Original Research Article

Control and prevention of nosocomial infection

Palle Lokhnah Reddy[1]*, Aluka Anand Chand[2]

[1]Department of Community and Family Medicine, Surabhi Institute of Medical Sciences, Siddipet, Telangana, India
[2]Department of General Surgery, Osmania Medical College, Hyderabad, Telangana, India

*Correspondence:
Dr. Palle Lokhnath Reddy,
E-mail: lokmaanya@gmail.com

ABSTRACT

Background: The center for disease control and prevention estimates that 1.5 million people suffer from hospital acquired infection every year and hereby one lack people die. Major nosocomial infections (NIs) are ventilator associated pneumonia (VAP), urinary tract infection (UTI), surgical site infection (SSI) and blood stream infections (BSI).
Methods: This was a retrospective multicenter descriptive study involving 2000 consecutive patients in ICU for a period of 2 years. The data was compared with the data available from National Nosocomial infection surveillance. NIs were analyzed by infection site and pathogen distribution.
Results: The main factors responsible for NI are both hospital and patients. Almost 40% UTI's contribute to NI's, 30% VAP's, 20% SSI and 10% BSI respectively. Nosocomial infections can be reduced by better surveillance system and infection control. Primary blood stream infections, pneumonia and UTI associated with invasive devises made up the great majority of nosocomial infections.
Conclusion: We can reduce NI's by proper use and care of urine catheters, proper use and care of vascular accesses lines, by proper surveillance of surgical procedure and by proper hand and hygiene standard precautions.

Keywords: Noscomial infection, Control, Prevention

INTRODUCTION

The center for disease control and prevention estimates that 1.5 million people suffer from hospital acquired infection every year and hereby one lacks people die. Major nosocomial infections (NI) are ventilator associated pneumonia (VAP), urinary tract infection (UTI), surgical site infection (SSI) and blood stream infections (BSI). The main factors responsible for nosocomial infections (NI) are both hospital and patients. Almost 40% UTI's contribute to NI's, 30% VAP's, 20% SSI and 10% BSI respectively. Nosocomial infections can be reduced by better surveillance system and infection control. Primary blood stream infections, pneumonia and UTI associated with invasive devises made up the great

majority of nosocomial infections. We can reduce NI's by proper use and care of Urine catheters, proper use and care of vascular accesses lines, by proper surveillance of surgical procedure and by proper hand and hygiene standard precautions.[1]

Educational efforts targeted at entry-level health care providers and hospital epidemiologists must be strengthened. Government agencies, academic centers, industry, and professional organizations each have unique strengths and talents that can be collectively brought to bear on the problem. Nosocomial or hospital acquired infection is an infection in hospitalized patient or may be in any other health care faculty not present or incubating on admission.[2-4] Infection control addresses factors

related to the spread of infections within health care settings (weather patient to patient, patient to staff and from staff to patients).[5,6] The NI's are caused by gram positive, gram negative, viruses and fungi etc.[7,8] The four major NI's which constitute a major challenge are:

- UTI - occurs to be in 12% of reported NIs.[9] Patient's flora is responsible for 2/3 of patients for origin of infection for UTI. *E. coli* is the most common pathogen reported for the cause.
- VAP - is estimated to occur in 9-27% of mechanically ventilated patients with highest risk being early course of hospitalization and is the second most NI's in ICU.[10] VAP is more in first five days of mechanical ventilation 3% with mean duration between intubation and development. Early onset is that occurring within four days and is usually attributed to antibiotic sensitive pathogens and late onset is caused by multi drug resistant bacteria and emerges after four days of intubation.
- SSI - are potential complications associated with any type of procedure and are among most preventable NI's. SSI account to 17% hospital acquired infections. The pathogens commonly involved are *E. coli* and *Enterobacter*. SSI depends on procedure of surgery and can be reduced by laparoscopic procedures.[11]
- BSI - another common type of NI's after hospital acquired *Pneumonia*. It accounts to almost 8% of NI's; most of the BSI is caused by gram positive bacteria, followed by gram negative *Cocci*.

Objective of the study was to describe the plans for preventing and controlling nosocomial infections and goals for reducing infections that have been judged achievable, using existing prevention and control strategies.

METHODS

This was a retrospective multicenter descriptive study involving 2000 consecutive patients in ICU for a period of 2 years (from 1 June 2017 to 2019) at Osmania General Hospital, Hyderabad, Gandhi General Hospital, Hyderabad and Nizam's Institute of Medical Science, Hyderabad, Telangana.

The study included patients with clinical features of invasive sepsis who had isolated pathogen from culture of at least one specimen collected from the patient after 48 hours of admission to ICU. Samples were collected from body sites, venous blood and devices are sent for bacterial culture.

Blood cultures were done by using BACT/ALERT Plus Medium which serves as both aerobic and anaerobic culture media using specialized liquid emulsion sensors (LES) and was analyzed with BACT/ALERT instrument using sophisticated algorithms with colour change and pH change indicators and incubated at 36° C for 7 days. If the culture found to be positive gram stain was performed on

the culture fluid. Subcultures was performed depending on the result of gram staining technique.

The collected data was compared with the data available from national nosocomial infection surveillance (NNIS) program in 2014.[12] Nosocomial infections were analyzed by infection site and pathogen distribution.

The statistical analysis was carried out using windows 10 version of SPSS 23 and presented in number and percentages. Nosocomial infections were analyzed by infection site and pathogen distribution. The p value was considered statistically significantly if $p<0.05$.

RESULTS

There were 2000 patients admitted in the tertiary care hospital (provide hospital name) during the two years study period. All the patients developed culture confirmed nosocomial sepsis. The surgical equipment was controlled for by calculating equipment associated infection rates for BSI, VAP, UTI and SSI by dividing the number of equipment infections by the number of days of equipment usage and hospital stay in days.

In this study UTI were most frequent accounting to 40% (n=800), followed by VAP accounting to 30% (n=600), BSI accounting to 10% (n=200) and SSI accounting to 20% (n=400). The data available in the current study was compared with the data available from NNIS. The study data when compared with NNIS statistics was marginally higher but with significant p value ($p<0.05$).

Table 1: Comparison of current study and NNIS study.

Variables	UTI N (%)	VAP N (%)	SSI N (%)	BSI N (%)
Current study	40	30	20	10
NNIS study	44	26	19	11

DISCUSSION

Infections occurring more than 48 hours after of hospital admission are usually considered as nosocomial infections. These infections are acquired in hospital care which is not present or incubating at admission. In the present study overall incidence of NIs were comparable to the data available from NNIS.

Primary blood stream infections, pneumonia and UTI associated with invasive devices made up the great majority of nosocomial infections.

Many risk factors are associated with incidence of NIs that include poor hygienic conditions, immunosuppression in the patients, prolonged stay in ICU, prolonged use of antibiotics, unawareness of using health devices by the understaff, improper use of

injections, poor knowledge of basic infection control measures.[13,14]

Care should be taken by the patients and staff for preventing the transmission of pathogens during the treatment. Catheters should be used only when clearly indicated. Condom catheters should be used whenever possible and discontinue catheters as soon as possible. Gloves and gown should be disposed at all times and masks should be used only during procedures.[15]

NIs need to be prevented from the baseline so that their spread can be prevented. Unhygienic environment acts as the best source for pathogenic organisms to grow. Air, food, water get contaminated easily in such conditions and transmitted to the patients under health care delivery. Policies should be made to ensure the cleaning and use of cleaned baths, toilets, beds and other medical devices. Airborne isolation measures should be taken by thoroughly checking the ventilation systems, OR-HEPA filtered airflow should be designed for operating theaters, ICUs. Microbiological monitoring methods should be done for analysis of water, Food quality should meet the standard criteria.[15]

Health care professionals should take role in infection control. Everyone should maintain personal hygiene. Hand disinfectants should be used after being in contact with infected patients. Proper uniform with use of masks, headcovers, gloves are essential during health care delivery.[15]

Waste from hospitals containing heavy metals, surgical waste, waste from infected individuals, diagnostic wastes must be disposed of separately. Proper management of such things by health care staff and cleaners are essential.[15]

Despite of significant efforts made to control NIs, 1 out of 25 hospital patients acquire at least a single type of NI.[16] Health care institutes should develop control programs against such infections. Administration, workers and individuals admitted or visiting hospitals should be aware of such infection control programs.[15]

In the present study, incidence of UTIs are more observed (n=800, 40%) compared to other NIs. This was in contrary with the findings of Naidu et al.[12] In his study, RTIs were seen in 125 patients out of 663 patients. Nosocomial pathogens are usually resistant to several antibiotics. In the present study, we do not present antibiotic susceptibility data.

CONCLUSION

The study provides important information that strongly suggest that infection control can be achieved by improving and employing infection control policies in the health care system. Proper training of hospital staff for proper waste management, biosafety and health reforms and making general public aware of these infections would help in reduction of nosocomial infections.

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