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Original article

Clinical and microbiological profile of healthcare associated infection in a tertiary care hospital in north-eastern India

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ABSTRACT

Background: Data from northeast India regarding health care associated infections (HAI) is limited.
Objective: To determine the incidence, determinants, clinical and microbiological profile of healthcare associated pneumonia and urinary tract infection (UTI).
Methods and material: Prospective, observational study was conducted in 150 patients with HAI, aged ≥18 years, selected randomly. HAI was defined by CDC criteria. Controls comprised of 150 age and sex matched patients without HAI. Data was analysed using SPSS-17.0 and p value <0.05 was considered significant.
Results: Mean age was 54.3 ± 17.2 years with male:female ratio of 3:2. Most patients (66%) were aged ≥50 years. Overall incidence of HAI was 11.06%. Most common causative organisms for healthcare associated UTI and pneumonia were E. coli (34.8%) and Klebsiella (37.7%) respectively. Compared to controls, patients with HAI had significantly higher co-morbidities (57.3% vs. 18.7%, $p < 0.001$); increased use of invasive devices ($p < 0.05$); increased use of quinolones, piperacillin-tazobactam, carbapenem; longer stay in the ICU (12.04 vs. 6.02 days, $p < 0.01$) and increased in-hospital mortality (27.3% vs. 5%, $p < 0.01$).
Conclusion: HAI are more common in patients aged ≥50 years, having co-morbidities, resulting in increased hospital stay and poorer outcomes. The incidence of HAI and isolation of multidrug resistant organisms are lower than other studies.

1. Introduction

Health care-associated infection (HAI) is an infection that develops after 48 h of hospitalization, and is commonly in the forms of urinary tract infection (UTI), pneumonia and bloodstream infections associated with indwelling devices [1].

HAI is the most frequent adverse event in health-care delivery worldwide leading to significant mortality, increased cost of health care with increasing isolation of multidrug resistant organisms [2,3]. It is estimated that out of every 100 hospitalized patients at any given time, five in developed and 15 in developing countries will acquire at least one HAI, the burden being greater in the intensive care setting [4]. The most frequent HAI is UTI in high-income countries and surgical site infections (SSI) in developing countries.[4] While most developed countries have annual surveillance programmes for HAI, such systems are not available in developing countries like India. Reports from various parts of India show a rise in multidrug resistant organisms in HAI, particularly in ICU settings, including carbapenem resistant gram negative organisms and vancomycin resistant Staphylococcus spp. [5].

However, there is no published data about the incidence and pattern of HAI from the north east of India. In this background, this study was conducted to determine the burden of HAI and its determinants and outcomes from a tertiary care hospital in the north east.

2. Materials and methods

A total of 150 patients with HAI were enrolled for the study. One thousand five hundred patients, aged 18 years and above were selected by systematic random sampling from a total of 17,275 hospital admissions into the Department of General Medicine between August 2010 and July 2011 and screened for health care associated infections. Out of these 1500 randomly selected patients, 166 were found to have HAI, either as UTI and/or pneumonia, as per the CDC/NHSN [3]. Of these patients with HAI, 16 patients who did not satisfy the selection criteria were excluded,

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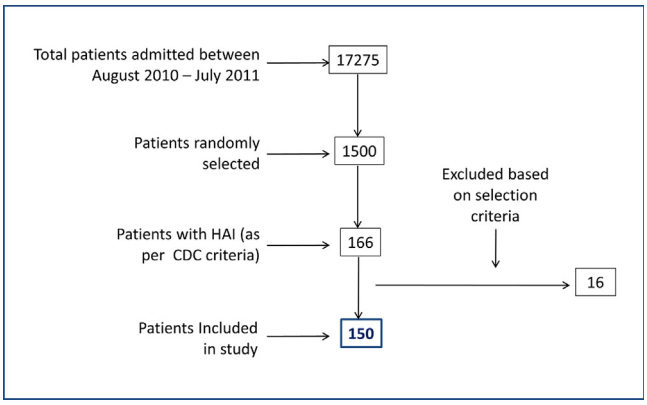

Fig. 1. Showing scheme of selection of participants based on selection criteria.

Table 1
Age distribution of patients and controls.

Age (years)	Patients with HAIs Cases (N = 150) n (%)	Controls (N = 150) n (%)
18–30	8(5.3)	9 (6.0)
31–40	16(10.6)	17 (11.3)
41–50	27(18)	26 (17.3)
51–60	37(24.7)	36 (24.0%)
61–70	44(29.3)	43 (28.7%)
71 and above	18(12)	19 (12.7)

thereby including 150 patients in the present study (Fig. 1). Another 150 age and sex matched patients without HAI were selected randomly from the same department during the period of the study and these served as controls.

2.1. Inclusion criteria

1 Patients aged 18 years and above admitted to the medicine general wards and medical intensive care units (ICU) developing pneumonia and/or urinary tract infection (UTI) after 48 h of admission as per the CDC/NHSN definitions [3].

2.2. Exclusion criteria

1 Patients admitted with existing respiratory tract infection (RTI), and/or urinary tract infection (UTI)
2 Any post-operative patient with HAI
3 Hospital stay <48 h
4 Patients with immunocompromised states

The definitions of HAI for pneumonia and UTI as per the CDC/NHSN are as follows [1] –

UTI: Patient has at least one of the following signs with no other recognized cause i.e. fever, urgency, frequency, dysuria, and suprapubic tenderness with a positive urine culture.

Pneumonia: Patient has at least one of these signs i.e. fever (>38 °C with no other cause), leukopenia (<4000/mm^3) or leucocytosis (>12000/mm^3), new onset or worsening cough or dyspnea or tachypnea, respiratory distress, altered mental status with no other cause, and chest x ray finding of new or progressive infiltration, cavitations, consolidation with or without a positive sputum culture.

For all selected patients, a thorough history was taken followed by clinical examination. Laboratory investigations including complete blood counts, urine analysis, blood urea, serum creatinine, blood glucose, liver function tests, chest x-ray and ultrasonography of abdomen were done in all cases. Other investigations were done as and when required. All the results for each patient were recorded in a structured performa.

Ethical clearance was taken from the Institutional Ethical Committee and written informed consent was taken from all the patients included in the study.

2.3. Statistical analyses

Statistical Analyses were done using Statistical Package for Social Sciences (SPSS) software for Windows version 17.0. The results were tabulated and graphically represented using Microsoft Office for Windows 2010.

3. Results

Out of the total 1500 patients selected randomly, HAI was detected in 166, thereby giving an incidence of HAI of 11.06% (Fig. 1). There were no significant differences in the age and sex between cases and controls. The mean age of the study population was 54.3 ± 17.2 years with a male to female ratio of 3:2. Most of the cases (66%) were above the age of 50 years (Table 1). Fever was the presenting symptom in all the patients, followed by altered sensorium in 30.6%, urinary symptoms in 25.33%, cough in 20.67% and dyspnoea in 9.33% patients respectively. Ninety eight of the 150 patients with HAI had UTI (65.3%), while 67 patients (44.7%) had pneumonia.

The presence of co-morbidity was significantly higher in cases as compared to controls, being 57.3% and 18.7% respectively ($p < 0.001$). The most frequent co-morbidity in HAI was diabetes mellitus, present in 24.7% patients followed by chronic obstructive pulmonary disease in 8.7% patients. The presence of diabetes mellitus and chronic kidney disease was significantly higher in cases as compared to controls ($p < 0.05$) (Table 2).

The use of invasive devices was significantly higher in cases as compared to controls (235 vs.71, $p < 0.05$). Use of Ryle's Tube (76 vs 23; $p < 0.05$); urinary catheter (117 vs 29; $p < 0.01$), central venous catheter (23 vs 5, $p < 0.05$) and ventilator use (19 vs 9, $p < 0.05$) was significantly higher in cases as compared to controls (Table 3).

Table 2
Distribution of co-morbidities among cases and controls.

Co-morbidity	Cases (N = 150)		Controls (N = 150)		**p value**
	n	%	n	%	
Diabetes mellitus	37	24.7	7	4.7	<0.05
Chronic kidney disease	24	16	9	6	<0.05
Chronic obstructive pulmonary disease	13	8.7	8	5.3	>0.05
Chronic liver disease	7	4.7	2	1.3	>0.05
Hypertension	12	8	7	4.7	>0.05
Malignancy	7	4.7	2	1.3	>0.05
Benign prostatic hypertrophy	5	3.3	2	1.3	>0.05

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