

Nosocomial Infections in Medical Ward (Four Months Descriptive Study in a Tertiary Care Hospital)

¹B.R. Devrajani, ¹S.Z. Shah, ¹T. Devrajani and ²G. Ali Qureshi

¹Department of Medicine, Liaquat University of Medical and Health Sciences,
Jamshoro/Hyderabad, Pakistan

²Department of Biochemistry, University of Health Sciences, Lahore, Pakistan

Abstract: The objectives of this Descriptive study were, to determine the frequency of Nosocomial infection in the medical department, to identify the causes of Nosocomial infection and to identify the risk factors for Nosocomial infections. This hospital based descriptive study was conducted at Liaquat University Hospital (a tertiary care hospital) Hyderabad Sindh Pakistan from September 2007 to December 2007. All patients who were above 12 years of age, admitted in the medical ward for more than 48 h with different complain and presentations, develops clinical evident of infections that do not originate from a patient's original admitting diagnosis were studied. All patients were carefully examined, relevant investigations were performed and data was collected through questionnaire. During our study period, 50 patients were identified to acquire nosocomial infection during hospitalization in medical ward. Most of the patients 29 (58%) were more than 50 years of age. Majority of patients 38 (76%) were develop fever (febrile illness). The most common hospital acquired infections found in our study were UTIs (68%), bloodstream (38%) and RTIs (26%), other infections we identified were skin, soft tissue, wound, MRSA, VRE and gastrointestinal. Our study concluded that the hospitalized patients are at great risk to develop nosocomial infection. We detected various infections in patients during their hospital stay acquired from different sources. The proper hygiene, sterilized instruments and equipments are the best tool to control these life threatening infections.

Key words: Nosocomial infections • Hospital acquired infections • Health care associated infections

INTRODUCTION

Nosocomial comes from the Greek word nosokomeion meaning hospital (nosos = disease, komeo = to take care of). It is also called Hospital-acquired infections (HAIs), or healthcare associated infections, encompass almost all clinically evident infections that do not originate from a patient's original admitting diagnosis. Most infections that become clinically evident after 48 h of hospitalization are considered hospital-acquired [1]. Although nearly two thirds of hospital acquired illness is secondary to various infections and also associated with wide variety of other conditions, such as tissue injury, immunological reaction, or inflammatory processes. Thus nosocomial infection represents a frequent nonspecific clinical problem with potential consequences for morbidity and mortality [2-5].

These colonies of hospital strains of bacteria generally develop in the patient's skin, respiratory tract and genitourinary tract. Risks factors for the invasion of

colonizing pathogens can be categorized into 3 groups: iatrogenic, organizational and patient-related. The Iatrogenic risk factors include pathogens on the hands of medical personnel, invasive procedures (e.g. intubation and extended ventilation, indwelling vascular lines, urine catheterization) and antibiotic use and prophylaxis. The organizational risk factors include contaminated air-conditioning systems, contaminated water systems and staffing and physical layout of the facility (e.g. nurse-to-patient ratio, open beds close together) and the patient risk factors include the severity of illness, underlying immunocompromised state and length of stay.

Nosocomial infections are caused by viral, bacterial and fungal pathogens; the most common pathogens are staphylococci, pseudomonas, *E. coli*, mycobacterium tuberculi, candida, aspergillus, fusarium, trichosporon and malassezia. All are associated with morbidity and mortality. Most patients who are infected with nosocomial bacterial and fungal pathogens have a predisposition to

infection caused by invasive supportive measures such as intubation and the placement of intravascular lines and urinary catheters. Fungal infections are more likely to arise from the patient's own flora; occasionally, they are caused by contaminated solutions (e.g. those used in parenteral nutrition).

In addition to the presence of systemic signs and symptoms of infection as fever, tachycardia, tachypnea, skin rash, general malaise, the source of HAIs may be suggested by the instrumentation used in various procedures.

The common nosocomial infections include urinary tract infection, upper respiratory tract infection (ear, nose and throat infection) and lower respiratory tract infection (pneumonia), gastrointestinal, skin/soft tissue infection, cardiovascular and surgical site infection. Many of the pathogens that cause nosocomial infection have a high level of resistance to an antibiotic therapy; some of the major concerns are methicillin resistant staphylococcus aureus (MRSA), Vancomycin-resistant enterococci (VRE), Extended spectrum beta lactamase resistance (ESBL) Enterobacteriaceae, clostridium difficile and norovirus.

The Nosocomial infection can be controlled by preventive measure as isolation, hand washing, gloving and indwelling catheter should be removed.

The aims of this descriptive study have been to determine the frequency of Nosocomial infection in the medical department, to identify the causes of Nosocomial infection and to identify the risk factors for Nosocomial infections.

MATERIALS AND METHODS

It is a hospital based descriptive study of four months carried out on 50 patients in the Department of Medicine at Liaquat University Hospital L.U.H (a tertiary care hospital) Hyderabad Sindh, Pakistan from September 2007 to December 2007. All patients who were above 12 years of age, admitted in the medical ward for more than 48 h with different complain and presentations, develops clinical evident of infections that do not originate from a patient's original admitting diagnosis were included in our study. The exclusion criteria were patients less than 12 years of age, stay/admitted in medical ward for less than 48 h and were known case of any infectious disease. A questionnaire was designed and used for data collection, the known and potential risk factors for nosocomial infection were identified by studying and analyzing such data. The detail clinical history was taken, the inquiry of active complains was recorded and the temperature chart was maintained and updated upon daily

basis. All such patients were examined daily regarding the treatment response and their active complains that conveys to us by patient himself or through the attendant of such patients. All relevant laboratory investigations including routine (Blood CP + ESR, blood glucose, chest radiography, urine analysis) and specific (according to complains and the clinical presentations of patient) was done. The treatment plan was also carefully recorded, monitored, maintained and updated. The referred patients from different units (surgery, neurosurgery, nephrology and burns) who developed fever post operatively, after neurosurgical procedures or after intravenous catheterization (CVP line) for haemodialysis, history of burns were referred to medical ward for further evaluation and were also included in our study.

RESULTS

Fifty patients with nosocomial infection were identified during our study period. Most of the patients 29 (58%) were more than 50 years of age; 32 (64%) patients were unconscious, 10 (20%) were semiconscious and 8 (16%) were conscious. Majority of patients 38 (76%) were develop fever (febrile illness) during the admission period/hospital stay in ward. The causes of nosocomial infection in these patients were urinary tract infection UTI in 34 (68%) patients, bloodstream infection 19 (38%), lower respiratory tract infection (pneumonia) in 09 (18%) patients, upper respiratory tract infection sinusitis in 4 (8%) patients and otitis in 3 (6%) patients, bronchitis in 07 (14%) patients and tracheitis in 3 (6%) patients. The skin and soft tissue infection were identified in 08 (16%) patients. Gastrointestinal infection was observed in 12 (36%) patients. 06 (12%) patients developed fever after the medical specific procedures (peritoneal paracentesis, bone marrow and liver biopsy).

Out of 34 urinary tract infection UTI detected cases, 32 had their urine culture positive with gram negative organisms *E. coli* 07 (14%) patients, proteus mirabilis 02 (4%) patients, klebsiella 01 (2%) patient, serratia 01 (2%) patient, pseudomonas 06 (12%) patients, coagulase negative staphylococci includes staphylococcus epidermis in 4 (8%) patients and staphylococcus saprophyticus in 02 (4%) patients, staphylococcus aureus in 05 (10%) patients, enterococci in 01 (2%) patient and candida albicans in 03 (6%) patient. The cause of hospital acquired UTIs in such patient was catheterization (Foley's Catheter) and these all are also the leading factors of catheter induced bloodstream infections.

The blood culture was taken from 2 different sites, it shows positive result in 19 (38%) patients and this is due

to bloodstream infection. The chest radiograph shows the pneumonic patch (consolidation) in 16 (32%) patients, in which 07 (14%) were unconscious, 02 (4%) were semiconscious and 10 (20%) were conscious, according to the result of pleural fluid examination of our study the causes of hospital acquired pneumonia in such patients was infection with gram negative bacilli *E. coli* 06 (12%) patients, pseudomonas in 3 (6%) patients, enterobacter in 01 (2%) patients, klebsiella in 02 (4%) patients, staphylococcus aureus in 03 (6%) patients and anaerobes in 04 (8%) patients. Out of 12 (36%) patients of hospital acquired GI infection 08 (16%) were infected with clostridium defficile, 03 (6%) had stool culture positive with gram negative organisms, 01 (2%) patient acquired hepatitis A and 01 (2%) patient acquired hepatitis E infection during admission period, 04 (8%) patient acquired malaria during hospitalization.

In our study, 02 (4%) patients acquired scabies (acquired from other hospitalized patients) and 11 (22%) patients develop bed sores (prolong bed ridden patient). The soft tissue infections (cellulitis and abscess) were found in 03 (6%) patients, impetigo was identified in 02 (4%) patients (the cause was staphylococcus aureus) and 03 (6%) acquired varicella zoster infection (chicken pox).

The wound infections [staphylococcus in 01 (2%) patient and pseudomonas in 03 (6%) patients] were detected in patients referred from surgery [02 (4%) patients], neurosurgery [01 (2%) patient] and burns ward [01 (2%) patient]. Two patients (4%) referred from nephrology unit already had placement of intravascular line (CVP/double lumen catheter DLC) showed that the skin around the line was swollen and red, suggests infection.

MRSA and VRE were found in 12 (36%) patients and it is due to prolong use of different antimicrobial agents that results in the creation of resistance against such microorganisms.

The risk factors we identified in our study were unsterilized hospital instruments and equipments, poor hygienic condition of the hospital/ward, contaminated food supplements and the use of contaminated water of ward/hospital, non isolation of the infected person, unhygienic status of the hospital staff/improper hand washing, fecal incontinence and pressure ulcers.

DISCUSSION

The hospitalized patients are always at great risk to acquire different nosocomial infections through different sources e.g. invasive devices (urinary catheters, intravascular catheters/cannulas, nasogastric intubations

and through various medical procedures). In our study the urinary tract infection UTI was the most common hospital acquired infection and this is due to catheterization. Different organisms get entry into the bloodstream through such route and leads to septicemia. In our study fever was the first sign detected after acquiring nosocomial infection and it suggested that the presence of infectious element, the same finding was reported in various other studies in the nosocomial infection [2-5]. The frequency of hospital acquired infection was increased in the elderly patients [6-8] however in our study we detected that the majority of patient who acquired hospital infection were more than 50 years of age and this is because of decrease immunity in the advanced age. The mean time from hospitalization to the onset of fever was approximately 9 days in our study whereas, the value is between 7 days in the study of Arbo *et al.* [2] and the 13 days in the study of Filice *et al.* [5] Our study detected that the infections were the most important cause of fever and the most common infectious site was urinary tract and respiratory tract, however on various other studies, despite the common finding of fever in association with infection, a proportion of older patients (25%) did not exhibit the febrile response in the presence of serious infectious diseases [9,10]. The most common pathogens for urinary tract infection detected in our study was *E.coli*, where as pseudomonas, staphylococcus aureus and staphylococcus epidermis were the causes of urinary tract infection in catheterized patient. In a large study [11]. UTIs accounted for 40% of nosocomial infections. Mortality of patients with bacteriuria was found to be nearly 3 times higher than that for those without bacteriuria [12]. although the prevalence is decreased in recent decades from 23% in the 1960s [13] to 10% in the 1990s [14], nosocomial UTIs continue to cause significant morbidity and mortality.

In our study the hospital acquired blood stream infection was detected through blood culture, the sample was taken from different sites upon different timings. The blood stream infection would represent the eighth leading cause of death in the United States [15], the common source of blood stream infection were UTIs and intravascular catheterization.

In our data showed the hospital-acquired respiratory infection includes sinusitis, otitis, pharyngitis, bronchitis and pneumonia. The most common RTI found in our study was pneumonia and the common pathogens were gram negative bacilli, staphylococcus aureus and anaerobes. The basic loci of these pathogens were UTIs, intravascular catheterization or the direct infection within the respiratory tract. The anaerobes mostly found within

unconscious patients, the cause was aspiration pneumonia which is due to inhalation of respiratory secretion. The frequent use of hospital equipments as nebulizers, oxygen mask and the other diagnostic devices within different patients in hospital is also one of cause of hospital acquired respiratory tract infection.

Our study also detected gastrointestinal infection; the most common was clostridium defficile (CD). It is the only important known infectious cause of nosocomial diarrhea. CD is rarely (1-3%) found as part of the normal intestinal flora and data suggest that even sporadic cases of CD-associated diarrhea (CDAD) are acquired exogenously. Unlike infection with other enteric pathogens, infection with CD is nearly always precipitated by antimicrobial therapy. The most common agents implicated in our study were 2nd and 3rd generation cephalosporins and clindamycin. Clindamycin resistance in some strains of CD increases the risk of CDAD in patients exposed to this agent. Asymptomatic CD colonization is common in hospitalized patients and stool toxin testing is important for the diagnosis of CDAD although toxin assays, particularly toxin EIA assays are not as sensitive as culture for the diagnosis of CDAD. Oral metronidazole and vancomycin are highly effective in the treatment of CDAD; however recurrence is common following either agent. Effective control measures for nosocomial CDAD have included restriction of specific antimicrobials, glove use by healthcare workers and replacement of electronic thermometers with disposable thermometers. Outbreaks and deaths due to CDAD continue to occur and new or better methods of control and treatment are needed. The hepatitis A and E infections were also found in our study and it is due to use of contaminated water/food of hospital and poor hygienic hospital equipments.

The hospital acquired skin infections detected in our study were scabies, impetigo and chicken pox. All such patients acquired those infections from other hospitalized patients through contaminated hands or from contaminated bed sheets.

The hospital acquired infection in I.C.U patients is ventilator associated pneumonia (VAP) and the pathogens responsible for such infection are streptococcus pneumoniae, haemophilus influenzae, methicillin sensitive staphylococcus aureus MSSA, methicillin resistant staphylococcus aureus and acinetobacter baumannii. Other infections acquired by ICU patients are UTIs, RTIs, bloodstream, bedsores and gastrointestinal. The unconscious patients are more prone to develop aspiration pneumonia during endotracheal

intubation or acquire infection if the endotracheal tube is not properly sterilized. The common nosocomial in the surgery ward is wound infection and the pathogens are staphylococcus aureus and methicillin resistant staphylococcus aureus MRSA.

To control nosocomial infections, there are certain antimicrobial agents which are effective against such pathogens such as vancomycin, nafcillin, fluoroquinolones, cabapenems and aminoglycosides. The empiric broad spectrum antibiotics are recommended for neutropenic and other hospitalized immunocompromised patients and in patients who are clinically unstable [1].

To prevent hospital acquired infections general rules of hygiene should be implemented, aseptic measure should be taken while performing any procedure, strict isolation is required for patients with severe respiratory tract infection or severe burns, proper cleaning, sterilization and disinfection of reusable equipments, prophylactic antibiotics are not recommended as they result in emergence of resistant strains of microorganism.

CONCLUSION

From our study we had concluded that the hospitalized patients are at great risk to acquire nosocomial infections. The common hospital acquired infections we detected in medical ward were urinary tract (UTIs), bloodstream, respiratory tract infection (RTIs), skin/soft tissue, wound and gastrointestinal. The pathogens responsible for such infections were *E. coli*, pseudomonas, staphylococcus and clostridium difficile. The risk factors we identified were poor hygienic environment of ward, improper hand washing, contaminated water and usage of unsterilized instruments and equipments for medical procedures.

REFERENCES

1. Stephen, J., A. Maxine and M. Lawrence, 2007. Current Medical Diagnosis and Treatment: General Problem in Infectious diseases. 46th Edn. San Francisco (California): Lang, pp: 1317-1320.
2. Arbo, M.J., M.J. Fine, B.H. Hanusa, T. Sefcik and W.N. Kapoor, 1993. Fever of nosocomial origin: etiology, risk factors and outcomes. Am. J. Med., 95: 505-512.
3. McGowan, J.E., R.C. Rose, N.F. Jacobs, D.R. Schaberg and R.W. Haley, 1987. Fever in hospitalized patients: with special reference to the medical service. Am. J. Med., 82: 580-586.

4. Bor, D.H., H.J. Makadon, G. Friedland, P. Dasse, A.L. Komaroff and M.D. Aronson, 1988. Fever in hospitalized medical patients: Characteristics and significance. *J. Gen. Intern. Med.*, 3: 119-125.
5. Filice, G.A., M.D. Weiler, R.A. Hughes and D.N. Gerding, 1989. Nosocomial febrile illnesses in patients on an internal medicine service. *Arch. Intern. Med.*, 149: 319-324.
6. Christophe Trivalle, Philippe Chassagne, Marc Bouaniche, Isabelle Landrin, Isabelle Marie, Nadir Kadir *et al.*, 1998. Nosocomial Febrile Illness in the Elderly. *Arch. Internal Med.*, 158:1560-1565.
7. Saviteer, S.M., G.P. Samsa and W.A. Rutala, 1988. Nosocomial infections in the elderly: increased risk per hospital day. *Am. J. Med.*, 84: 661-666.
8. Haley, R.W., T.M. Hooton and D.H. Culver *et al.*, 1981. Nosocomial infections in US hospitals, 1975-1976: estimated frequency by selected characteristics of patients. *Am. J. Med.*, 70: 947-959.
9. Norman, D.C., D. Grahn and T.T. Yoshikawa, 1985. Fever and aging. *J. Am. Geriatr Soc.*, 33: 859-863.
10. Wasserman, M., M. Levinstein, E. Keller, S. Lee and T.T. Yoshikawa, 1989. Utility of fever, white blood cells and differential count in predicting bacterial infections in the elderly. *J. Am. Geriatr Soc.*, 37: 537-543.
11. Haley, R.W., D.H. Culver, J.W. White, W.M. Morgan and T.G. Emori, 1985. The nationwide nosocomial infection rate: a new need for vital statistics. *Am. J. Epidemiol.*, 121: 159-167.
12. Platt, R., B.F. Polk, B. Murdock and B. Rosner, 1983. Reduction of mortality associated with nosocomial urinary tract infection. *Lancet.*, 1: 893-897.
13. Kunin, C.M. and R.C. McCormack, 1966. Prevention of catheter-induced urinary-tract infections by sterile closed drainage. *N. Engl. J. Med.*, 274: 1155-1161.
14. Johnson, J.R., P.L. Roberts, R.J. Olsen, K.A. Moyer and W.E. Stamm, 1990. Prevention of catheter-associated urinary tract infection with a silver oxide-coated urinary catheter: Clinical and microbiologic correlates. *J. Infect Dis.*, 162: 1145-1150.
15. Richard, P. and B. Michael, 2001. The impact of hospital-acquired bloodstream infections. *Emerging Infectious Diseases*, 7(2): 174-77.