EVALUATING HOSPITAL-ACQUIRED INFECTIONS AND THEIR IMPACT ON INPATIENT MORBIDITY AND MORTALITY IN PARAS HOSPITAL: A RETROSPECTIVE STUDY

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by

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Under the Supervision and Guidance of

Dr. Mamta Chauhan

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PARAS
HEALTH

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WHOMSOEVER IT MAY CONCERN

This is to certify that **Dr. Litty Anil** has successfully completed her internship in **Medical Administration Department** from **10th March, 2025 to 31st May, 2025**.

During her internship period she was found to be sincere, dedicated and efficient in her work.

We wish her all the best for a bright future.

For **Paras Hospitals, Gurgaon**

PARAS HEALTHCARE LIMITED
PARAS HEALTH GURGAON

Authorized Signatory
Human Resources

Jeyadesh
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Dr Nadia Shafi Malik

IIHMR UNIVERSITY

CERTIFICATE

This is to certify that dissertation titled **"Evaluating Hospital Acquired infection and their impact on inpatient Morbidity and Mortality in Paras Hospital: A Retrospective Study"** is a record of the research work undertaken by **Dr. Litty Anil** in partial fulfillment of the requirements for the award of the degree of MBA (Hospital and Health Management) from the IIHMR University, Jaipur under my guidance and supervision and her approach to the research study has been sincere, scientific, and analytical.

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DECLARATION BY STUDENT

I hereby declare that this dissertation titled "**Evaluating Hospital-Acquired Infections and Their Impact on Inpatient Morbidity and Mortality in Paras Hospital: A Retrospective Study**" is the Bonafide record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.

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Abstract

Considering its impact on patient outcomes, duration of hospital stays, and overall healthcare expenditures, hospital-acquired infections (HAIs) remain a major concern for healthcare facilities around the world. The purpose of this descriptive cross-sectional record-based review study was to evaluate the prevalence of HAIs and their impact on inpatient morbidity and death at Paras Hospital, a multispecialty tertiary care facility. Surgical site infections (SSI), ventilator-associated pneumonia (VAP), bloodstream infections (BSI), and catheter-associated urinary tract infections (CAUTI) were among the HAIs that were later identified in patients who had been hospitalized for longer than 72 hours.The study examined infection types, department-wise distribution, related risk factors, complications, and patient outcomes using ICD-10 coding and hospital records.

To evaluate infection trends, morbidity patterns, and mortality rates, quantitative analysis was carried out using Microsoft Excel. With a discernible effect on length of stay and patient outcomes, the results showed that findings, such as "BSI and CAUTI were the most common infections observed". The highest infection rates were recorded in the surgical and intensive care units. In order to lessen the burden of HAIs, this study emphasizes the necessity of focused treatments and strengthened infection control procedures. The knowledge acquired is intended to optimize healthcare delivery, increase patient safety, and assist hospital quality improvement initiatives.

Aim

To evaluate hospital-acquired infections and their impact on inpatient morbidity and mortality at Paras Hospital using ICD-10-based data.

Objective

- To determine the incidence rate of HAIs in different hospital departments.
- To assess the impact of HAIs on inpatient morbidity and mortality.
- To identify common risk factors associated with HAIs.
- To evaluate the adherence to infection control protocols and their effectiveness in reducing HAIs.

Methodology

A descriptive cross-sectional record-based review study was done that included the inpatients admitted in the hospital in 6 months. Data was collected from HMIS, medical records, MRD by accessing the four different departments on HAI. Extracted data was entered into a master excel sheet for carrying out descriptive analysis.

Results

Over a six-month period, the study found 1,068 hospital-acquired infection (HAI) cases, with a male preponderance and the largest burden seen in individuals between the ages of 30 and 40. Among the most reported HAIs were bloodstream infections (BSI) and catheter-associated urinary tract infections (CAUTI). Pseudomonas aeruginosa, Klebsiella pneumoniae, and E. coli were the most isolated microbes. While death was observed in relation to VAP, CAUTI, and SSI, especially during peak months, morbidity was higher in cases of VAP and CAUTI. Even though surgical site infections (SSI) were under control, the incidence rates of ventilator-associated pneumonia (VAP) and bloodstream infections (BSI), particularly in intensive care units (ICUs), exceeded benchmark requirements for several months.

Conclusion

The study highlights that hospital-acquired infections contribute significantly to inpatient morbidity and, in some cases, mortality, especially among critical care patients. While SSI rates were within acceptable limits, elevated morbidity and occasional mortality from VAP and BSI stress the urgent need for enhanced surveillance, compliance with infection control bundles, and continuous staff training. In order to lessen the burden of HAIs and enhance patient safety outcomes in tertiary healthcare settings, these findings highlight the significance of focused treatments.

Keywords:

Hospital-acquired infections, morbidity, mortality, infection control, ICD-10, patient safety.

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I also want to express my gratitude to the Paras Hospital's IT Department, Nursing In-charges, and Medical Records Department (MRD) employees for their collaboration and technical assistance. This project would not have been possible without their help with data access, retrieval, and analysis. I also want to express my gratitude to **Prof. Mamta Chauhan**, who is the head of the IIHMR University's Centre for Behavioural Sciences, for her academic advice, constructive criticism, and steadfast support during the dissertation process. Finally, I would want to express my gratitude to IIHMR University for giving me this important platform and chance to pursue this research and make a significant contribution to the field of hospital and healthcare administration.

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List of Abbreviations

Abbreviation	Full Form
HAI	Hospital-Acquired Infection
VAP	Ventilator-Associated Pneumonia
CAUTI	Catheter-Associated Urinary Tract Infection
SSI	Surgical Site Infection
BSI	Bloodstream Infection
ICD	International Classification of Diseases
ICD-10	International Classification of Diseases, 10th Revision
KPI	Key Performance Indicator
EMR	Electronic Medical Record
WHO	World Health Organization

Chapter 1 Introduction

1.1 Rationale of Study

A wide range of data, including patient demographics, clinical diagnoses, comorbidities, procedures, reasons of death, and administrative data, are produced by hospitals, dynamic and complicated systems. Clinical and administrative decision-making based on evidence requires the efficient administration, categorization, and analysis of these datasets. Of them, inpatient data is especially important since it documents a patient's whole journey, from diagnosis and admission to treatment and discharge, providing valuable information for resource efficiency and quality enhancement. Among the many insights inpatient data offers, one critical concern it helps highlight is the occurrence and impact of hospital-acquired infections (HAIs).

These illnesses, which are not present at the time of admission and typically appear 72 hours after hospitalization, include surgical site infections (SSI), ventilator-associated pneumonia (VAP), bloodstream infections (BSI), and catheter-associated urinary tract infections (CAUTI). Increased morbidity, longer hospital stays, higher medical expenses, and inpatient mortality are all significantly impacted by HAIs. Their presence not only burdens patients but also jeopardizes hospital performance and safety measures.

International health agencies such as the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) emphasize that robust infection surveillance systems, along with a strong commitment to infection prevention and control practices, are essential to effectively address these challenges. To organize and analyse clinical data pertaining to HAIs, standardized classification systems like the International Classification of Diseases (ICD-10) are essential. Systematic documenting and comparison of morbidity and mortality patterns are made possible by ICD-10 classification, which guarantees the creation of analytically significant datasets that are comparable across time and geography.

The purpose of this descriptive cross-sectional record-based review study is to assess the prevalence of HAIs and their effect on inpatient morbidity and death at Paras Hospital, a multispecialty tertiary care centre. Through a six-month assessment of ICD-10 coded patient records, this study will determine important risk variables, examine incidence rates by department, and evaluate adherence to infection control protocols. The ultimate goal is to deliver data-driven insights that can reinforce infection control tactics, support focused actions, and improve overall patient safety and hospital quality standards.

1.2 ICD Background

One often used medical classification system is the International Classification of Diseases or ICD. The International Classification of Diseases (ICD), published by the World Health Organization (WHO), is widely used for collecting morbidity and mortality statistics and for developing automated clinical decision support systems. This system of classification is a crucial component of the broader framework known as the "WHO Family of International Classifications".

1.2.1 Brief History & Revisions of ICD

Back in **1856**, William Farr developed one of the first simple statistical classifications of diseases. He emphasized that “classification is a method of generalization,” arguing that a statistical classification must contain a small number of mutually exclusive categories to encompass the full spectrum of morbidity conditions. Each disease should have a specific category, and residual categories should exist for conditions that do not fit elsewhere—thus distinguishing statistical classification from mere nomenclature [1].

In 1948, the World Health Organization (WHO) assumed responsibility for the classification system and expanded it in 1949 to include both causes of death and diseases, marking the birth of the International Classification of Diseases (ICD) [1,2]. Since then, it has undergone major revisions roughly every ten years to meet evolving public health and clinical needs.

The sixth (1949), seventh (1957), and eighth (1968) revisions marked key milestones, with ICD-6 being the first to incorporate non-fatal diseases, unlike earlier versions that focused solely on mortality [2]. In 1977, ICD-9 was introduced, offering a more detailed classification system, including four-digit subcategories to support more granular data analysis [3].

Development of ICD-9-CM (Clinical Modification) further enabled comprehensive morbidity data collection for both inpatient & outpatient settings. Followed by the introduction of ICD-10 in 1992, which came into full effect by 1993. ICD-10 significantly expanded the coding structure—from approximately 17,000 to over 155,000 codes providing a more exhaustive and flexible tool for disease classification & healthcare analytics [2,4].

1.2.2 Gaps in current research

Although this study successfully documents the incidence and department-wise distribution of HAIs using retrospective ICD-10-coded data, it does not incorporate real-time surveillance, antimicrobial resistance profiling, or advanced multivariate analytics to identify independent risk factors and predictors of morbidity and mortality. Moreover, the absence of compliance audits and electronic monitoring tools limits the study's ability to provide actionable insights into the effectiveness of infection control interventions.

1.3 AIM OF THE STUDY

To evaluate hospital-acquired infections and their impact on inpatient morbidity and mortality at Paras Hospital using retrospective ICD-10-based data.

1.4 OBJECTIVES

- To determine the incidence rate of HAIs in different hospital departments.
- To assess the impact of HAIs on inpatient morbidity and mortality.
- To identify common risk factors associated with HAIs.
- To evaluate the adherence to infection control protocols and their effectiveness in reducing HAIs.

1.5 RESEARCH QUESTION

What is the prevalence of hospital-acquired infections at Paras Hospital and how do HAIs impact inpatient morbidity and mortality rates?

Chapter 2-Review of Literature

For this study, the limited availability of extensive literature on hospital-acquired infections within the Indian context posed a significant constraint. As a result, relevant international studies were referenced to support the research framework. Furthermore, the implementation and utilization of the ICD coding system in India have not been as robust or widespread as in many developed countries. This study, therefore, seeks to bridge this gap by contributing meaningful data and insights to the existing body of literature, with a focus on enhancing the application of ICD-based infection surveillance in Indian healthcare settings.

Author (Year)	Title	Study Location	Sample Size	Sampling Technique	Salient Features
Mehta et al. (2014)	*Device-Associated Infections in Indian ICUs: Findings from INICC*	Mumbai, India	3,986 patients	Consecutive sampling	Reported 11.3% HAI prevalence; highest in ICU; SSI most common infection
Khan et al. (2017)	*Assessment of Nosocomial Infections and Antibiotic Resistance Pattern*	Lahore, Pakistan	1,200 patients	Random sampling	Identified high resistance in pathogens causing HAIs; BSI and CAUTI most prevalent
Saini et al. (2020)	*Ventilator-Associated Pneumonia in ICU: A Tertiary Hospital Study*	Delhi, India	750 ICU patients	Purposive sampling	VAP rate significantly high in ventilated patients; linked with prolonged ICU stay
Sharma & Gupta (2021)	*Trends of CAUTI and SSI in a Surgical Unit: A Retrospective Analysis*	Jaipur, India	1,100 patients	Retrospective review	Noted peak incidence within first 5 days of surgery or catheter insertion
Raza et al. (2019)	*Role of Infection Control in Reducing Nosocomial Infections*	Karachi, Pakistan	980 patients	Cross-sectional sampling	Infection control teams led to measurable reduction in HAIs

Author (Year)	Title	Study Location	Sample Size	Sampling Technique	Salient Features
Rosenthal et al. (2016)	*Impact of Multinational Infection Control Initiatives in ICUs*	43 developing countries	Multi-hospital	Observational cohort	Found that surveillance-based interventions reduced HAI rates by 30–40%
WHO (2022)	*Global Report on Infection Prevention and Control*	Global	--	Policy analysis	HAIs are a global threat; stressed need for antimicrobial stewardship and surveillance
Allegranzi et al. (2011)	*Burden of Endemic Healthcare Associated Infection in Developing Nations*	55 countries (WHO study)	--	Systematic review	Found 15 out of 100 patients in LMICs acquire HAIs; hand hygiene most effective
Horan et al. (2008)	*CDC Definitions of Nosocomial Infections for Surveillance*	USA	Nationwide data	Administrative data review	Provided standard criteria for defining and classifying HAIs

Chapter3-Methodology

3.1. Key Research Question

What is the prevalence of hospital-acquired infections at Paras Hospital, and how do HAIs impact inpatient morbidity and mortality rates?

3.2. Research Design

This study employs a descriptive cross-sectional record-based review study, using patient records and ICD-10-coded data collected over a 6-month period to evaluate trends, associations, and outcomes related to HAIs.

3.3. Study Setting

The study was conducted at Paras Hospital, a tertiary care multispecialty hospital offering a wide range of impatient and critical care services. The hospital adheres to standard infection control protocols and maintains electronic medical records for all patients.

3.4. Study Population

3.4.1 Inclusion Criteria:

- Patients admitted to the hospital for more than 72 hours.
- Patients diagnosed with a hospital-acquired infection as per ICD-10 coding during hospitalization.
- Inpatients admitted in ICU department
- Inpatients admitted in Urology department
- Inpatients admitted in OT department
- Inpatients admitted in Oncology department

3.4.2 Exclusion Criteria:

- Patients who are presented with an infection at the time of admission.
- Patients discharged or transferred before 72 hours of admission.
- Cases whose discharge/death summaries could not accessed through HMIS

3.5. Study Approach

The study uses a quantitative approach, relying on retrospective data analysis from patient records. The following components were analyzed:

- Type of HAI (e.g., CAUTI, SSI, VAP, BSI)
- Age and gender distribution
- Department-wise incidence
- Length of hospital stay
- Morbidity indicators
- Mortality outcomes

No qualitative interviews or surveys were conducted.

3.6. Sample Size and Sampling Technique

- Total enumeration sampling was used. All patients diagnosed with HAIs in the 6-month study period were included
- A total of 1068 HAI patients were included in the study based on the Excel data.

3.7. Study Instrument

Data were collected through:

- Electronic Medical Records (EMRs)
- Infection Control Department reports
- ICD-10 codes for identifying HAI types

3.8. Operational Definitions

- **Hospital-Acquired Infection (HAI):** Any illness that was not present or incubating at the time of admission but manifested 72 hours later is referred to as a hospital-acquired infection (HAI).
- **Morbidity:** Any complication, prolonged hospitalization, or additional intervention

directly associated with HAI.

- **Mortality:** In-hospital death occurring as a direct or indirect result of an HAI.

3.9. Statistical Methods

Software Used: Microsoft Excel, MIS

3.9Analysis Included:

1. Descriptive statistics: frequency, percentage distribution
2. Cross-tabulations: HAI types vs. departments, age groups, gender.
3. Morbidity and mortality rates for each type of infection.
4. Graphical representation: Pie charts, bar graphs

3.10. Ethical Considerations

- Permission was taken from Hospital Authorities/ relevant department to use the patient data.
- Patient data were re-identified to maintain confidentiality.
- Access to data was restricted to the research team only.

Chapter 4-Results

Age wise Distribution of Sample

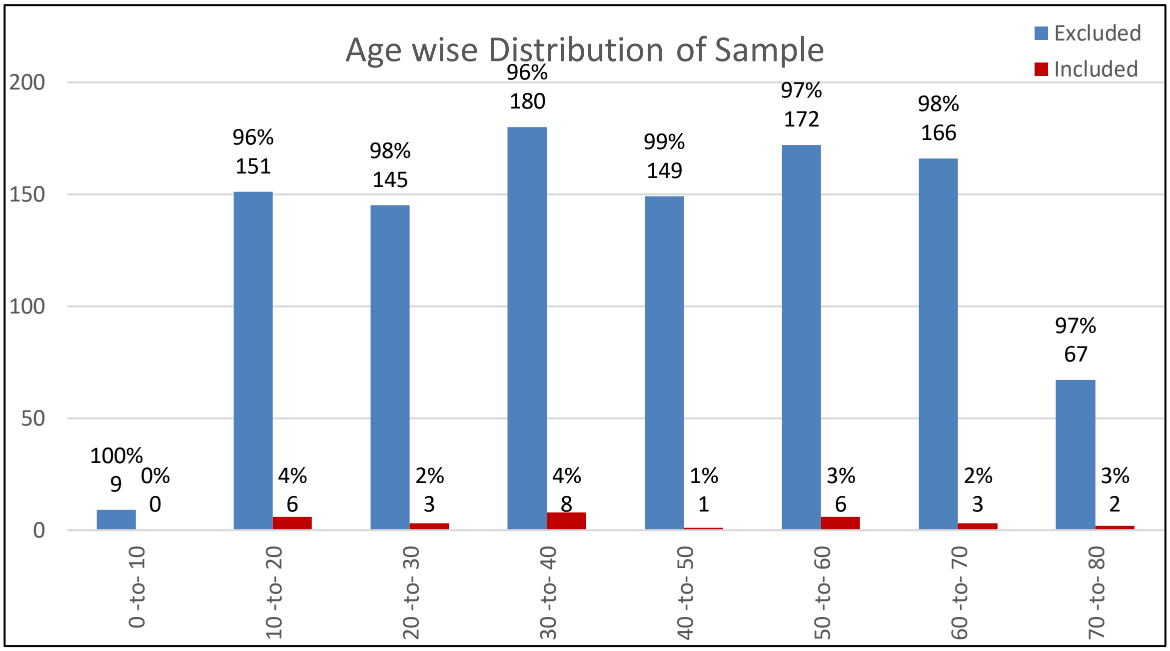

Figure 4.1*: Age wise Distribution of Sample*

The age-wise distribution of included and excluded cases reveals that the highest number of total cases (188) were in the 30–40 age group, with 96% excluded and 4% included. The 10–20 and 30–40 age groups both showed a 4% inclusion rate, the highest among all groups. The 0–10 group had no included cases. Inclusion rates across other age groups remained low, ranging from 1% to 3%. The 40–50 age group had the highest exclusion rate (99%). Overall, middle-aged adults (30–60 years) represented the largest proportion of cases, highlighting their vulnerability to hospital-acquired conditions.

Distribution by Sample Type

Among the biological samples analyzed, urine samples were the most frequently collected, accounting for 39% of all samples. This was followed by blood (15%), pus (14%), sputum (8%),ET (7%),BAL and TT (6%).

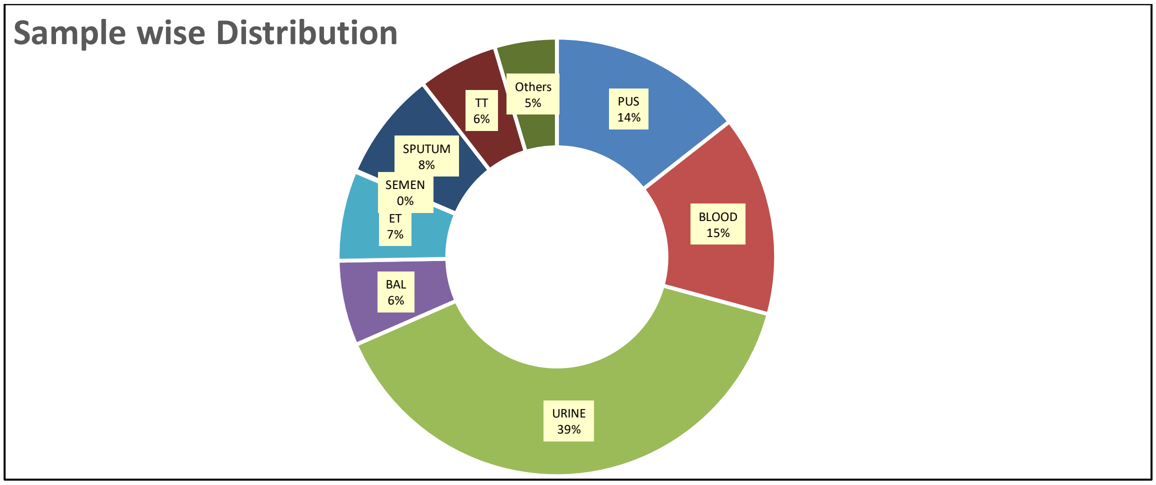

Figure4.2*: Sample wise distribution*

Urine samples show a high prevalence of catheter-associated urinary tract infections (CAUTI), which is in line with global and national trends in HAI. The significant volume of blood and pus samples also reflects the vigilance in identifying bloodstream infections (BSI) and wound infections.

Microbiological Profile: Top Organisms Identified

The microbiological analysis identified E. coli (30%) as the most prevalent pathogen, followed by Klebsiella pneumoniae (29%), and Pseudomonas aeruginosa (12%). These gram-negative organisms are known to be commonly associated with device-related and nosocomial infections.

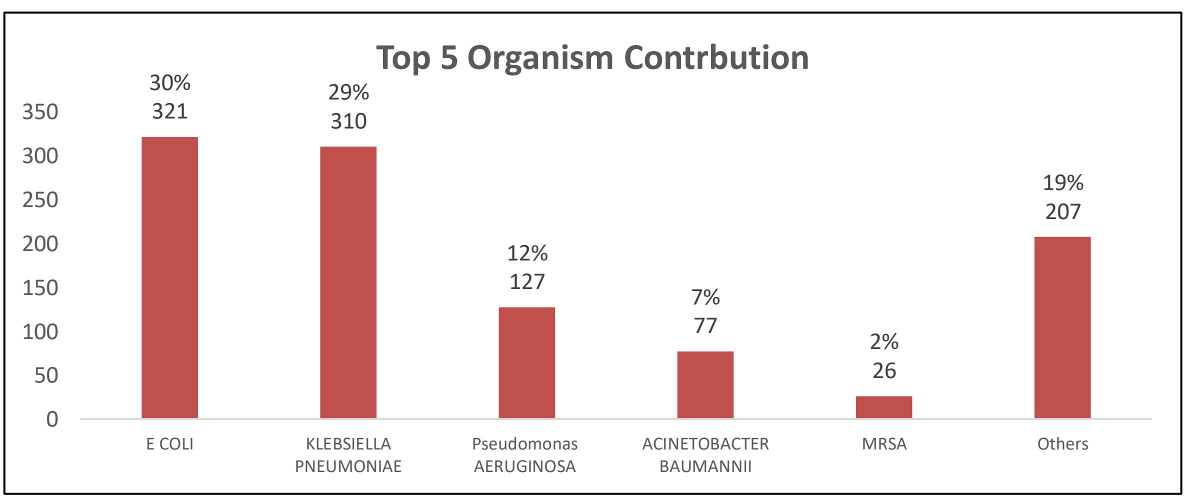

Figure *4.3: Top 5 Organism Contribution*

The high proportion of multi-drug-resistant pathogens like E. coli and Klebsiella highlights the ongoing challenge of antimicrobial resistance in the hospital setting.

HAI-Specific Morbidity and Mortality Trends

Month	VAP		CAUTI		SSI		BSI		Excluded	
	Mortality	Morbidity	Mortality	Morbidity	Mortality	Morbidity	Mortality	Morbidity	Mortality	Morbidity
Oct-24	-	1	1	2	-	1	-	-	-	314
Nov-24	-	2	2	-	-	3	-	-	-	257
Dec-24	-	-	-	-	1	2	-	-	-	217
Jan-25	1	-	-	-	-	1	-	-	-	118
Feb-25	2	-	-	1	1	-	-	1	-	59
Mar-25	-	1	-	-	1	2	1	-	-	76
TOTAL	**3**	**4**	**3**	**3**	**3**	**9**	**1**	**1**	**-**	**1,041**

Table-4.1: Mortality/morbidity trends

Month-wise breakdown of HAI-associated morbidity and mortality reveals:

- **VAP** morbidity fluctuated monthly, with the highest mortality observed in January and February, indicating possible gaps in ventilator care protocols or delayed diagnosis.
- **CAUTI** showed intermittent morbidity and limited mortality (October and November), aligning with the higher urine sample burden.
- **SSI** remained relatively stable but showed isolated mortality in the later months, suggesting possible lapses in surgical asepsis.
- **BSI** showed mortality in the month of March
- Overall, mortality remained low, but morbidity trends signal a need for stricter adherence to infection prevention and control (IPC) protocols.

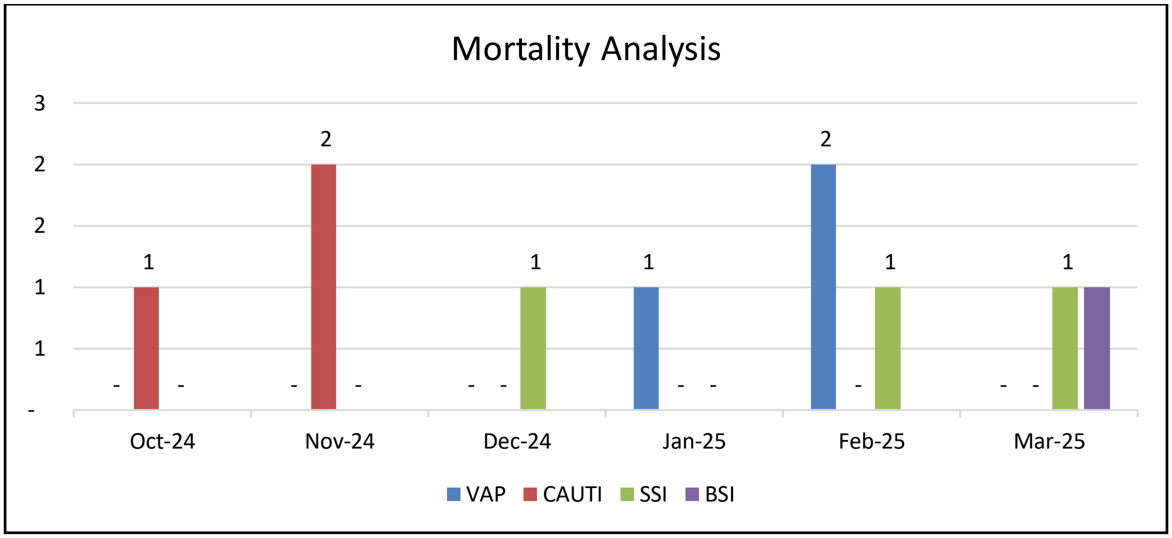

Figure 4.4: *Mortality analysis*

Benchmark Monitoring and Performance Evaluation

Key performance indicators (KPIs) for VAP, SSI, and BSI were tracked monthly and compared to standard benchmarks:

KPI	Target/ Benchmark	OCT (2024)		NOV (2024)		DEC (2024)		JAN (2025)		FEB (2025)		MAR (2025)	
VAP	**8.5(NCBI))**	1	3.73	2	8.33	0	0.00	1	4.41	2	7.72	1	7.09
		268		240		284		227		259		141	
SSI	**0.9 (NHSN)**	1	0.23	3	0.49	3	0.51	1	0.17	1	0.18	3	0.49
		431		613		587		576		565		618	
BSI	**0.8(NHSN)**	0	0.00	0	0.00	0	0.00	0	0.00	1	1.80	1	2.08
		860		590		639		639		556		481	
CAUTI	**0.9 (NHSN)**	3	2.00	2	1.25	0	0.00	0	0.00	1	0.64	0	0.00
		1500		1595		1517		1604		1556		1057	

Table-4.1: benchmark Monitoring and Performance Evaluation

- **VAP** rates exceeded the benchmark (8.5/1000 ventilator days) in November (8.33), February (7.72), and March (7.09**)**. This highlights a periodic spike in ventilator-associated complications, potentially linked to peak ICU occupancy or staffing limitations.
- **SSI** rates consistently remained below the NHSN benchmark (0.49) of 0.9 per 100 procedures, demonstrating effective surgical site management**.**
- **BSI** rates, although minimal in earlier months, surpassed the benchmark (0.8) in

February (1.8) and March (2.08), suggesting emerging concerns with intravenous line protocols or increased patient acuity.

- **CAUTI** showed a significant increase by 2.00 exceeding the benchmark limit 0.9

This KPI analysis underlines that while SSI control measures are effective, VAP, CAUTI and BSI require reinforced surveillance, staff retraining, and targeted intervention strategies

KPI Contribution

The pie chart illustrates the proportional contribution of different hospital-acquired infections (HAIs) to overall infection-related Key Performance Indicators (KPIs) monitored at Paras Hospital.

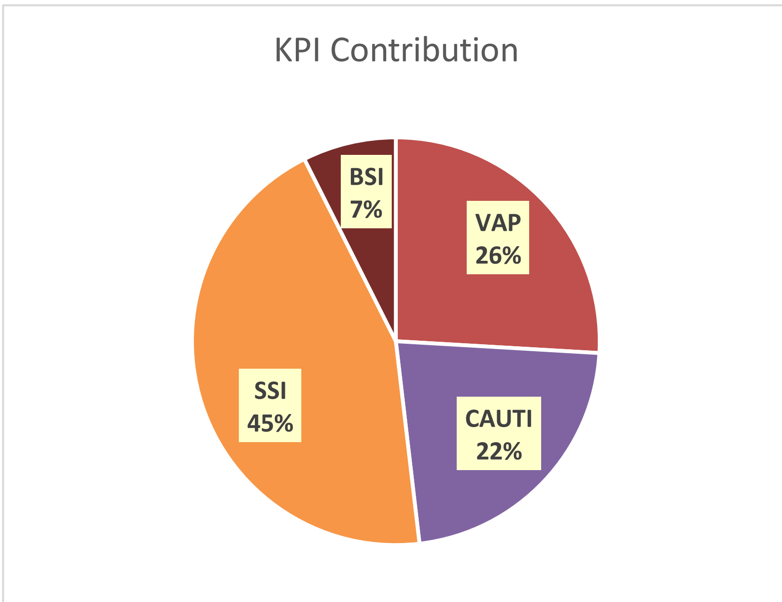

Figure *4.5: KPI contribution.*

- **Surgical Site Infections (SSI)** contribute the highest to the KPI burden, accounting for **45%**. This indicates that nearly half of the monitored HAIs are related to post-surgical complications**,** emphasizing the importance of maintaining strict aseptic techniques in operation theatres and post-operative care areas.
- **Ventilator-Associated Pneumonia (VAP)** is the second-largest contributor at **26%**, reflecting the significant risk associated with prolonged mechanical ventilation**,** particularly in intensive care settings.
- **Catheter-Associated Urinary Tract Infections (CAUTI)** make up **22%**, pointing

to the prevalence of urinary catheter usage and the need for improved catheter care practices.

- **Bloodstream Infections (BSI)** account for the smallest share at **7%**, but their clinical impact and potential for severe outcomes make even this smaller percentage noteworthy.

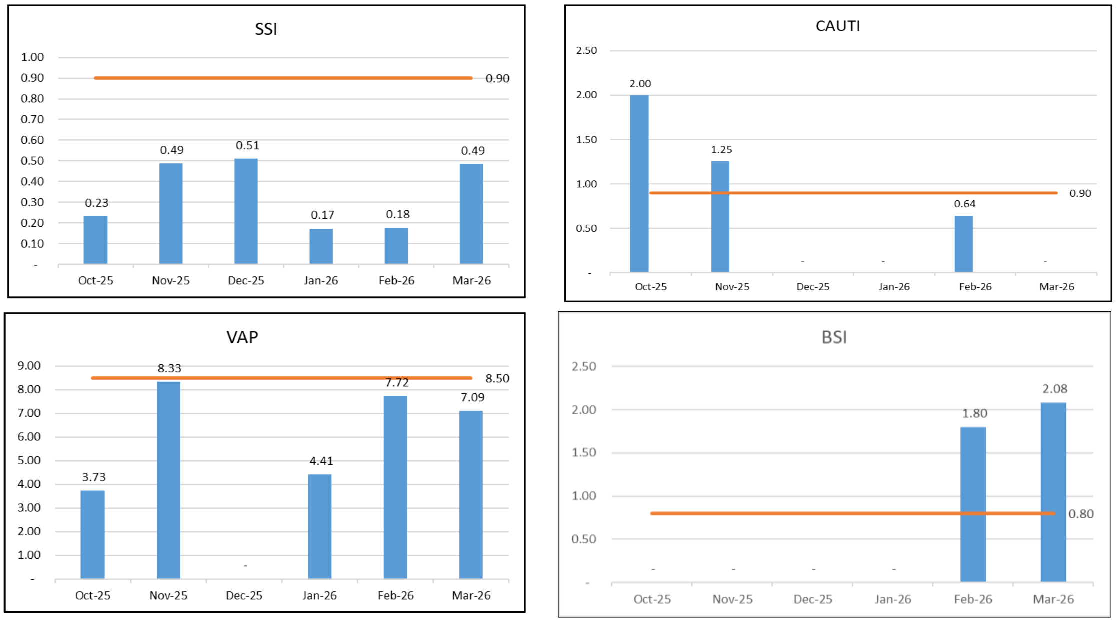

Figure 4.6*: KPIs comparison with respective benchmark*

Monthly Summary of Hospital-Acquired Infections

The summary graph provides a consolidated monthly overview of various hospital-acquired infections (HAIs) over a six-month period from October 2024 to March 2025. The data includes four major HAIs — **VAP, CAUTI, SSI, and BSI** — along with line-related infections (peripheral line and male catheter usage) and excluded cases.

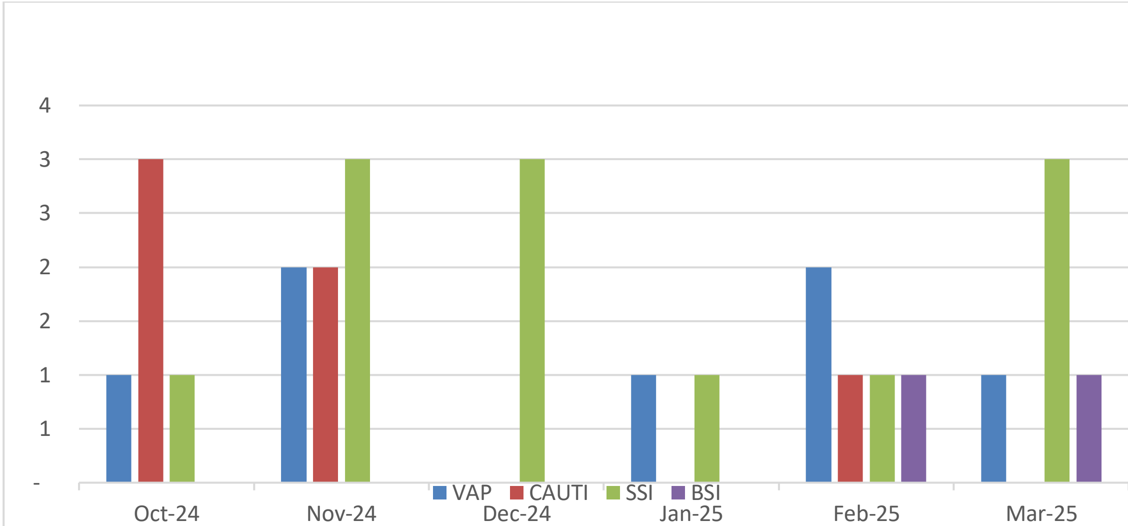

Figure 4.7*: KPI monthly trend*

Ventilator-Associated Pneumonia (VAP):

VAP cases were observed in all months except December, peaking in February (2 cases) and November (2 cases). This indicates ongoing ventilator-associated risks, particularly in high-dependency areas like the ICU.

Catheter-Associated Urinary Tract Infection(CAUTI):

CAUTI showed the highest frequency in **October (3 cases)**, declining gradually to **0 cases in December, January, and March**. This trend may reflect improved catheter care protocols or seasonal variations in admission profiles.

Surgical Site Infections (SSI):

SSI cases were consistently present each month, ranging from **1 to 3 cases**. The **highest count was recorded in November (3 cases)** and **March (3 cases),** possibly linked to higher surgical volumes or elective surgeries during those periods.

Bloodstream Infections (BSI):

BSI was reported only in **February and March (1 case each)**, with **no cases in the initial four months**, suggesting a recent rise in line-related infections or changes in patient acuity. This warrants further review of central line insertion and maintenance protocols.

Chapter 5-Discussion

Globally, hospital-acquired infections (HAIs) continue to pose a serious threat to patient safety and healthcare quality. The World Health Organization reports that up to 15% of patients in low- and middle-income countries acquire at least one HAI during hospitalization, contributing significantly to patient morbidity, prolonged stays, and increased costs [5]. This six-month retrospective study at Paras Hospital, Gurgaon, aimed to assess the prevalence and trends of HAIs—specifically ventilator-associated pneumonia (VAP), catheter-associated urinary tract infections (CAUTI), surgical site infections (SSI), and bloodstream infections (BSI)—using ICD-10-coded data.

Demographic findings indicated that the 30–40 age group had the highest incidence of HAIs, followed by those aged 40–50 and 20–30. This aligns with studies from Indian ICUs where invasive procedures are more common in these age brackets [6]. A male predominance (~67%) was also observed, potentially due to higher ICU admissions and device exposure, which is similarly reported in national studies [6].

Urine samples formed the largest share (39%) of biological samples, highlighting the prevalence of CAUTI. The dominant organisms isolated—E. coli and Klebsiella pneumoniae—are widely recognized as common and often drug-resistant pathogens in nosocomial infections [7].

Infection-Specific Findings:

1. VAP incidence remained persistent, with mortality peaks in January and February, exceeding the benchmark rate of 8.5/1000 ventilator days. This underlines the need for consistent ventilator care bundle compliance and ICU audits [8].
2. CAUTI peaked in October, then declined, indicating progress in catheter care practices. However, associated early mortality highlights the risk of even isolated poorly managed cases.
3. SSI rates consistently stayed within the accepted benchmark of 0.9%, suggesting effective surgical asepsis and prophylaxis measures.
4. BSI emerged late in the study period (February–March), with rates breaching acceptable thresholds, pointing to lapses in intravenous line maintenance.

Additional Operational Trends:

- CAUTI and BSI decreased in earlier months, reflecting the partial success of infection control measures.

- Peripheral line and male catheter-related infections were minimal, indicating good aseptic technique adherence.
- A reduction in excluded cases suggests better ICD-10 documentation and data completeness, essential for accurate surveillance and performance monitoring [9].

Chapter 6-Conclusion

This six-month retrospective study at Paras Hospital in Gurgaon offers important new information about the prevalence, distribution, and consequences of hospital-acquired infections (HAIs). The study focused on the four main HAIs: bloodstream infections (BSI), surgical site infections (SSI), ventilator-associated pneumonia (VAP), and catheter-associated urinary tract infections (CAUTI) using data from ICD-10 and benchmark comparisons. The results show that the most frequent bacteria causing HAIs were E. Coli, Klebsiella pneumoniae, and Pseudomonas aeruginosa.

Among the infection types, SSI remained well-controlled, with rates consistently below national benchmarks. However, VAP and BSI showed periodic spikes, with VAP breaching benchmark thresholds in several months, and BSI emerging as a concern in the latter part of the study. CAUTI, while showing improvement over time, resulted in early mortality in some months.

Demographic analysis identified middle-aged males as the most affected population, and urine was the most commonly tested sample, aligning with the predominance of CAUTI. The gradual decline in excluded cases and CAUTI incidence reflects improved documentation and adherence to infection control protocols.

Overall, the study highlights the importance of continuous surveillance**,** benchmark-based performance evaluation, and structured infection control practices in managing HAIs effectively. It also contributes to the relatively sparse Indian literature on ICD-10-based infection analysis in tertiary care settings.

Recommendations

Based on the findings and performance gaps identified during the study, the following recommendations are proposed to enhance infection control practices and patient safety:

- Implement Real-Time Electronic Surveillance Systems
- Conduct Routine Compliance Audits

- Department-Wise Infection Control Training
- Introducing Root Cause Analysis (RCA) for Every HAI-Linked Mortality
- Benchmarking Against National and Global Standards
- Establish a Multidisciplinary Infection Control Committee
- Patient Risk Stratification and Early Isolation

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