NOSOCOMIAL INFECTIONS (HOSPITAL ACQUIRED INFECTIONS) AT INTENSIVE CARE UNIT IN A TERTIARY CARE HOSPITAL IN LAHORE, PAKISTAN

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ABSTRACT

Introduction: There is great risk for patients in intensive care units (ICUs) to acquire Nosocomial infection. We conducted study to determine the frequency of nosocomial infections, prevalence of different pathogens involved in the development of nosocomial infections particularly ventilator-associated pneumonia and associated risk factors in ICU. **Settings:** Thestudy was conducted at ICU in a tertiary care hospital of Lahore city for 3 months. **Materials & Methods:** A cross-sectional study was conducted for 3 months starting form 1st march 2013 to 30th May, 2013. Non-probability purposive sampling method was used; patients admitted to ICU during study period and meeting the inclusion criteria were included in the study. **Results:** Out of 72 patients included in the study 12 (17%) patients developed nosocomial infections as evidence by hyperthermia, increased Total Leukocyte Count (TLC) and a positive culture for microbial growth. 41% Bloodstream Infections (BSIs), 17% Respiratory Tract Infections (RTIs), Urinary Tract Infections (UTIs) and Surgical Site Infections (SSIs) each category. Prevalence of ventilator-associated pneumonia was documented as 18%. Device utilization rate and corresponding infections development rate was determined. **Conclusions:** Nosocomial infections principally blood stream infections and ventilator-associated pneumonia were found to be prevalent among patients in ICU with positive associations with the invasive devices used. Preventive measures like standard precautions and aseptic technique must be adapted every time while having contact with patients and/or exposing them to invasive devices.

Key words: Intensive, hyperthermia, prevalence, total leukocyte count, aseptic, invasive

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INTRODUCTION

In countries like Pakistan, health care continues to be a great burden for the economy therefore; getting treatment for health impairments becomes very exclusive in these countries.[1] Any infection which develops 48 hours post admission to hospital or within 48 hours after being discharged which was not cultivating at the time when patient was admitted to the hospital is termed as Nosocomial Infection.[2] Infections are communicated in between patients by healthcare personnel touching a patient or their used equipment without donning gloves, then touching other patient/sand not washing or sanitizing their hands in between.[3] It is clearly mandated by Centers for Disease Control and Prevention (CDC) that all healthcare personnel should clean their hands by washing with soap and water or rubbing with alcohol based hand sanitizers before entering or leaving the patient's room.[4]

Patients in ICU are at greater risk of procuring nosocomial infection than those in medical/surgical units (25% of all Nosocomial Infections develop in ICU). This increased risk may be attributed to the frequent exposure of critically ill patients to the invasive devices like

urinary catheters, central venous/arterial catheters and endotracheal / tracheostomy tubes which compromise the first line defense of body i.e. normal skin and mucosal barriers.[2] Urinary catheter either inserted through urethra or suprapubically poses a major risk to develop Urinary tract infections.[5] Ventilator-associated pneumonia (VAP) progress usually more than 48 hours of patient's intubation.[6] Patency of airway is affected after introduction of ETT in the trachea through orally (intubation) by diminished cough reflexes which compromises the mechanism for airway clearance and resulting in aspiration of pathogenic microorganisms into the lungs causing ventilator-associated pneumonia.[7] To minimize Nosocomial infections, stringent policies must be developed and employed in healthcare facilities as it can result in increased morbidity and mortality by prolonging the patient's stay in the hospitals.[8]

METHODS
A cross-sectional study was conducted at Intensive Care Unit (ICU) in one of the tertiary care hospitals of Lahore City between 1st March 2013 and 30th May 2013. All patients admitted to intensive care unit (ICU) during study period who were shifted through either emergency ward or from other medical/surgical wards (who stayed ≤ 24 hours in medical/surgical ward) were included in the study. Non-probability purposive sampling method was used in this regard. Information was collected from patient's files (physician's progress notes, laboratory and radiological reports) admitting to intensive care unit (ICU) to highlight the prevalence. Rest of the information regarding possible risk factors was obtained by culturing the swabs taken randomly from different objects of the intensive care unit (ICU) to highlight the possible risk factors associated to Nosocomial Infections.

Inclusion Criteria
All the patients were included in the study who met the following criteria:
· First ICU admission,

· If admitted from other wards of the hospital should not have stayed ≥ 24 hours in other wards prior shifting to ICU,
· Immediately shifted to ICU after surgery (Post operative),
· Neither intubated nor tracheostomized at the time of ICU admission,
· Intubated or tracheostomized during the first 24 hours after ICU admission.

Exclusion Criteria
All those patients were excluded from the studywho were:
· Admitted through ICU or medical/surgical wardof some other hospital.

Definition of a case of Nosocomial Infection
A case of nosocomial infection was defined according to following:
· Temperature > 38°C developed after 48 hours of stay in ICU
· Leukocyte count > 12,000/mm3 analyzed after 48 hours of stay in ICU
· A positive Culture from specimen taken from Blood/Urine/Central Venous Catheter's tip etc after 48 hours of stay in ICU.

Definition of a case of Ventilator-associated pneumonia (VAP)
Ventilator-associated pneumonia (VAP) was defined according to the following:
· Intubated or tracheostomized attached to mechanical ventilator machine
· Temperature > 38°C or leukocyte count > 12,000/mm3 or < 4,000/mm3 24 hours of intubation
· Chest X-rays exhibiting lung infiltrates after 24 hours of intubation
· One of the following (24 hours of intubation): a) sputum modification, b) suggestive auscultation, c) low oxy hemoglobin saturation, or d) increased pulmonary oxygen consumption;
· Tracheal Aspirate - positive culture 24 hours of intubation

Microbiological specimens were always obtained as soon as possible after the identification of clinical or radiological criteria of pneumonia. In case of consecutive VAP episodes, only the first episode was considered for analysis.
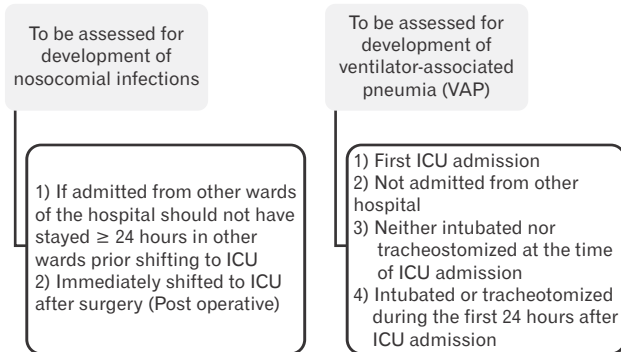
To be assessed for development of nosocomial infections
1) If admitted from other wards of the hospital should not have stayed ≥ 24 hours in other wards prior shifting to ICU 2) Immediately shifted to ICU after surgery (Post operative)

To be assessed for development of ventilator-associated pneumia (VAP)
1) First ICU admission 2) Not admitted from other hospital 3) Neither intubated nor tracheostomized at the time of ICU admission 4) Intubated or tracheotomized during the first 24 hours after ICU admission

Figure 1. Inclusion criteria for the patients to be taken as a sampling unit

Statistical Analysis

The descriptive analysis was used to see risk factors associated with the occurrence of nosocomial infections. For categorical variables Chi-square (χ^2) proportion test was used to see the association of risk factors with the occurrence of nosocomial infections and ventilator-associated pneumonia. Contingency coefficient was calculated for the numerical variables associated with the development of ventilator-associated pneumonia (VAP) to quantify their association with ventilator-associated pneumonia. For all calculations level of significance was set at 0.05.

RESULTS

In this study, data was collected from a total of 72 patients (42 males and 30females)admitted in the ICU during the study period and analyzed using SPSS v16.00.17% (12/72) patients developed the nosocomial infection after 48 hours stay in ICU; 29% (4/12) of these infections were caused by *candida spp.* being the most prevalent, isolated from the urinary tract and respiratory tract as shown in fig. 2 below. Infection development with exposure to different invasive devices was also assessed and it was found that central venous catheter posed highest risk for patients to develop nosocomial infections evidenced by blood stream

infections recorded in 25% patients exposed to the CVC as shown in fig. 3 below. 22 patients were first ICU admissions and 10 patients were intubated at the time of admission,4 out of obese according to BMI
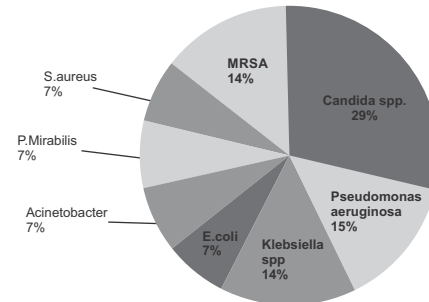

Figure 2. Prevalence of different pathogens involved in the development of nosocomial infections.

Table 1. Different variables observed in patients to assess the development of Nosocomial Infections.

Age Group		15-40 Years		>40 Years		Total
Gender						N=72
		16	6	26	24	72
Temperature>38˚C		5	4	15	12	66
TLC>12000mm^3		4	3	14	12	24
Positive Culture		2	1	5	4	12
Breathing Status	Through O$_2$ mask	6	6	26	14	52
	Through Ventilator	3	2	7	8	20
Treatment Outcome	Recovered	6	5	24	13	48
	Expired	3	3	9	9	24

Table 2. Confirmed cases of Ventilator Associated Pneumonia

		Intubated		Total
		Yes	No	
Ventilator Associated Pneumonia developed	Yes	4	0	4
	No	6	12	18
Total		10	12	22

Table 3. Exposure of the patient to different invasive devices and rate of infections developed

Devices	Exposure	Organism isolated by Culture		Body sites exposed in infections	Percentage of infections
		Total	14		
Intravenous (IV) Cannula	72 (100%)	06		Blood (BSI)	08%
Central venous catheter (CVC)	24 (33%)				25%
Foley's catheter	72 (100%)	03		Urinary Tract (UTI)	04%

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Naso gastric (NG) Tube	18 (25%)	-	Digestive Tract	-
Endotracheal tube (ETT)	07 (10%)	02	Respiratory Tract (RTI)	28%
Drain tube	2 (02%)	02	Surgical Wounds (SWI)	100%

10(40%) intubated patients developed VAP caused by *Staphylococcus aureus*(50%), *E. coli*and*Acinetobacter* (25%) each.

CONCLUSIONS

This study documents the high prevalence of nosocomial infections particularly blood stream infections and ventilator-associated pneumonia in patients admitting to ICU with high associations with the invasive devices used. In summary, our study suggestedthe significance of nosocomial infections particularly device associated infections in ICUs. It was also observed that there is no active surveillance method to record the incidence of different nosocomial infections. Significance of the findings of this study should encourage clinicians to develop a strategy for the quick detection and preventive measures for early-onset VAP shortly after ICU admission. There is urgent need for adapting aseptic measures when exposing the patients to invasive devices and more effective preventive interventions.

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