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HEALTHCARE-ASSOCIATED INFECTIONS IN PUBLIC HOSPITALS OF PAKISTAN: CHALLENGES AND PREVENTION STRATEGIES — A COHORT STUDY OF HOSPITALS IN ISLAMABAD AND RAWALPINDI

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Abstract

Introduction: *Healthcare-associated infections (HAIs) are an ongoing issue for health systems around the world, with the burden of HAIs highest in low- and middle-income countries, where infection prevention resources are more limited. Pakistan's public hospitals often face very high patient loads, overcrowding and resource shortages that place patients at an increased risk of developing nosocomial infections.*

Purpose: *The purpose of this study was to determine the incidence, risk factors and prevention barriers to HAIs in tertiary public hospitals in Islamabad and Rawalpindi.*

Methods: *A prospective cohort study was conducted in three tertiary public hospitals: the Pakistan Institute of Medical Sciences (PIMS), Holy Family Hospital – Rawalpindi, and Benazir Bhutto Hospital – Rawalpindi. The cohort consisted of 600 adult patients admitted to either medical or surgical wards who were followed for the development of healthcare-associated infections during their hospitalisation from January 2023 to June 2023. Patients with infections at the time of admission were excluded. Data were collected by means of structured questionnaires, clinical evaluations and medical record reviews. Multivariable logistic regression analysis was used to identify significant predictors of HAIs.*

Findings: *The overall incidence of healthcare-associated infections was 14.5%. Of these, the highest percentage (38%) was due to surgical site infections, followed by urinary tract infections (27%), hospital-acquired pneumonia (21%), and bloodstream infections (14%). Independent risk factors for HAI included a longer length of stay (>7 days), use of invasive medical devices, and admission to intensive care unit.*

INTRODUCTION

Infections that develop in patients while receiving medical care in a healthcare facility known as healthcare-associated infections (HAIs) or nosocomial infections. HAIs may also be referred to as hospital-acquired infections. HAIs represent a major risk to patient safety, worldwide and contribute to morbidity & mortality and the length of the hospital stay for patients and additional costs to healthcare.

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Healthcare-associated infections (HAIs) are caused by pathogens that were not present or incubating when patients arrived for treatment in healthcare facilities. One of the most significant threats to patient safety worldwide; also contribute to morbidity, mortality, length of stay, and increased healthcare expenditure, HAIs are estimated to occur at a rate of between 5 and 15% in hospitalized patients, throughout the world. HAIs represent an especially severe problem for low- and middle-income countries where the burden of HAIs is increased by limited resources, suboptimal infection prevention infrastructure, and limited or nonexistent surveillance systems. Multiple international reports estimate that HAIs impact hundreds of millions of victims each year and are one of the more frequently reported types of adverse events occurring in healthcare facilities. The most commonly reported types of HAIs are surgical site infections; catheter-associated urinary tract infections; ventilator-associated pneumonia; and bloodstream infections. HAIs are typically caused by the performance of an invasive procedure, prolonged hospitalization, inappropriate use of antimicrobials, and failure to follow infection prevention protocols. In addition to overcrowding and limited supplies of trained health care providers; inadequate infection control and prevention policies; and lack of decontamination and disinfection supplies; the Pakistani healthcare system has numerous other structural challenges, which may lead to a higher prevalence of healthcare-associated infections as compared to other parts of the world.

Methodology:

Study Design: A Subsequently selected cohort prospective design (followed up over time) was utilized to evaluate the frequency and associated risk factors for the development of the healthcare associated infections (HAIs) amongst patients hospitalised.

Study Setting: The research was carried out within three (3) major public (tertiary) hospitals located in Islamabad and Rawalpindi:

1. Pakistan Institute of Medical Sciences (PIMS, Islamabad)
2. Holy Family Hospital (Rawalpindi)
3. Benazir Bhutto Hospital (Rawalpindi)

Each of these hospitals provides specialist health care services to a large number of people from both Federal Capital and surrounding areas.

Population of the Study:

The patients that comprised the population for this research include all adults who were hospitalised into either medical wards or surgical wards during the period in which this research was undertaken.

1. Any patients aged at least eighteen years (18) of age.
2. Any patients who had been in hospital for a minimum of forty-eight hours (48) (i.e. A minimum length of stay and all patients can be readily identified as not currently having an active infection at the time of being admitted to hospital.)
3. Any patient who has an active infection at the time of being discharged from hospital prior to eighty hours (80) after admission.

Sample Size: A total of six hundred (600) patients were recruited and followed throughout the period of their stay in the hospital.

Methods for Data Collection:

Data was collected from the use of the following: Structured (standard) questionnaires, review of medical charts/records and visual observation of compliance with infection prevention (IP) practices. Data included demographic characteristics (age, sex, marital status, location), clinical symptoms (in disease, inflammation, category), length of hospital stay, types of invasive procedures carried out, and type of antibiotic treatment received by each patient who was either identified as having a HAIs at the time of being discharged from hospital.

Outcome Measurement:

The primary outcome of the study was to determine if each patient developed an HAI during their episode of hospitalisation, therefore the diagnosis (HAIs) needed to be confirmed by both clinical and laboratory [microbial pathogen identification] criteria for the purpose of identification.

Data Analysis:

Statistical analysis of written data collected included: descriptive statistics to summarize demographic

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characteristics; calculating incidences of HAIs per 100 patients; using logistic regression analyses to determine independent predictors of developing an HAI after being hospitalized and using p <0.05 to establish whether differences between subjects were statistically significant.

Ethical Considerations:

The study received ethical approval from the Institutional Review Board (IRB) of each participating facility. Participants provided voluntary, written informed consent before enrolling in the study.

Results

Out of 600 patients in the sample, the average age of participants was 42.7 years (SD±15.3). Of these, 54% of the recruitment population were male and 46% female.

On a broad basis, there were 87 reported cases of hospital-acquired infections that occurred during hospitalization (or approximately 14.5% of the participants).

Infectious diseases resulting from surgical procedures were the most prevalent types of hospital-acquired infections, followed by urinary tract infections, pneumonia, and bloodstream infections.

Factors associated with an increased likelihood of developing a hospital-acquired infection include length of hospital stay for greater than 7 days, as there was a marked difference in hospital-acquired infections in individuals who were hospitalized for greater than 7 days vs. those who had shorter lengths of stay.

The use of invasive devices to treat patients, such as urinary catheters and ventilators, was also strongly associated with the development of additional infections. Patients in the ICU had a higher rate of developing healthcare-associated infections (HAI) than patients treated in the general wards of the hospital.

Multivariate logistic regression analysis determined that the following clinical predictors of HAI's after adjusting for case mix were independent factors predicting additional infections:

- Patients with invasive medical procedures (OR 2.8; 95% CI 1.7–4.6)
- Patients who stayed in the hospital for >7days (OR 2.3; 95% CI 1.4–3.9)
- Patients treated in the ICU (OR 2.1; 95% CI 1.2–3.5)
- Patients with poor hand hygiene compliance (OR 1.9; 95% CI 1.1–3.1)

These results suggest that both clinical and systemic factors contribute to the occurrence of HAIs.

Discussion

From this cohort study, it can be clearly observed that health-care associated infections pose a major problem in public hospitals of Islamabad and Rawalpindi. The rate observed (14.5%) is close to figures observed in similar developing country's studies, yet higher than figures reported in many high-income country settings. HAI rates observed in international studies conducted in Europe and North America tend to range from 5% to 8%, while studies conducted in South Asia and Sub-Saharan Africa often demonstrate HAI rates of above 12% due to differences in health infrastructure and infection control capacity. Surgical site infections (SSIs) was the predominant form of HAI identified in this study. Patterns of a similar nature have been observed in other regional studies, where infection risk was also noted to be greater on surgical wards because of issues with sterilization and overpopulation of the beds. The relationship of prolonged hospital admission to an increased risk of infection found in this study, supports earlier studies showing a higher risk of infection with a longer hospital admission due to increased chance for microbial spread.

Another important risk factor was the use of invasive medical procedures. Invasive procedures are any procedure that breaks the skin or enters into the body. Examples of invasive procedures include placing urinary catheters, inserting ventilators, and performing surgical procedures, all of these create pathways for microbes to enter the body, so they are known to be significant contributors to hospital-acquired infections (HAIs).

Healthcare workers must wash their hands in accordance with healthcare facility guidelines to help prevent HAIs. During this study, a number of observational assessments showed a relationship between hand hygiene compliance with the amount of patients being cared for. There was a lower level of hand hygiene compliance among healthcare workers

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at different times of the day when a higher Patient Load was present.

Strengthening infection prevention and control programs is a necessity if the incidence of healthcare-associated infections (HAIs) is to be reduced. Healthcare facilities can significantly improve patient safety outcomes by using strategies such as continuing education and training for staff regarding infection prevention/control, improved sanitation in the hospital, implementing an antimicrobial stewardship program, and establishing a standardized system for infection surveillance. The results of this study emphasize the need for developing and implementing comprehensive infection control strategies in the public sector's healthcare system in Pakistan.

Conclusion:

A major public health issue exists regarding healthcare-associated infections in Pakistan's tertiary public hospitals. Results from this prospective cohort study identified that patient (hospital) length of stay as well as performing invasive medical procedures and lack of adequate infection prevention were the significant contributors to the rate at which infections occurred. Comprehensive infection prevention and control programs should be implemented along with improved monitoring systems; additionally, continuing education and training for healthcare providers are necessary to reduce the burden of healthcare-associated infections.

Future research should focus on completing multi-center intervention studies that assess the effectiveness of specific infection prevention and control methods across all of Pakistan's health care systems.

Table 1. Demographic Characteristics of Study Participants:

Variable	Category	Percentage
Gender	Male	54%
Gender	Female	46%
Age	18–35 years	33%
Age	36–55 years	41%
Age	>55 years	26%

Table 2. Types of Healthcare-Associated Infections:

Infection Type	Percentage
Surgical Site Infection	38%
Urinary Tract Infection	27%
Hospital-acquired Pneumonia	21%
Bloodstream Infection	14%

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