; 36:275-284.*
9. *Rosineide M, Ribas & Paulo, Gontijo Filho. Comparing hospital infections in elderly vs younger adults. The Brazilian J of Infect Dis 2003;7:210-215.*
10. *Richards MJ, Edwards JR Culver DH et al. Nosocomial infections in combined medical surgical intensive care units in United States. Infect control Hosp Epidemiol 2000; 21:510-515.*
11. *Mohanasundaram KM. Retrospective analysis of the incidence of nosocomial infections in the ICU. J of Clinical & Diagnostic Research 2010; 4:3378-3382.*

JIMSA TRAVEL GRANT

Guidelines for the Award

1. No. of Grants-Two (2)
2. Original research work by a young researcher (age < 45 years) for presentation at IMSACON every alternate year for travel with in the country.
3. Research work should clearly project the objectives, selection of material, methodology adopted, results analysis with statistics, discussion and conclusions. A summary in 350 words highlighting why the paper should be considered for the award, must be enclosed.
4. Travel Grant not exceeding Rs.8000/- per awardee, to cover the travel expenses with in the country.
5. The abstract of the paper should be sent to the Chairman, Scientific Committee, IMSACON (for acceptance and presentation at the conference) bearing a label "JIMSA Travel Grant." Only accepted papers will be judged for "Travel Grant".
6. In case the applicant is in Government job, he should enclose a letter from the Head of Department/Institution certifying that he is not being supported by any other agency.
7. Selected candidates will be required to submit full manuscript {3 copies along with one CD} prepared as per the format of JIMSA (see Check list page 222) to be sent to Editor, JIMSA at office address for the publication in JIMSA. The article will be accepted for publication in JIMSA only after the proper peer review by the referee.

Editor, JIMSA