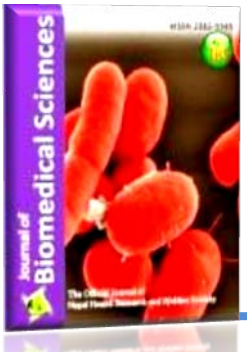

Letter to Editor
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LETTER TO EDITOR

Environmental screening for microorganisms of patient's surrounding as the possible source of nosocomial infections in a hospital in Nepal

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Dear Editor,

Recently, nosocomial infection has been recognized as a serious global issue for patient's safety. It is responsible for prolonged hospitalization with increase in unnecessary expenses. According to Centers for Disease Control and Prevention (CDC), about 2 million patients suffer from hospital acquired infections every year with around 100,000 deaths and up to $4.5 billion of additional annual healthcare expenses [1]. However, it has been observed that one third or more of nosocomial infections are preventable [2]. In developed countries despite the various measures like development of infection control teams, surveillance and training of staffs; 5% to 15% of inpatients in regular wards and as many as 50% or more of patients in intensive care units (ICUs) are affected by hospital acquired infections. In developing countries, where the infectious diseases are common and sanitary conditions of the healthcare facilities are not good, the rates of nosocomial infections may be very high but the exact magnitude of the problem is unknown mainly due to lack of proper resources and expertises. Due to limited awareness to the prevention of nosocomial infections, it has become very serious problem in developing countries [3, 4].

To find out the possible sources of nosocomial infections and hence to control it we conducted a retrospective study from June 2013 to September 2015 in a tertiary care hospital in Nepal. The swab samples collected from different sites (taps, patient beds, operation tables, operation theatre lights, ventilators, warmers, incubators, medicine racks, anesthesia trolleys etc.) those have direct effect on patients care were cultured by using standard microbiological techniques and the organisms isolated were identified up to species level with the help of Gram's stain, colony morphology and conventional biochemical tests. Extended-spectrum beta-lactamase (ESBL) and metallo-beta-lactamase (MBL) production were detected by combined disc method (ceftazidime+clavulanic acid for ESBL and imipenem+EDTA for MBL). Methicillin resistant *Staphylococcus aureus* (MRSA) was detected by using cefoxitin disc. The fungi were identified by colony morphology and observation of the reproductive parts in lactophenol cotton blue mount. To find out the concentration of the microbes in the environment of the departments (ICU, OT, NICU, CCU) plate exposure method was used. All the samples were taken after the fumigation of the rooms of these departments with formaldehyde or a formulated product, ecocil.

The growth of the microbes in significantly high numbers of samples suggested the ineffectiveness of the fumigation processes (table-1).

Table 1: Number of samples taken from different sites in different time periods and their growth positivity.

Location	Sites	No. of samples	Growth positive (%)
ICU	Bed	900	20
	Tap	900	62
	Medicine rack	900	41
	Ventilator	900	52
	Air exposure	900	49
CCU	Bed	700	17
	Tap	700	64
	Medicine rack	700	35
	Ventilator	700	54
	Air exposure	700	43
NICU	Bed	500	10
	Tap	500	47
	Incubator and warmer	500	36
	Medicine rack	500	40
	Air exposure	500	58
OT	Bed	750	5
	OT light	750	18
	Anesthesia trolley	750	34
	Air exposure	750	20

ICU-Intensive Care Unit, CCU-Coronary Care Unit, NICU-Neonatal Intensive Care Unit, OT-Operation Theatre.

The most common bacterium isolated from ICU was *Acinetobacter baumannii* (40%) followed by *Pseudomonas aeruginosa* (36%), members of Enterobacteriaceae, *Staphylococcus aureus, Staphylococcus epidermidis*, *Aspergillus fumigatus*, *Candida albicans* and *Bacillus cereus*. Most of the microbes were isolated from taps followed by ventilators. Among the gram-negative bacilli isolated, 60% were ESBL producers and 10% were MBL producers. In CCU also the most common bacterium isolated was *Acinetobacter baumannii* (53%) followed by *Pseudomonas aeruginosa* (29%), members of Enterobacteriaceae, *Aspergillus fumigatus* and *Bacillus cereus*. Among the gram-negative bacteria isolated from CCU, 52% were ESBL producers and 12% were MBL producers. In CCU also most of the microbes were isolated from taps followed by ventilators. In NICU the most common microorganism isolated was *Klebsiella pneumoniae* (48%) followed by *Acinetobacter baumannii* (30%), *Staphylococcus aureus*, *Staphylococcus epidermidis*, and *Aspergillus fumigatus*. Among the gram negative isolates, 27% were ESBL producers and 5% were MBL producers. In OT the most common bacterium isolated was *Staphylococcus aureus* (65%) followed by *Bacillus cereus* (20%), sterile fungi and *Acinetobacter baumannii*. 30% of the *Staphylococcus aureus* isolated were MRSA. In the air exposure plate the most common microbes isolated were *Aspergillus fumigatus*, sterile fungi, *Staphylococcus aureus*, and *Staphylococcus epidermidis* and were present in very high concentration (>100 cfu per 90 mm BHI agar plate exposed to air for at least 1 hr). This is the first this type of study conducted in Nepal. So the findings of this study will certainly create a pressure in the responsible authorities of the health care systems of underdeveloped countries like Nepal to improve and monitor the sanitary conditions of the health care facilities, so as to lessen the hospital acquired infections.

The isolation of the highly drug resistant bacteria from these departments is attributed to the indiscriminate use of antibiotics in the admitted patients who contaminate their vicinity [5]. Worldwidely multidrug-resistant organisms, like *Pseudomonas aeruginosa* and *Acinetobacter baumannii*, and extended-spectrum β-lactamase (ESBL)–producing or carbapenemase-producing Enterobacteriaceae along with the methicillin resistant *Staphylococcus aureus* are increasingly being reported as the common causative agents of nosocomial infections [6]. So the presence of these superbugs in the sites which should be regularly touched during patient care or which are in direct contact with patients may put the patients at higher risk of getting nosocomial infections, resulting in long hospital stay and unnecessary expenses leading sometimes to fatal outcomes. The presence of the microbes in the tap from which the water is used regularly for patient's care cannot be neglected. In bacteriological quality testing of tap water it was confirmed that the bacteria were colonized in the tip of tap rather than presenting in water itself. The possible reason for colonization of the bacteria in the tip of the tap was splattering during discarding of the infected samples of the patients in the basin which is a common practice in most of the hospitals in Nepal.

So proper disinfection of the vicinity of the patients along with strict implementation of the hand hygiene program is very necessary to reduce the rate of hospital acquired infections. Regular monitoring of the effectiveness of the disinfection processes used to sterilize the vicinity of the patients is also necessary especially in low income countries like Nepal where the proper attention is not given to the sanitary conditions of the health care facilities.

Keywords:

Acinetobacter baumannii, Enterobacteriaceae, extended-spectrum beta-lactamase, metallo-beta-lactamase, nosocomial infection, *Pseudomonas aeruginosa*

Competing interests

The authors declare that they do not have any competing interests.

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