Original article

Nosocomial Bacterial Infection and Antimicrobial Resistant Pattern in a Tertiary Care Hospital in Nepal

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Abstract

Introduction: Nosocomial infection is a global problem with multi facet outcomes. At present, the emergence of resistance to antimicrobial agents is a global public health problem which is well pronounced in developing countries.

Methods: The aim of this study was to determine the prevalence of bacteria causing nosocomial infections and their antibiotics resistant pattern among the patients admitted at Tribhuvan University Teaching Hospital (TUTH), Kathmandu, Nepal. The study was conducted during a period of March 2011 to February 2012. Nine hundred clinical specimens which included urine, sputum, endotracheal aspirates, pus & blood were subjected for bacterial culture and their antibiotics sensitivity test at the Department of Microbiology with the use of standard method as described by American Society for Microbiology (ASM).

Results: Prevalence of bacteria causing nosocomial infection was 34.4% (n=310). Out of 310 specimens, urine 122 (39.30%), sputum 78(25.2%), pus 78(25.2%), endotracheal secreation 24 (7.7%) and blood 8(2.6%). Three hundred thirty three bacteria were isolated from three hundred ten specimens. The most common isolates were Escherichia coli followed by Acinetobacter species, Klebsiella pneumonia and Staphylococcus aureus. In-vitro antibiotic susceptibility tests revealed that the Gram-negatives bacilli were only sensitive to fluroquinolones, ceftrixone, cefepime carbapenem, polymyxin B and colistin sulphate while the Gram-positive cocci were sensitive to fluroquinolones, Ceftroxone, cefepime and vancomycin.

Conclusion: The findings suggested the need for constant monitoring of susceptibility of specific pathogens in different populations to commonly used anti-microbial agents to cope up this alarming situation in the hospital for the management of such patients and prevent the dissemination of such strains.

Key words: Nosocomial infections, Bacteria and Antibiotics

Introduction

Nosocomial infections, also called healthcare acquired infections or health care-associated infections, is defined by the Center for Disease Control (CDC) as a localized or systemic condition that results from adverse reaction to the presence of an infectious agent(s) or its toxin(s) and that was not present or incubating at the time of admission to the hospital. For most bacterial nosocomial infections usually become evident after 48 hours (i.e., the typical incubation

period) or more after admission. However, because the incubation period varies with the type of pathogen and to some extent with the patient's underlying condition, each infection must be assessed individually for evidence that links it to the hospitalization [1].

Nosocomial infection is a problem throughout the world both in developed and developing countries. The changing pattern of the bacterial isolates causing nosocomial infection has been observed in different time period. The impact of nosocomial infection on public health is a subject of increasing concern, due to the increasing numbers of hospitalized patients in crowded facilities, many of whom have impaired immunity, the emergence of new micro-organisms, and the increase in antibiotic resistance. In many countries, strict guidelines and policies for control, prevention, and management of nosocomial infections are implemented but even then hospital infections do occur in one form or another. In Nepal, there is a lack of education in this field but other social, ethical and economic factors also need to be considered in the control of nosocomial infections.

Over 1.4 million people worldwide suffer from infectious complications acquired in hospital. The highest frequencies of nosocomial infections were reported from hospitals in the Eastern Mediterranean and South-East Asia Regions (11.8 and 10.0%, respectively), with a prevalence of 7.7 and 9.0%, respectively in the European and Western Pacific Regions. Twenty five to 50% of nosocomial infections are due to the combined effect of the patients own flora and invasive devices. Most infections acquired in hospital today are caused by microorganisms which are common in the general population, in whom they cause no or milder disease than among hospital patients (*Staphylococcus aureus*, coagulase-negative *Staphylococci*, *Enterococci*, Enterobacteriaceae) [2].

Nosocomial infections are also important public health problems in developing countries, as well as in developed countries. The socioeconomic impact, i.e. prolongation of hospitalization, mortality, and cost, of these infections adversely affects patients and nations economic well-being. They are important for both patient and public health problem in developing countries, as well as in some developed countries [3, 4]. Nosocomial infections may result in an excess length of stay in hospital for up to 10 days and an increase in the costs of hospitalization [5, 6]. Nosocomial infections pose a critical threat to patients, especially in the high-risk departments, such as the Intensive Care Unit (ICU) [7, 8]. Risk factors for the development of nosocomial infections 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 ICU stay [9]. Over the past several decades, the frequency of antimicrobial resistance and its association with serious infectious diseases have increased at alarming rates. The increasing resistance rate among nosocomial pathogens is a commonly encounter problem [10, 11].

It is estimated that in developed countries 5–10% patients get one of these infections during hospitalizations, whereas in developing countries rates are higher up to (25%) [12]. An international study covering 47 hospitals in 14 countries (Europe, Eastern Mediterranean, Southeastern Asia and Western Pacific Region) over the period from 1983 to 1985 showed that an average prevalence rate was 8.7%, ranging from 3 to (21%) [13].

Today, antibiotic remain the front line therapy for conquering bacterial infections. However, treatment with these drugs is to be acknowledges as a two edged sword. As antimicrobial agents have been misused and overused, bacteria have fought back with a selection process by which certain strains are now no longer susceptible to one or more agents. As a result, bacteria that once seemed to be losing the battle for survival have re-emerged to create therapeutic dilemmas with resulting increased risks of treatment failure and disease complications. As the incidence of antimicrobial resistance rises, so do costs associated with its consequences. The worldwide emergence of multidrug resistance (MDR) among Gram-negative and Gram-positive bacteria has resulted in a great threat to conquer against the microbes.

During invasive procedures pathogens that are present on medical personnel hands or in the instruments or that are acquired by the patient in the skin, respiratory tract, genitourinary tract, gets entry into the already weakened patients. These medical procedures bypass natural protective barrier against the entry of pathogens and provide an easy route for infection. Patients already colonized with hospital strains on admission are instantly put at a greater risk when they undergo such invasive procedure leading to nosocomial infections.

Method

A Prospective study was conducted from March 2011-February 2012 at intensive care unit, medical wards, orthopedic ward, neurological ward, surgical ward, surgical ICU and Department of Microbiology, TUTH. A total of 900 specimens which included urine, sputum, pus, endotracheal secretions and blood were collected from patients admitted at TUTH. All the specimens were collected, culture, identification tests were done by according to the standard protocol by the ASM and

analyzed accordingly [14]. The antibiotic sensitivity tests of the pathogens isolated from the clinical specimen against different antibiotics were done using Mueller Hinton agar by the standard disk diffusion technique of Kirby- Bauer method as recommended by CLSI [15]. This study was approved by Institutional Review Board of Institute of Medicine. Data were analyzed by using SPSS version 17.0.

A detailed clinical examination and review of systems most likely reveal the involved organs or systems. Investigation should be focused on these abnormal areas such as; bloodstream, UTI, pneumonia and surgical-site infection. Laboratory test for nosocomial infection can be performed by taking specimens from the sites of the infection [16]. Laboratory analyses aim to identify the responsible infectious agent, evaluation of its susceptibility to anti-infectious treatments, typing of bacterial strains etc. The identification of common nosocomial infection sites and simplified criteria for each infection. (Table: 1)

Table 1 Provides common nosocomial infection sites and Simplified criteria for each infection[2].

Type of nosocomial infections	Simplified criteria
Surgical site infection	Any purulent discharge, abscess, or spreading cellulitis at the surgical site during the month after the operation
Urinary infection	Positive urine culture (1 or 2 species) with at least 10^5 bacteria/ml, with or without clinical symptoms
Respiratory infection	Respiratory symptoms with at least two of the following signs appearing during hospitalization: — Cough — Purulent sputum — New infiltrate on chest radiograph consistent with infection
Vascular catheter infection	Inflammation, lymphangitis or purulent discharge at the insertion site of the catheter
Septicemia	Fever or rigours and at least one positive blood culture

Result

Nine hundred patients admitted between March 2011 to February 2012 at Tribhuvan University Teaching Hospital were studied for prevalence of nosocomial infections. On admission, they were carefully examined clinically as well as microbiologically to exclude community-acquired infections and to determine any underlying risk factors. Out of nine hundred specimens 34.4% (n= 310) were found to be associated with nosocomial infection. (Table 2 and Figure 1)

Table 2 Prevalence of nosocomial infection

Total no. of specimens	900
Specimens those associated with nosocomial infection	310

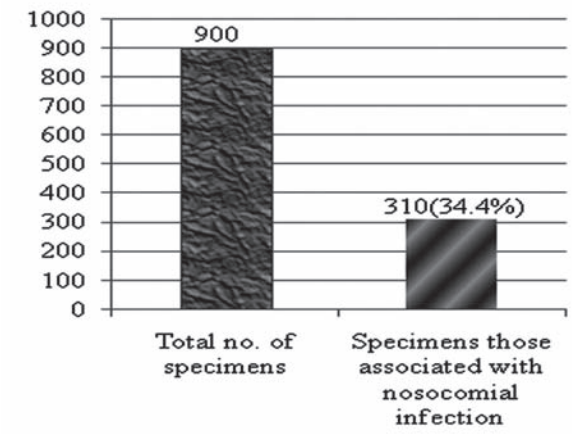

Figure 1. Prevalence of nosocomial infection

Distribution of specimens associated with nosocomial infections

Out of 310 specimens, urine 122 (39.30%), sputum 78(25.2%), pus 78(25.2%), endotracheal secreation 24 (7.7%) and blood 8(2.6%). (**TABLE 3)**

Table 3 Distribution of specimens associated with nosocomial infections

Specimens	Number	Percent
Urine	122	39.3
Sputum	78	25.2
Pus	78	25.2
ET secretion	24	7.7
Blood	8	2.6
Total	310	100

Three hundred thirty three bacteria were isolated from three hundred ten specimens. Among the 122 urinary bacterial isolates, Escherichia coli was found to be the most predominant (41.8%) followed by Enterococcus faecalis (14.8%), Acinetobacter spp. (15.6%), Klebsiella pneumoniae (9%), Pseudomonas aeruginosa (9%), Staphylococcus aureus (9%) and Citrobacter freundii (0.8). In case of sputum specimens (n=79), K. pneumoniae was found to be most predominant bacteria (25.3%) which was followed by Acinetobacter spp. (3%), E. coli (16.5%), P. aeruginosa (10.1%), S. aureus (19%). Whereas (n=95) bacteria were isolated from pus specimens, E. coli (31.6%) was most common pathogen which is followed by Acinetobacter spp. (20.0%), K. pneumoniae (13.7%), P.aeruginosa (11.6%), C. freundii (4.2%), M. morgannii (2.1%) S. aureus (15.8%) and E. faecalis (1.1%).Among the 29 endotracheal bacterial isolates, Acinetobacter spp was found to be more predominant (44.8%) which was followed by P. aeruginosa (24.1%), K. pneumoniae (20.7%) and E.coli (10.3%). Moreover, eight bacteria were isolates from blood in which Acinetobacter spp. was found to be more predominant (50%) which was followed by C. freundii (12.5%), E. coli (12.5%) and S. aureus (25%). (Table 4)

Table 4 Distribution of Bacteria associated with Nosocomial Infection

Sites of Nosocomial Infection	Bacterial Isolates	Number	Percent
UTI (n=122)	Escherichia coli	51	41.8
	Acinetobacter spp.	19	15.6
	Klebsiella pneumoniae	11	9
	Pseudomonas aeruginosa	11	9
	Citrobacter freundii	1	0.8
	Enterococcus spp.	18	14.8
	Staphylococcus aureus	11	9
LRTI (n=79)	K. pneumoniae	20	25.3
	Acinetobacter spp.	20	25.3
	E.coli	13	16.5
	P.aeruginosa	8	10.1
	C.freundii	3	3.8
	S.aureus	15	19
SSI (n=95)	E.coli	30	31.6
	Acinetobacter spp.	19	20.0
	K.pneumoniae	13	13.7
	P.aeruginosa	11	11.6
	C.freundii	4	4.2
	M.morgannii	2	2.1
	S.aureus	15	15.8
	E.faecalis	1	1.1
VAP (n=29)	Acinetobacter spp	13	44.8
	P.aeruginosa	7	24.1
	K.pneumoniae	6	20.7
	E.coli	3	10.3
BSI (n=8)	Acinetobacter spp.	4	50
	C.freundii	1	12.5
	E.coli	1	12.5
	S.aureus	2	12.5

Table 5 Distribution of bacteria associalted with nosocomial infection

Antibiotics	E. coli (n=51)	A. spp. (n=19)	K. pneumoniae (n=11)	P. aeruginosa (n=11)	E. spp. (n=18)	S. aureus (n=11)
Amoxycillin	98	100	100	-	100	100
Ciprofloxacin	96	100	100	100	77.8	81.8
Co-trimoxazole	86.3	40	100	-	-	81.8
Nitrofurantoin	39.2	94.7	81.8	-	33.3	18.2
Norfloxacin	86.3	100	100	100	83.3	81.8
Cephalexin	94.2	100	100	-	-	90.9
Ceftriaxone	86.3	47.4	100	54.5	-	-
Cefotaxime	86.3	52.6	100	54.5	-	-
Ceftazidime	86.3	47.4	100	54.5	-	-
Cefepime	68.6	36.8	90.9	36.4	-	-
Gentamycin	64.7	100	90.9	90.9	-	63.6
Amikacin	35.3	89.5	63.6	81.8	-	45.5
Ampicillin-Sulbactam	92.2	68.4	100	-	-	-
Cefoparazone -Sulbactam	17.6	36.8	54.5	45.5	-	-
Piperacillin	82.4	57.9	81.8	45.5	-	-
Piperacillin-Tazobactam	29.5	26.3	54.5	45.5	-	-
Imipenem	5.9	31.6	27.3	36.4	-	-
Meropenem	5.9	26.3	27.3	36.4	-	-
Polymyxin B	0	0	0	0	-	-
Colistin sulphate	0	0	0	0	-	-
Erythromycin	-	-	-	-	94.5	90.9
Vancomycin	-	-	-	-	0	0
Cloxacillin	-	-	-	-	-	54.5
Clindamycin	-	-	-	-	-	63.6

Incidence of antibiotics resistant with E. coli to ciprofloxacin (96%), cephalosporin(86.3%), gentamycin (64.7%), nitrofurantoin (39.2%), Acinetobacter spp. to cephalosporin (100%), ciprofloxacin (100%), Klebsiella pneumoniae to ceftriaxone (100%), amikacin 89.5%), P. aeruginosa to ceftazidime (54.5%), piperacillin (45.5%) and piperacillin-tazobactam (45.5%), Enterococcus spp. to ciprofloxacin (77.8%), and S. aureus to amoxycillin (100%), ciprofloxacin (81.8%), cloxacillin (54.5%) and cefalexin (90.9%) in urinary isolates.(Table 5)

Table 6 Antimicrobial Resistant Pattern of Urinary Isolates Presented in Percentage

Antibiotics	K. pneumoniae (n=20)	A. spp. (n=20)	E. coli (n=13)	P. aeruginosa (n=8)	S. aureus (n=15)
Amoxycillin	100	100	100	-	100
Ciprofloxacin	85	95	92.3	62.5	86.7
Ofloxacin	85	95	84.6	62.5	86.7
Co-trimoxazole	85	100	92.3	-	73.3
Cephalexin	100	100	92.3	-	93.3
Ceftriaxone	95	100	92.3	62.5	93.3
Cefotaxime	95	100	92.3	62.5	93.3
Ceftazidime	95	100	92.3	75	-
Cefepime	85	95	77	50	93.3
Gentamycin	90	95	84.6	75	80
Amikacin	65	95	53.8	62.5	73.3
Ampicillin-Sulbactam	-	100	92.3	-	-
Cefoparazone -Sulbactam	45	80	38.5	12.5	-
Piperacillin	90	95	92.3	87.5	-
Piperacillin -Tazobactam	55	95	69.2	25	-
Imipenem	15	95	23	12.5	-
Meropenem	15	95	23	12.5	-
Polymyxin B	0	0	0	0	-
Colistin sulphate	0	0	0	0	-
Erythromycin	-	-	-	-	100
Vancomycin	-	-	-	-	0
Cloxacillin	-	-	-	-	66.7
Clindamycin	-	-	-	-	66.7

Bacteria isolated from sputum specimens showed antibiotics resistant with K. pneumoniae to ceftriaxone (95%), amikacin (65%), Acinetobacter spp. to cephalosporin (100%), ofloxacin (95%), E. coli to cephalosporin (92.3%), carbapenem (23%), P. aeruginosa to ceftazidime(75%), piperacillin (87.5%) and piperacillin-tazobactam (25%) and S. aureus to amoxycillin (100%), ofloxacin (86.7%), cloxacillin (66.7%) and cefalexin (93.3%).(Table 6)

Table 7 Antimicrobial Resistant Pattern of Sputum Isolates Presented in Percentage

Antibiotics	*E. coli* (n=30)	A. spp. (n=19)	*K. pneumoniae* (n=13)	*P. aeruginosa* (n=11)	*S. aureus* (n=15)
Amoxycillin	100	100	100	-	100
Ciprofloxacin	96.7	100	100	100	86.7
Ofloxacin	96.7	100	100	100	86.7
Co-trimoxazole	76.7	80	100	-	80
Cephalexin	96.7	94.7	100	-	93.3
Ceftriaxone	83.3	89.5	100	81.8	67.7
Cefotaxime	83.3	89.5	100	81.8	67.7
Ceftazidime	83.3	89.5	100	81.8	-
Cefepime	76.7	80	92.3	63.6	67.7
Gentamycin	73.3	94.7	100	90.1	73.3
Amikacin	40	84.2	92.3	90.1	46.7
Ampicillin-Sulbactam	90	68.4	100	-	-
Cefoparazone -Sulbactam	23.3	40	92.3	45.5	-
Piperacillin	93.3	84.2	100	63.6	-
Piperacillin-Tazobactam	36.7	57.9	77	63.6	-
Imipenem	6.7	63.2	38.5	54.5	-
Meropenem	6.7	63.2	38.5	54.5	-
Polymyxin B	0	0	0	0	-
Colistin sulphate	0	0	0	0	
Erythromycin	-	-	-	-	93.3
Vancomycin	-	-	-	-	0
Cloxacillin	-	-	-	-	67.7
Clindamycin	-	-	-	-	73.3

The rate of antibiotics resistant with E. coli to ceftriaxone (83.3%), carbapenem (6.7%), Acinetobacter spp. to cephalosporin (89.5%), ofloxacin (100%), K.pneumoniae to ceftriaxone (95%), amikacin (92.3%), P. aeruginosa to ceftazidime (81.8%), piperacillin (63.6%) and piperacillin-tazobactam (63.6%) and S. aureus to amoxycillin (100%), ofloxacin (86.7%), cloxacillin (67.7%) and cefalexin (93.3%) in pus isolates.(Table 7)

Table 8 Antimicrobial Resistant Pattern of Pus Isolates Presented in Percentage

Antibiotics	Acinetobacter spp. (n=13)	K. pneumoniae (n=6)	P. aeruginosa (n=7)
Amoxycillin	100	100	-
Ciprofloxacin	100	100	100
Co-trimoxazole	100	16.7	-
Ofloxacin	100	100	71.4
Cephalexin	100	100	
Ceftriaxone	100	100	100
Cefotaxime	100	100	100
Ceftazidime	100	100	100
Cefepime	100	16.7	71.4
Gentamycin	100	100	85.7
Amikacin	100	16.7	85.7
Ampicillin-Sulbactam	100	16.7	-
Cefoparazone -Sulbactam	92.2	66.7	28.6
Piperacillin	100	100	42.9
Piperacillin-Tazobactam	100	100	14.3
Imipenem	92.2	0	28.6
Meropenem	92.2	0	28.6
Polymyxin B	0	0	0
Colistin sulphate	0	0	0

Bacteria isolated from endotracheal screation revealed antibiotics resistant with Acinetobacter spp. showed 100% resistant to most commonly prescribed antibiotics except carbapenem, cefoparazone-salbactam (92.2%) respectively, K. pneumoniae to amikacin (16.7%), cefoparazone-salbactam (67.7%), P. aeruginosa to ceftazidime (100%), piperacillin (42.9%) and piperacillin-tazobactam (14.3%) (Table 8)

The antibiogram of blood isolated, for *Acinetobacter* spp. the antibiotic effect was very poor. They showed 100% sensitive to Polymyxin B and colistin sulphate followed by cefoperazone-sulbactam (75%), Piperacillin-tazobactam (75%), imipenem (75%). *E.coli* were found to be resistant to amoxycillin, aminoglycosides and second generation of cephalosporin, and sensitive to polymyxin B and colistin sulphate, imipenem and meropenem and others. For *S.aureus*, amoxycillin had no effect. Vancomycin were found to be most effective antibiotic (100%) which was followed by amkacin and cloxacillin (each 50%).

Discussion

The study was aimed to find out the current prevalence and trend of the bacteria causing nosocomial infections and the efficacy of drugs being used against them. The overall prevalence of bacteria causing nosocomial infection is (34.4%), which is higher than the similar studies in the other hospitals from different countries, which were

(13%-17.8%) [17-22]. This increase in the prevalence of nosocomial infections in this hospital may be attributed to less attention being paid 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 this study, the most common nosocomial infection was found to be UTI (39.30%) followed by LRTI (25.20%), SSI (25.20%), VAP (7.7%) and BSI (2.6%). Our results are concurrent with the multicentic study in Greece showed that UTI was (22.4–38.2%), LRTI (21.1–32.6%), SSI (14.6–22.7%) and BSI (9–13.2%) [23].

The bacteria isolated in our study from patients who were suffered from nosocomial urinary tract infections included E. coli (41.8%) followed by Acinetobacter spp. (15.6%), Enterococcus spp. (14.8%) and S. aureus (9%).These results were supported by Neto et al. (2003) study which was done among 188 patients with positive urine culture in Brasileira and found that the most common pathogens causing nosocomial urinary tract infections were E-coli (26%), Klebsiella spp. (15%), P. aeruginosa (15%) and Enterococcus spp. (11%)[24.]

In this study K. pneumoniae was found to be most predominant bacteria (25.3%) causing nosocomial LRTI followed by Acinetobacter spp. (25.3%), E. coli (16.5%) and P. aeruginosa (10.1%). In a study by Singh et al, most frequent isolates causing LRTIs were Klebsiella spp. (24.48%), followed by Proteus (18.33%) and E. coli (12.24%) which concurrent with our study [25]. This shows that the prevalence of K. pneumoniae has increased in 2012 as compared to 2010 at TUTH. A study done by Mishra et al showed the growth of 18.95% of K. pneumoniae in lower respiratory tract infection.

In the surgical site infection (SSI), E. coli (31.6%) were found to be most predominant followed by Acinetobacter spp. (20%), K. pneumonia (13.7%), P. aeruginosa (11.6%), C. freundii (4.2%), M. morgannii (2.1%) and S. aureus (15.8%), Enterococcus spp.(1.1%). Regarding the growth pattern, single bacterial growth was found in 10.5% of the cases while 79.5% were multiple bacterial growths (2 or more than 2). This could be because of the profound influence of endogenous contamination from the bowel and hollow muscular organs of patients.

In case of ventilator associated pneumonia (VAP), Acinetobacter spp. was found to be more predominant (44.8%) followed by P. aeruginosa (24.1%), K. pneumonia (20.7), E. coli (10.3%). A study conducted in Nepal by Ranjit S, Bhattarai B, Acinetobacter spp.was most common bacteria causing VAP[26]. Gram negative bacteria, P. aeruginosa and Acinetobacter baumanii are commonly associated with late onset VAP [27].

In case of nosocomial blood stream infection (BSI), Acinetobacter spp. was found to be more predominant (50%) followed by C. freundii (12.5%), E. coli (12.5%) and S. aureus (25%).

Currently many microorganisms have become resistant to different antimicrobial agents and in some cases to nearly all agents. Resistance to antimicrobial agents is a problem in health care facilities, but in hospitals, transmission of bacteria is amplified because of the highly susceptible population (WHO, 2002). The antibiotic resistant of our study confirmed the alarming percentage of resistance exhibited by pathogens to the common antibiotics in use.

However, the present study showed a high prevalence of resistance to the commonly prescribed antimicrobial agents. This may be because of the intense use of antimicrobial agent in the hospital, easy availability and indiscriminate use of these drugs outside the hospitals, and many antibiotics are available over the counter for self-medication. These problems, coupled with the increase chance of cross infection among inpatients, are known to account for circulating resistance strains.

The emergence of Gram-negative bacterial species with acquired resistance to various broad spectrum β-lactams and other classes of antimicrobials is becoming a worldwide clinical problem. This may be due to exposure of hospitalized patients to different broad and extended spectrum drugs beside multiresistant isolates are disseminated widely in the hospital setting due to different iatrogenic mechanism and these patients may not be immunocompetent.

This study provides insights into the problem of resistance in bacterial pathogens in TUTH. Our results demonstrated that, in general, isolates have high rates of resistance to antibiotics commonly used in developing countries. We also found a high rate of resistance to amoxicillin, first, second and third generation cephalosporins, fluroqunolones, aminoglycosides and co-trimoxazole. Therefore, cheap antibiotics such as amoxicilline, ciprofloxacin, gentamycin, cephalexin and co-trimoxazole are now of limited benefit in the treatment of infections in TUTH.

The high level of ciprofloxacin resistance among E. coli, and more generally Enterobacteriaceae, rules out the use of ciprofloxin as empirical treatment when invasive infections due to these pathogens are suspected. The rate of resistance to third-generation cephalosporins is also worrisome.

The high prevalence of Acinetobacter spp. in UTI 15.5%

(n=19), LRTI 25.3% (n=20), SSI 20% (n=19) and in P. aeruginosa UTI 9% (n=11), LRTI 10.1% (n=8), SSI 11.6% (n=11) may have been exacerbated by failure of infection control in the hospitals. The overall rate of antibiotic resistance in Acinetobacter spp. was higher than that in P. aeruginosa, this observation contrasts with previous results founds in South Africa[28]. Resistance to carbapenem (imipenem) in Acinetobacter spp. was (31.6-95) %, but (12.5-54.5) % in P. aeruginosa. This high rate of resistance to carbapenem in Acinetobacter spp. in our study is striking given that this antibiotic is frequently prescribed in TUTH, Nepal. This result may be due to the clonal spread of a multi-resistant strain of A. baumanii.

The indication of antibiotic therapy for nosocomial UTIs in acute care settings is a controversial issue. Nonetheless, the treatment of symptomatic UTIs is virtually universal. Yet routine therapy increases not only drug costs but also adverse drug reactions and the emergence of antibiotic–resistant microorganisms. The increasing antimicrobial resistance among the bacteria causing nosocomial urinary tract infections makes therapy of this type of infections difficult and leads to more use of extensive broad-spectrum drugs.

Carbapenem resistance in Acinetobacter was widespread. Carbapenems therefore can no longer be relied on as empiric therapy for these organisms, leading to an increase in use of alternatives such as polymyxin B and colistin. We found that 100% were susceptible to polymyxin B and colistin sulphate.

Carbapenems have potent activity against multidrug resistant Acinetobacter isolates. Acinetobacter spp. may develop resistance to carbapenem through various mechanisms including class B and D carbapenemase production, decreased permeability, altered penicillin binding proteins and rarely over expression of efflux pumps [29, 30]. The resistance of Acinetobacter spp. towards the carbapenems is much higher in this study as compared to different studies in Indian hospitals at All India Institute of Medical Sciences (AIIMS) (34.7% for meropenem and 27.2% for imipenem)[31].

Conclusion

It is quite alarming that prevalence of bacteria causing nosocomial infection was 34.4% in TUTH. This study showed that Gram-negative bacilli were the predominant isolates. Polymyxin B, colistin sulphate, imipenem, meropenem and nitrofurantoin were relatively effective drugs for Gram-negative bacilli where as vancomycin was relatively effective drugs for Gram-positive cocci. However, all the bacteria isolated from nosocomial infection were 100% resistance to Ampicillin. Empirical treatment to nosocomial infections provoke drug resistance, therefore treatment should be based on the result of culture and sensitivity. This study concludes that if one could not wait the culture results in nosocomial infection amoxicillin, cloxacillin, ciproflocacin, gentamycine are quite ineffective to treat these infections.

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