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Original Article

Infectious Diseases Section

Hospital Acquired Infections Among Patients Admitted in the Medical and Surgical Wards of a Non-Teaching Secondary Care Hospital in Northern India

I. GINAWI[1], MOHD SALEEM[2], MASTAN SIGH[3], A.K. VAISH[4], I. AHMAD[5], V.K. SRIVASTAVA[6], A. FAHAD ABDULLAH M.[7]

ABSTRACT

Objective: To investigate the incidence of Nosocomial Infection (NI) and type of bacteriological isolates among the patients admitted in the medical and surgical wards of a non-teaching secondary care hospital in north India.

Materials and Methods: This was a cross-sectional hospital based study conducted in the Wards of General Medicine, General Surgery and Orthopaedic of the hospital. The patient were admitted in the department for various surgical procedures, without evidence of initial infection, were included in the study.

Results: A total of 176 patients were included in the study of which 82 were from Medical and 94 from Surgical ward. Overall incidence of NI was found to be 26.1% (Medical ward=28%, Surgical ward=24.5%., p=0.58). The isolation rate of *Acinetobacter baumanii* was (p=0.15) higher among the patients of medical ward (95.7%) than surgical ward (82.6). *Escherichia coli* was isolated in 89.1% and no significant difference was observed between medical and surgical wards. *Klebsiella pneumoniae* was isolated in 50% patients and was almost similar (p=0.37) in medical surgical wards. The isolation rate of *Pseudomonos aeruginosa*, *Enterococcus faecalis*, *Staphylococcus aureus* and Coagulase negative *staphylococci* were 43.5%, 73.9%, 34.8% and 17.4% respectively. A significant difference was observed in the isolation rate of *Enterococcus faecalis* (p=0.007) and Coagulase negative *staphylococci* (p=0.002) between medical and surgical wards. Overall, among the patients who developed NI, 27.2% patient's bacterial isolates were Gram positive (Surgical=64.1, Medical=80%).

Conclusion: The incidence of NI is increasing in the hospitals, so extensive that more care has to be taken in cleaning the wards of the hospitals.

Keywords: Hospital infection, Gram positive bacteria, Bacterial isolates

INTRODUCTION

Nosocomial Infections (NI) occur worldwide and affect both developed and developing countries. Infections acquired in health care settings are among the major causes of death and increased morbidity among hospitalized patients. These infections result in substantial morbidity, mortality and increased financial burden. NI are also important public health problems in developing countries as well as in developed countries. The socio-economic impact, i.e., prolongation of hospitalization, mortality and cost, of these infections adversely affects patients and nation's economic well-being [1,2]. A incidence survey was conducted under the auspices of World Health Organization (WHO) in 55 hospitals of 14 countries representing four WHO Regions (Europe, Eastern Mediterranean, South-East Asia and Western Pacific) showed an average of 8.7% of hospital patients had NI. At any time, over 1.4 million people worldwide suffer from infectious complications acquired in hospital [3]. The highest frequencies of NI were reported from hospitals in the Eastern Mediterranean and South-East Asia Regions (11.8 and 10.0% respectively), with a incidence of 7.7 and 9.0% in the European and Western Pacific Regions respectively [4].

Risk factors for the development of NI in the Surgical Intensive Care Unit (SICU) setting include poor nutritional status, exposure to multiple antibiotics, indwelling central venous catheters, mechanical ventilation and length of Intensive Care Unit stay [5]. The most common resistant gram-positive organisms encountered in the hospital setting are methicillin-resistant *Staphylococcus aureus* (MRSA) and Vancomycin-Resistant *Enterococci* (VRE). Among nosocomial gram-negative pathogens, Extended-Spectrum Beta-Lactamase (ESBL)-producing Enterobacteriaceae, multidrug-resistant *Pseudomonas* aeruginosa, and multidrug-resistant *Acinetobacter baumannii* are most prevalent.

The present study was carried out to investigate the incidence of NI and type of bacteriological isolates among the patients admitted in the medical and surgical wards of a non-teaching secondary care hospital in northern India.

MATERIALS AND METHODS

Study Design

This was a cross-sectional hospital based study conducted in a non-teaching secondary care hospital between January 2011 to December 2012.

Study Site

Wards of General Medicine, General Surgery and Orthopaedic departments of the hospital.

Patients

The patients were admitted in the department for various surgical procedures, without evidence of initial infection, were included in the study.

Nosocomial Infection

Patients who had no infection or they had not been in incubation period on the basis of signs and symptoms; at the admission time and had positive culture after third day of admission, were defined as patients with NI in the present study [6].

Data Collection

Pus, blood, urine, sputum and swabs from various lesions if present among study patients was taken after 48 hour of admission and followed till discharge from the hospital.

Bio-social characteristics	Medical (n=82)		Surgical (n=94)		Total (n=176)	
	no.	%	no.	%	no.	%
Age Group						
<15	4	4.9	4	4.3	8	4.5
15-25	12	14.6	12	22.3	33	18.8
26-35	15	18.3	15	12.8	27	15.3
36-45	14	17.1	14	19.1	32	18.2
46-55	19	23.2	19	11.7	30	17.0
>55	18	22.0	18	29.8	46	26.1
Sex						
Male	45	54.9	65	69.1	110	62.5
Female	37	45.1	29	30.9	66	37.5
Religion						
Hindu	74	90.2	89	94.7	163	92.6
Muslim	8	9.8	5	5.3	13	7.4
Cast						
General	16	19.5	18	19.1	34	19.3
Backward	22	26.8	23	24.5	45	25.6
Scheduled	44	53.7	53	56.4	97	55.1
Education						
Illiterate	53	64.6	57	60.6	110	62.5
< High school	12	14.6	16	17.0	28	15.9
High school-Intermediate	12	14.6	17	18.1	29	16.5
Graduate+	5	6.1	4	4.3	9	5.1
Occupation						
Service	26	31.7	31	33.0	57	1.7
Professional	0	00	3	3.2	3	7.4
Agriculture	11	13.4	2	2.1	13	26.7
Housewife	28	34.1	19	20.2	47	21.6
Unemployed	13	15.9	25	26.6	38	10.2
Labour	4	4.9	14	14.9	18	10.2
SES						
II	6	7.3	9	9.6	15	8.5
III	6	7.3	9	9.6	15	8.5
IV	5	6.1	11	11.7	16	9.1
V	65	79.3	65	69.1	130	73.9

[Table/Fig-1]: Distribution of patients by bio-social characteristics

Wards	Nosocomial infection		
	No. screened	No. with NI	% with NI
Medical*	82	23	28.0
Surgical*	94	23	24.5
Total	176	46	26.1

[Table/Fig-2]: Prevalence of Nosocomial Infection (NI) in different wards of the hospitals *p=0.58

Strain Identification

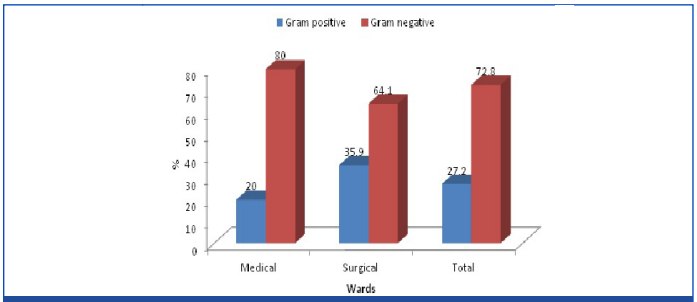
Bacterial strain was identified with the help of gram staining and biochemical tests. Mainly, facultative anaerobes and aerobic bacteria such as *Staphylococcus aureus*, streptococcus facealis, bacillus subtilis, *E-coli*, *Klebsiella*, Proteus species, Pseudomonas species and clostridium species was taken into consideration as per guidelines of CDC [7].

STATISTICAL ANALYSIS

The data collected was entered in the Microsoft Excel computer program and checked for any inconsistency. The results are presented in proportions/percentages. The Chi-square test was used to assess the associations. The p-value <0.05 was considered as significant. All the analysis was carried out by using SPSS 16.0 version.

Type of hospital/ organism*		Nosocomial infection			p-value[1]
		Medical patient with organism (n=23)	Surgical patient with organism (n=23)	Total patient with organism (n=46)	
Enterococcus faecalis	No	21	13	34	0.007*
	%	91.3	56.5	73.9	
Acinetobacter baumanii	No	22	19	41	0.15
	%	95.7	82.6	89.1	
Escherichia coli	No	13	8	21	0.13
	%	56.5	34.8	45.7	
Pseudomonos aeruginosa	No	10	10	20	1.0
	%	43.5	43.5	43.5	
Staphylococcus aureus	No	9	7	16	0.53
	%	39.1	30.4	34.8	
Klebsiella pneumoniae	No	10	13	23	0.37
	%	43.5	56.5	50.0	
Coagulase-negative *staphylococcus*	No	0	8	8	0.002*
	%	0.0	34.8	17.4	

[Table/Fig-3]: Distribution of different types of organism among patient's biological specimen *Multiple responses, [1]Between tertiary and secondary care hospitals, *Significant



[Table/Fig-4]: Distribution of Gram positive and Gram negative bacterial isolates among patient's biological specimen

Ethical Consideration

Ethical clearance was taken from the Ethical Committee of the hospital. The consent was taken from each patients included in the study.

RESULTS

A total of 176 patients were included in the study of which 82 were from Medical and 94 from Surgical ward. [Table/Fig-1] describes the bio-social characteristics of the patients. Overall incidence of NI was found to be 26.1%. The incidence of NI was higher among the patients of medical (28%) ward than surgical (24.5%) ward, however, the difference was statistically insignificant (p=0.58) [Table/Fig-2].

Acinetobacter baumanii was isolated in 89.1% patients. The isolation rate of *Acinetobacter baumanii* was (p=0.15) higher among the patients of medical ward (95.7%) than surgical ward (82.6). *Escherichia coli* was isolated in 89.1% and no significant difference was observed between medical and surgical wards. *Klebsiella pneumoniae* was isolated in 50% patients and was almost similar (p=0.37) in medical surgical wards. The isolation rate of *Pseudomonos aeruginosa*, *Enterococcus faecalis*, *Staphylococcus aureus* and Coagulase negative *staphylococci* were 43.5%, 73.9%, 34.8% and 17.4% respectively. A significant difference was observed in the isolation rate of *Enterococcus faecalis* (p=0.007) and Coagulase negative *staphylococci* (p=0.002) between medical and surgical wards [Table/Fig-3].

Overall, among the patients who developed NI, 27.2% patient's bacterial isolates were Gram positive and 72.8% patient's bacterial isolates were Gram negative. The Gram negative bacterial isolates were lower in surgical ward (64.1%) than medical ward (80%) [Table/Fig-4].

DISCUSSION

NI are infections acquired during hospital cares which are not present or incubating at admission. Infections occurring more than 48 hours after admission are usually considered nosocomial. Definitions to identify NIs have been developed for specific infection sites (e.g., urinary, pulmonary). These are derived from those published by the Centers for Diseases Control and Prevention (CDC) in the United States of America [8,9] or during international conferences [10] and are used for surveillance of NI. They are based on clinical and biological criteria, and include approximately 50 potential infection sites. NI may also be considered either endemic or epidemic. Endemic infections are most common. Epidemic infections occur during outbreaks, defined as an unusual increase above the baseline of a specific infection or infecting organism.

In the present study, overall incidence of NI was found to be 26.1%. The incidence of NI was higher among the patients of medical (28%) ward than surgical (24.5%) ward, however, the difference was statistically insignificant (p=0.58). Similar finding was seen by Kamat et al., [11], which is higher than the previous studies in which Infection rate were 16.4% [12] and 13% [13] and lower than following studies where NI rate was 27.4% [14].

Incidence of NI is increasing day by day. The factor that can account for the higher infection rate may be the availability of high number of visitors, lack of knowledge and proper monitoring and setup of the hospital. This slight increase in the incidence of NI in this hospital may paralleled to paying attention to well established processes for decontamination and cleaning of soiled instruments and other items, followed by sterilization and high-level disinfection processes and improving safety in operating rooms and other high-risk areas where the most serious and frequent injuries and exposures to infectious agents occur.

In other studies, the commonest bacterial organisms were *Escherichia coli* (51.0%), *Klebsiella* species (19.6%) and Proteus mirabilis (10.0%) [15]. Gram negative bacilli accounts for 194 (54.34%), *Klebsiella pneumoniae* 60 (31%) was the commonest [16] and Acinetobacter baumannii accounted for 41.8% (n=18) of all the infections [17]. In another study the most common microorganisms were *Escherichia coli* (64.3%), coagulase negative *staphylococci* (11.2%) and *Klebsiella* (8.1%) [18]. In this study, the isolation rate of *Pseudomonos aeruginosa*, *Enterococcus faecalis*, *Staphylococcus aureus* and Coagulase negative *staphylococci* were 43.5%, 73.9%, 34.8% and 17.4% respectively. These findings are almost in agreement with other studies.

Gram negative bacteria causes thousands of hospital acquired infections each year. It is estimated that approximately 30% of all the hospital acquired infections are caused by Gram negative bacteria, and that they are responsible for approximately 70% of all hospital acquired infections contracted in the Intensive Care Unit [19]. In the present study, Overall, among the patients who developed NI, 27.2% patient's bacterial isolates were Gram positive and 72.8 percent patient's bacterial isolates were Gram negative. The Gram negative bacterial isolates were lower in surgical ward (64.1%) than medical ward (80%). Vanitha et al., [20] reported that in most of the studies, Gram-negative bacilli have taken over the Gram positive organisms, especially in hospital settings and Gram negative bacteria were predominant (58%). Another study reported the incidence of 80.96% for Gram-negative and 18% for Gram-positives [21].

CONCLUSION

The incidence of NI is increasing in the hospitals, so that the more care has to be taken in the cleaning the wards of the hospitals.

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PARTICULARS OF CONTRIBUTORS:
1. Faculty, College of Medicine, University of Hail, Kingdom of Saudi Arabia.
2. Faculty, Department of Microbiology, King George's Medical University UP, Lucknow, India.
3. Faculty, Department of Microbiology, King George's Medical University UP, Lucknow, India.
4. Faculty, Department of Internal Medicine, King George's Medical University UP, Lucknow, India.
5. Faculty, Department of Pulmonary Medicine, King George's Medical University UP, Lucknow, India.
6. Faculty, Department of Community Medicine and Public Health, King George's Medical University UP, Lucknow, India.
7. Faculty, College of Medicine, University of Hail, Kingdom of Saudi Arabia.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Ibrahim Abdelmageed Ginawi,
College of Medicine, University of Hail, PO. Box 2440, Kingdom of Saudi Arabia.
Phone: +966 6 506771772, E-mail: iginawi71@gmail.com

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