# Hospital Acquired Infection: A Study to Measure Its Impact on Increase Average Length of Stay and Cost of Care in Multi-Specialty Hospital.

**Internship Training At**


(21st March, 2022 to 18th June, 2022)

By

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Roll Number: 1122

Under the guidance of

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MBA in Hospital Management

Batch 2020-2022

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## ACKNOWLEDGEMENT

When you travel with someone, it makes the journey easier. Undoubtedly, interdependence is better than independence. This project report is the end product of three months of training during which I had a lot of help and assistance. The fact that I can now convey my gratitude to them all is a good element.

I convey my heartfelt thanks to Dr. K.G Kumawat, Executive Director, Amar Jain Hospital, Vaishali Nagar, Jaipur for granting me the opportunity to work with this resourceful organization and for guiding me.

I also express my gratitude towards Dr. Shivani Kumawat to provide me the privilege to work as a Management Trainee, at Amar Jain Hospital during the study period.

My sincere thanks to my guide Dr. P.R. Sodani for keeping me motivated.

Last but not least, I'd like to thank my parents for their tolerance, perseverance, and love in helping me overcome obstacles in my life.

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MBA- (2020-22)

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# ABSTRACT


**Key words**: HAI, CAUTI, CLABSI, SSI, VAP

**Introduction:** The main factor in both morbidity and mortality among hospitalized patients was hospital acquired infections. According to several studies, 5 to 10% of individuals who are admitted get one or more infections while they are hospitalized. Patients who are immunosuppressed, have underlying diseases, are undergoing invasive procedures, are admitted to the intensive care unit, or are elderly are more likely to have this percentage.

**Aim:** The purpose of this study was to give baseline data on the incidence rate of HAI and to inform the administration of the financial burden that it has on hospitals and patients, in order to inform prioritization when developing strategies and policies.

**Objectives:**

- To determine additional costs incurred by patients due to Hospital acquired infection.
- To calculate the total cost incurred by hospitals due to Hospital acquired infection
- To determine the HAI incidence rate among patients admitted to hospitals,

**Study design:** A total of 90 HAI cases from 2022 were included in the sample size of this retrospective analytical and prospective observational investigation, which was conducted in an ICU and ward setting. Data was gathered prospectively through observation, expert and caretaker interviews, and records kept by the infection control department. (Doctors, Intensivists, ICNs, and Nurses),

**Data Analysis:** In this study, we used data from 2022 that was kept up to date by the infection control committee. There were 90 total cases of HAI, including 31 CAUTI cases, 17, 28 SSI cases, including 2 VRE cases and 1 MRSA case, and 14 VAP cases. ALOS after infection- CAUTI=6.8, CLABSI=14.7, VAP=29.7, and multiple infection=17.9 days. The overall average length of stay for CAUTI=17.4, for CLABSI=19.3, for VAP=44.17, and for multiple infection=30.4. There were typical days in SSI.

**Recommendations:** there is need of Increase health care workers' knowledge and understanding of the seriousness of the problem, as well as their adherence to the accepted practices for preventing hospital acquired infections, in order to lessen the financial burden that HAI causes.

**Conclusion:** HAI worsen the disparity in resources between basic and secondary healthcare by allocating limited resources to the treatment of potentially treatable conditions.

# AMAR JAIN HOSPITAL
Vaishali Nagar, Jaipur

DATE- 22ND JUNE 2022

## TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. Kunal Kothyari** student of **IIHMR University**, Jaipur has done his 3 months internship in the department of **Medical Administration** and has successfully completed his project on **"Hospital Acquired Infection: a study measuring its impact on length of stay and cost of care in multispecialty hospital"** from **"21st march 2022 to 18th June 2022"** with **"WHC- Amar Jain Hospital, Vaishali Nagar, Jaipur, Rajasthan.**

During his training we found him to be sincere and hardworking.

We wish him success in future.

**For WHC- Amar Jain Hospital, Vaishali Nagar, Jaipur**

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# PART-A: HOSPITAL PROFILE

## 1.1 ABOUT THE HOSPITAL:

Amar Jain Hospital is a recognised name in comprehensive patient care. It was founded in the year 1971. With a vision to offer the best, equipped with technologically advanced healthcare facilities.

Amar Jain Hospital is a 150 bedded, multi-specialty hospital with ultra-modern facilities and state of the art infrastructure with an experienced team of eminent doctors and trained medical staff.

AMAR JAIN HOSPITAL BUILDING, AMRAPALI CIRCLE, VAISHALI

## 1.2: Hospital Philosophy

**Mission:**

To make hospitable healthcare spaces accessible to all, with the support of compassionate and expert medical professionals who touch lives beyond the scope of just the treatment.

**Vision:**

To redefine healthcare and wellness industry by establishing ourselves as a hospitable and loving healing center, defined by its experience.

## 1.3: Hospital Location

The hospital is strategically located in the prime centre of the posh locality of Vaishali Nagar Jaipur. The hospital address is 374, Block C, Amrapali Circle, Vaishali Nagar, Jaipur.

## 1.4 LIST OF DEPARTMENTS & DIVISIONS VISITED

- Department of Internal Medicine
- Department of Dental Surgery
- Division of Endocrinology & Diabetes
- Division of ENT & Head Neck Surgery
- Department of General Surgery
- Division of GI & Bariatric Surgery
- Department of Hepatology and Liver Transplant
- Department of Urology and Andrology
- Department of Nephrology
- Department of Orthopedics and Joint Replacement
- Department of Ophthalmology
- Division of Plastic, Aesthetic & Reconstructive Surgery
- Department of Pathology and Laboratory Medicine
- Department of Physiotherapy and Rehabilitation
- Department of Respiratory Medicine
- Division of Radiology & Nuclear Medicine
- Department of Transfusion Medicine (Blood Bank)
- Emergency and Trauma Care
- Department of Neurosciences
- Pharmacy

# PART-B:

# INTERNSHIP AS:

# MANAGEMENT TRAINEE

## 2.1 Roles and Responsibilities:

1. Reporting to: Executive Director- Dr. K.G Kumawat
2. Since Amar Jain Hospital is a young and growing organization a lot of learning opportunities and important job responsibilities lied in the role of as a Management Trainee.
3. Out-Patient Department being the first point of contact for the patients plays a critical role in the hospital. OPD deals not only with consultations but also minor procedures that took place on Out-patient basis. It caters to the masses. Being shop window of the hospital, OPD experience of the patient influences his/her response towards other services.
4. In all, the following work responsibilities were provided by the organization-

a) Ensure better patient experience, better queue management by the staff.
b) Ensure that the rules and protocols are followed by all the staff members of OPD.
c) Properly handling patient complaints and staff grievances.
d) To resolve all issues related to queue management.
e) Address patient's problems but also provides necessary information in case of any queries.
f) Ensure availability of doctors on time.
g) Manage security, housekeeping, billing, and registration to ensure smooth functioning of the department.
h) Analyse and streamline all the processes in the OPD and suggest reforms continuously.
i) Coordinating the Hospital at Home vertical.
j) Managing the marketing department of the Hospital at home services.

# PART-C:

# DISSERTATION

## Hospital Acquired Infection: A Study to Measure Its Impact on Increase Average Length of Stay and Cost of Care in Multi-Specialty Hospital.

## 3.1. INTRODUCTION:

Hospital acquires infections were leading cause of morbidity and mortality among hospitalized patients. According to various study 5 to 10% of admitted patients sufferd one or more than one infections during hospital stay. This proportion is greater in immunocompromised patients, patients with underlying disease, undergoing invasive procedures, admitted to ICU and elderly patients. According to the WHO definition "An infection occurring in a patient in a hospital or other health care facility in whom infection was not present or incubating at the time of admission. This includes infection acquired in the hospital but appearing after discharge, and also the occupational infections among staff of the facility".

### 3.1.1 Study Criteria Justification:

Hospital's perspective on HAI cost:

Cost related to the HAI comprises of three components: productivity cost and non-medical cost and diminished quality of life. The majority of economic and on medical costs as this cost directly impact on hospital make decision about economic benefit through investment.

Direct medical costs, the indirect the intangible costs related to cost analysis of HAI focus primarily finances. It also provides evidence to in infection control program.

## 3.2. LITERATURE REVIEW:

The major cause of morbidity and mortality among hospitalised patients was hospital acquired infections. According to several studies, 5 to 10% of individuals who are admitted get one or more infections while they are hospitalized. Patients who are immunosuppressed, have underlying diseases, are undergoing invasive procedures, are admitted to the intensive care unit, or are elderly are more likely to have this percentage. In rich countries, 7 out of every 100 hospitalized patients would develop at least one infection related to healthcare, compared to 10 in developing nations. The results of a study In total, hospital acquired infections led to an additional 14 days in the hospital, a 10% likelihood of death, an additional of £3153 in medical expenses, and six additional days of work.. The study come to an end that the economic burden of hospital acquired infection was about £.1.1 billion a year, and affects 1 in 10 patients. The total number of bed days consumed by hospital acquired infection was estimated at about 3.6 million a year, or equivalent to about 27 for 400-bed hospitals working at 90% capacity.

HAI result in substantial morbidity and mortality, prolong hospital stays and increased direct patient care costs. During 2002, about 1.7 million inpatients had an HAI-4.5 per 100 patients HAI costs the US $5B in 2000 and $6.7 billion in 2002 in healthcare cost.

How much longer the stay is depends on the type of infection, the age of the patient and any other co-morbidity that are present.

**Most common HAI types:**

- Cather associated urinary tract infection(CAUTI): 32%
- Surgical site infection(SSI): 22%

- Central line associated blood stream infection(CLABSI): 15%
- Ventilator associated Pneumonia(VAP): 14%

**The pathogenesis consists of:**

- Infectious agent: human and environmental source
- Susceptible hosts: Immune status, surgical procedures, indwelling devices etc.
- Transmission: Bacteria, Viruses, fungi, parasites, or prions, direct or indirect contact.

The amount of healthcare cost that can be practically assigned to the management of nosocomial infections, overuse and/or abuse of antimicrobials, and illnesses caused by multidrug-resistant bacteria is difficult to measure. There have, however, been some research conducted. The majority of research originated from various US states and used retrospective cohorts from administrative databases as well as diverse analyses with varying degrees of sophistication.

CLABSI found to be the most expensive (US$45,814 [2012]; LOS 10.4 days), followed by VAP= (US$40,144; LOS 13.1 days), SSI= (US$20, 785; LOS 11.2 days) in a study by the National Nosocomial Infection Surveillance (NNIS). Cost and LOS of infections increased by 105% when Methicillin-resistant Staphylococcus aureus (MRSA) was involved. The cost of CLABSI grew by 2206 and the LOS of CLABSI increased by 51%. These findings underline the significance of measures to curb bacterial drug resistance.

## 3.3. AIM:

Aim of this study was to provide baseline information of incidence rate of HAI and sensitize the administration about its economic impact on hospital's finance as well as on patients so as to guide priory setting in the development of strategy and policy.

## 3.4. OBJECTIVES:

- To determine additional out-of-pocket (OOP) expenses incurred by patients as a result of HAI in comparison to patients without HAI.
- To determine the incidence rate of HAI among hospitalized patients.

## 3.5. STUDY METHODOLOGY:

In this study, analytical approach of measuring of cost of HAI is comparing the group of patients affected with specific type of micro-organism with the group of the patients unaffected with HAI.

**Study Type:** Retrospective analyticall and prospactive observational

**Study Area:** Wards and Intensive care units

**Sample Size:** 90 cases of hospital acquired infection in 2022.

**Inclusion Criteria:** All patients of above 16 year age in intensive care units and wards with different complains, presentations and developed clinical evidence of infection, which does not came out from the patients original diagnosis at time of admission are taken in this study.

**Exclusion Criteria:** According to the definition of HAI, patients admitted before 48 hrs excluded from the study.

**Data collection tool:** Retrospective from the records maintained by infection control department, prospectively by observation and interviewed with experts and care takers. (Nurses, ICN, Intensivists, Doctors)

**Economic Evaluation Method:** Cost analysis method

**Data Analysis Method:** MS Excel

## 3.6. Data Analysis:

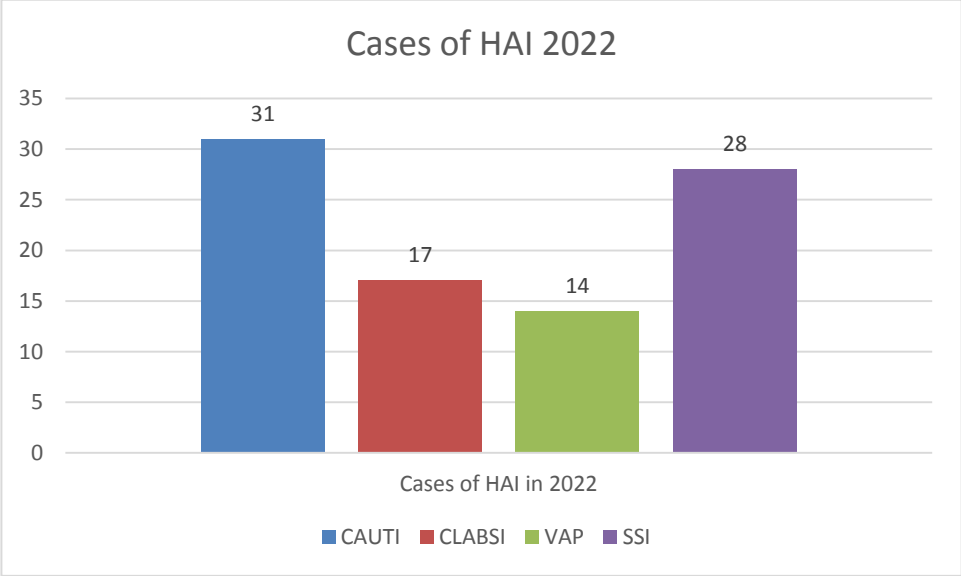



**Fig: 6.1 Annual cases of HAI**

I used information from the Infection Control Committee for this study, which included data from 2022. There were 90 total cases of HAI, including 31 cases of CAUTI, 17 cases of CLABSI, 28 cases of SSI, which included 2 cases of vancomycin-resistant enterococcus (VRE) and 1 case of methicillin-resistant staphylococcus aureus (MRSA), as well as (VAP).

| | |
|---|---|
| **No of multiple infection cases** | **17** |
| **UTI+BSI** | **6** |
| **UTI+VAP** | **4** |
| **BSI+VAP** | **4** |
| **BSI+UTI+VAP** | **1** |
| **VAP+SSI** | **1** |
| **BSI+SSI** | **1** |

**Table: 6.1 No. of multiple HAI cases**

In these 90 cases there is 17 cases which was suffered from multiple infection in which 6 cases suffer from UTI and BSI, 4 cases from UTI and VAP, 4 cases from BSI and VAP, 1 cases from BSI, UTI and VAP, 1 case suffer from VAP and SSI and 1 case suffer from BSI and SSI.

- Catheter associated urinary tract infection rate ( Annually)= Number of urinary catheter associated UTIs in a year/No of urinary catheter days in that year*1000

  =31/16911*1000=1.83

- Central line associated blood stream infection (Annually)= Number of central line associated BSI in a year/ No. of Central line days in year*1000

  =17/8365*1000=2.03

- Ventilator associated pneumonia rate (Annually)= Number of ventilator associated pneumonia in a year/ No of ventilator days in that year*1000

  =14/5265*1000=2.65

- Surgical site infection rate(Annually): Number of surgical site infection in a year/Number of total surgery in that year*1000

  =28/5117*1000=5.47

**3.6.1 CAUTI:**

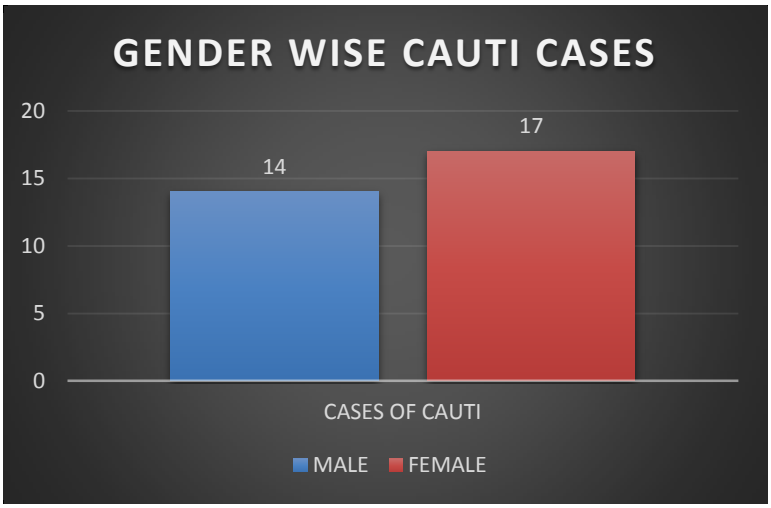



**Fig: 2 Gender wise distribution of CAUTI**

**Gender wise distribution:** Out of 31 cases 14 were Males and 17 were Females.

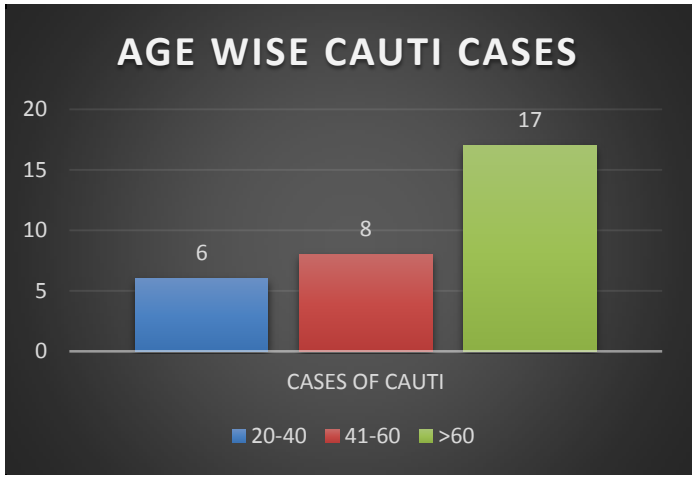



**Fig: 3 Age wise Distribution of CAUTI**

**Age wise distribution:** 6 cases below 20 years, 8 cases between 40-60 years and 17 cases of more than 60 years of age.

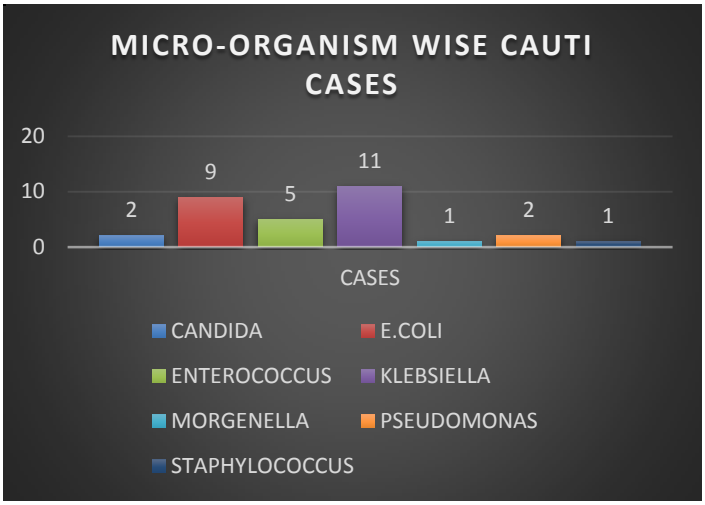



**Fig: 4 Micro-organism wise distribution of CAUTI**

**Micro-organisms wise distribution of CAUTI:** Most causative bacteria is Klabsiella and E. Coli, each contribute 11 and 9 cases, other organisms were Candida 2 cases, Enterococcus 5 cases, Pseudomonas 2 cases and staphylococcus 1 case.

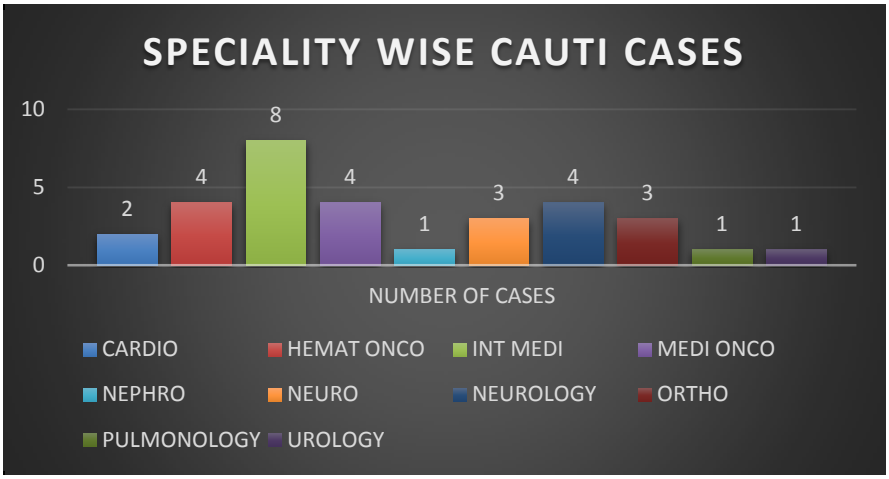



**Fig: 5 Specialty wise distribution of CAUTI**

**Specialty wise analysis of UTI**: most prevalent in Internal medicine cases, that are 8 cases and after that 4 cases from Medical oncology.

## 3.6.2 CLABSI:

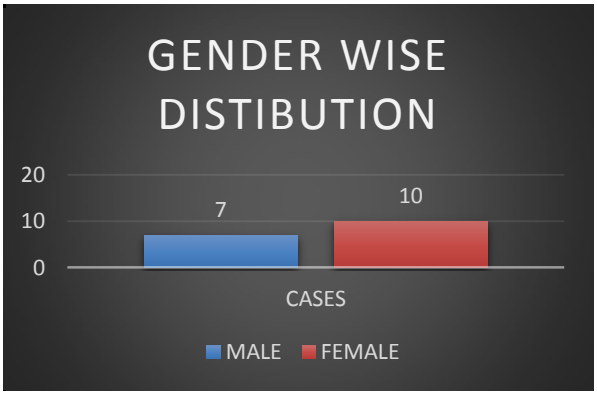



**Fig: 6 Gender wise distribution of CLABSI**

**Gender wise distribution:** Out of 17 cases 10 were females and 7 were males.

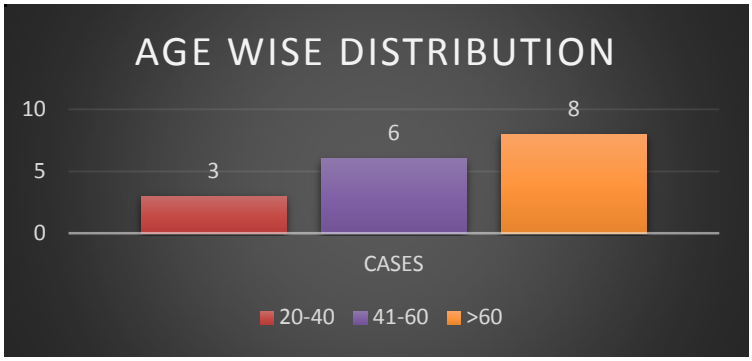
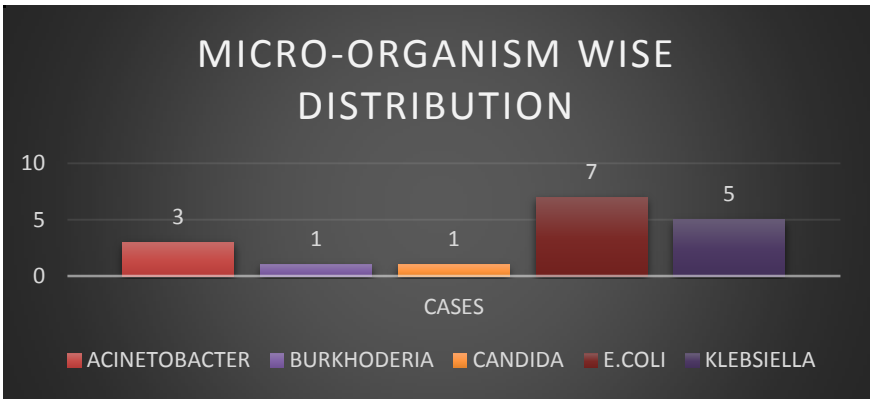



**Fig: 7 Age wise distribution of CLABSI**

**Age wise distribution:** 3 cases were from less than 40 years of age, 6 cases were from 40-60years of age, 8 cases from more than 60 years of age.




**Graph: 8 Micro- organism wise distribution of CLABSI**

**Micro-organism wise distribution:** E-Coli contribute 7 case, Klebsiella contribute 5 cases each, Burkhoideria, Candida and Morgenella contribute 1 case each and acinatobector contribute 3 cases.

## 3.6.3 SSI:

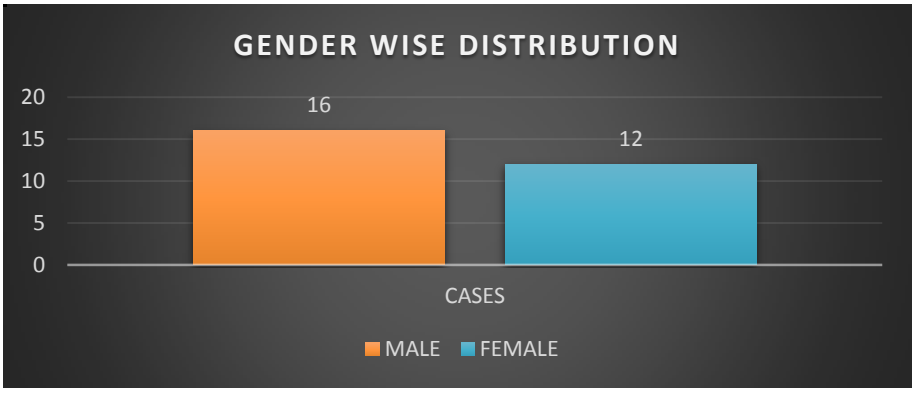



**Fig: 9 Gender wise distribution of SSI**

**Gender wise distribution:** Out of cases 16 cases were males and 12 cases were females.

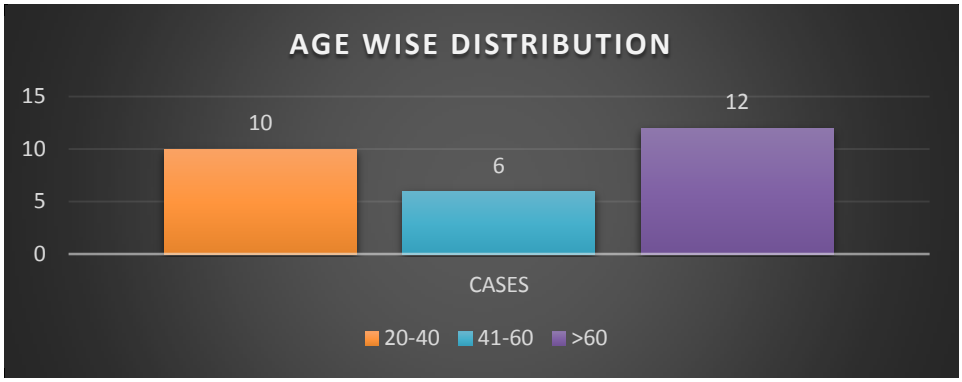



**Fig: 10 Age wise distribution of SSI**

**Age wise distribution:** 10 cases from 20-40 years, 06 cases from 41-70 years, 12 cases from more than 60 years of age.

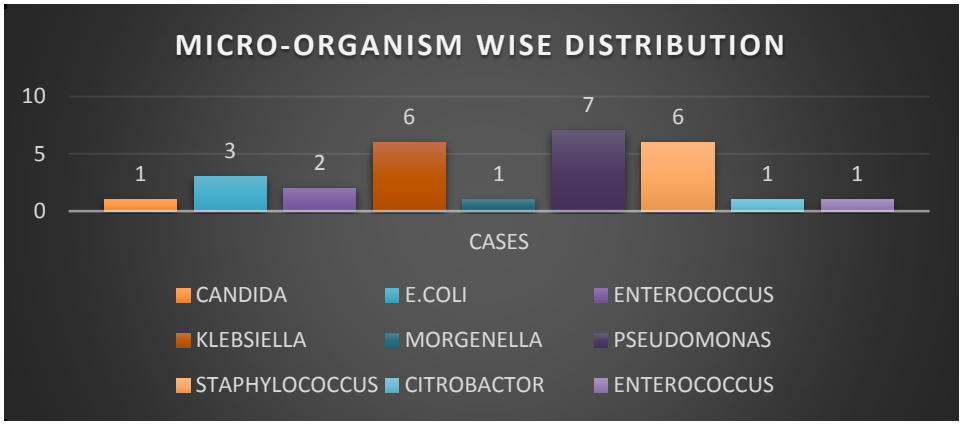



**Fig: 11 Micro-Organism wise distribution of SSI**

**Micro-Organism wise distribution :** 7 cases from Pseudomonas, 6 cases from Klebsialla, 6cases from Staphylococcus, 3 cases from E.Coli, 2 case from Enterobactor and 1 case each for Candida, Citrobactor, Morgenella and Enterococcus.

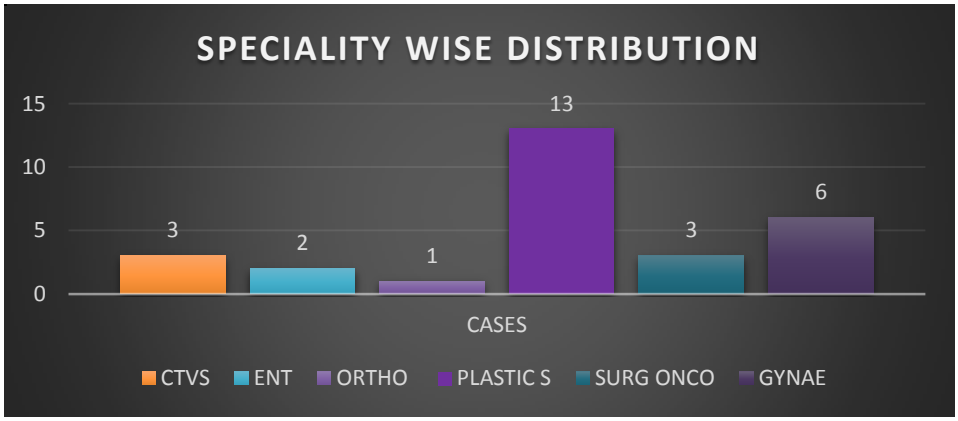



**Fig: 12 Speciality wise distribution of SSI**

**Speciality wise SSI distribution:** depict maximum 13 cases of SSI belongs to Orthopaedic department, 6 cases from gynae department, 3 cases from surgical oncology, 3 cases from CTVS, 2 cases from ENT and 1 case from Plastic surgery.

## 3.6.4 VAP:

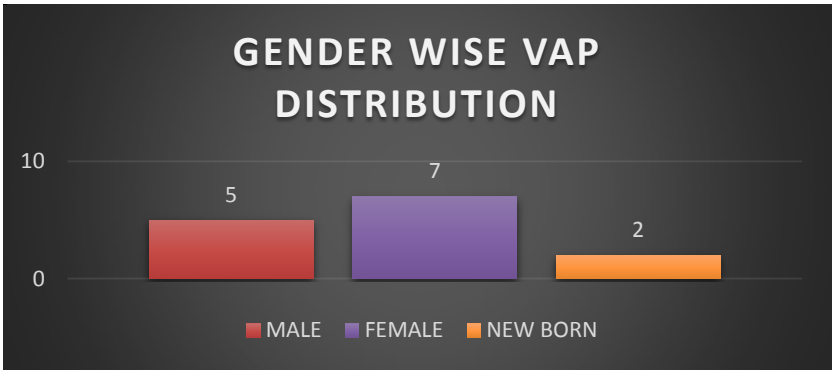



**Fig: 13 Gender wise distribution of VAP**

**Gender wise distribution**: Out of 14 cases 5 were males, 7 were females and 2 was new born baby.

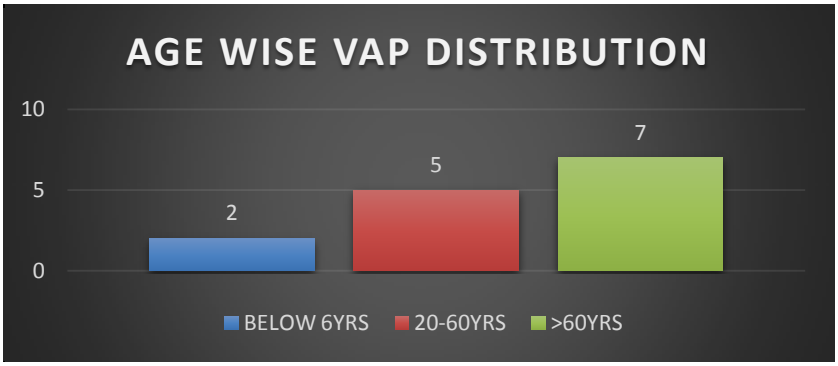



**Fig: 14 Age wise distribution of VAP**

**Age wise distribution:** 2 cases were from less than 6 month, 5 cases were from less than 60years and 7 cases from more than 60 years of age.

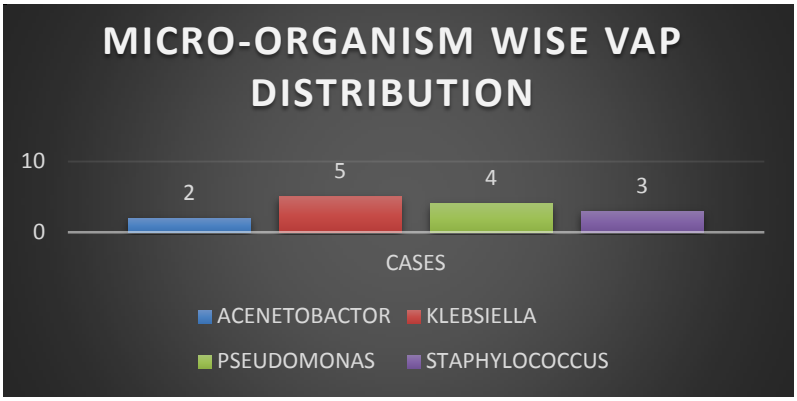



**Fig: 15 Micro-organism wise distribution of VAP**

**Micro-organism wise distribution:** 2 cases for Acinetobacter, 4 cases for Pseudomonas, 5 cases from Klebsiella and 3 case from Staphylococcus.

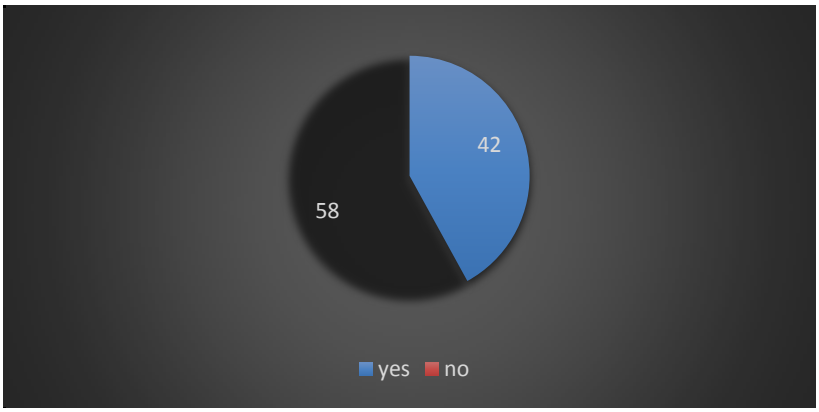



**Fig: 17 immunocompromised patient ratio**

42% of total HAI patients were immunocompromised and 58% patients were non-immunocompromised.

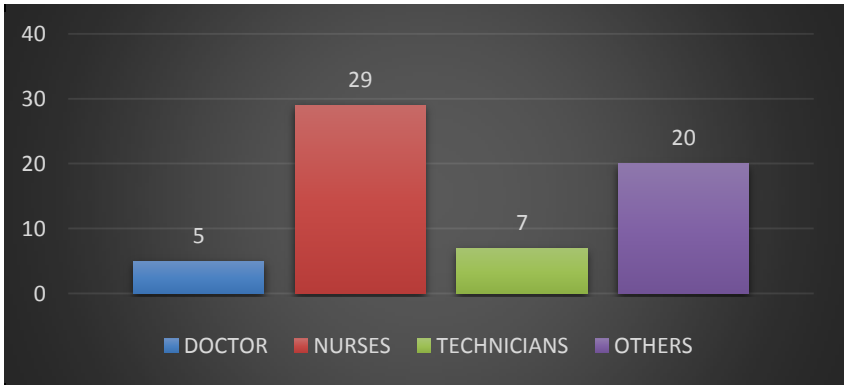



**FIG 18: NEEDLE STICK INJURY RATE**

Needle stick injury is also an important part of infection control. Annual data of NSI shows, 29 nurses, 5 doctors and 7 technicians and 20 others were suffered from NSI.

## 3.6.5: AVERAGE LENGTH OF STAY

we had four dates with us, admission date, discharge date, date of insertion of device like Foleys catheter, IV cannula and ventilator and date of culture(on date when bacterial culture was positive). In SSI case date of surgery was considered. From these dates we analysed average length of stay, Average length of stay after infection, and after how many days of surgery surgical site infection occur

| HAI | Total ALOS | Total ALOS after infection |
|---|---|---|
| CAUTI | 17.4 | 6.8 |
| CLABSI | 19.3 | 14.7 |
| VAP | 44.17 | 29.7 |
| Multiple Infection | 30.4 | 17.9 |

**Table: 2 ALOS of the patients with HAI**

In SSI, the average number of days following surgery until an infection became detectable was 15.8.

## 3.6.6: HAI Mortality rate:

There were 7 deaths out of 90 cases of HAI detected in 2022, where cause of death is either septic shock or sepsis was the contributing factor.

Number of death/ total number of HAI in a year*100

= 7/90*100= 7.77%

## 3.6.7: Economic impact of HAI:

Although it is very difficult to decide that which cost is contributed because of HAI because patients were admitted in critical condition. Still we categorized the cost on the basis that if patient is admitted only 1 day because of HAI what financial impact will be on patient.

We have taken time period after infection in which we took

- cost of antibiotic administered to the patient,
- Room rent,
- Nursing charges,
- Consultancy of doctor,
- Investigation charges and
- Some consumables.

We identified average cost incurred by patient CAUTI, CLABSI, VAP and Multiple infections.

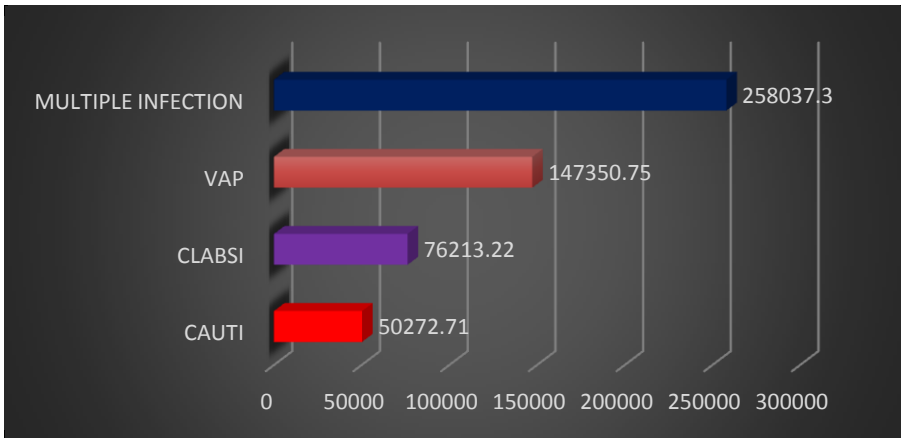



**Fig: 19 Cost of HAI (in rupees)**

As per the cost and ALOS after infection , the extra cost incurred by CAUTI was 50272.71 rupees, by CLABSI was 76,213.22 rupees, by VAP it was1,47,350.75 rupees and for multiple infection it was 2,58,037.3 rupees.

Economic impact of HAI on hospital mainly seen in TPA patients or package patients, where charges to the patients remain constant but cost to the hospital increases. The extra charges mean the patient with HAI consume more hospital resources.

To estimate the cost impact, a hospital can convert charges into cost by multiplying by an appropriate ratio of cost to the charges (RCC).

In SSI cases there is multiple visit of OPD for daily dressing after surgery and re-admission or re-exploration costs a huge amount which is really difficult to calculate. It also bear a huge opportunity cost because of multiple visit in hospital to the patient and their attendant.

## 3.7: Recommendations:

a) Sanitization should be done properly.
b) Increase education of hospital staff.
c) Spreading awareness among healthcare workers.
d) Preventing the Patients from Walking Barefoot.

## 3.8: Conclusion:

Due to the higher ALOS for the hospital and patient, the financial burden is multiplied by two to four times. Additionally, the social strain of having one attendant remain with the patient results in a theoretical loss of revenue. HAI causes functional handicap and emotional stress in the patient, both of which lower quality of life due to India's low per capita income and significant out-of-pocket expenses. HAI worsen the disparity in resources between basic and secondary healthcare by allocating limited resources to the treatment of potentially treatable conditions.

## 3.9: References:


1. *Health care-associated infections FACT SHEET | National Infectious Disease Prevention Initiative*. U.osu.edu. (2022). Retrieved 08 June 2022, from https://u.osu.edu/korzen.1/2016/09/23/health-care-associated-infections-fact-sheet/

2. *Health care-associated infections FACT SHEET | National Infectious Disease Prevention Initiative*. U.osu.edu. (2022). Retrieved 08 June 2022, from https://u.osu.edu/korzen.1/2016/09/23/health-care-associated-infections-fact-sheet/.

3. (2022). Retrieved 08 June 2022, from https://phc4.org/reports/hai/10/docs/hai2010report.pdf

4. Incidence of healthcare associated infection in the surgical ICU of a tertiary care hospital. Retrieved 08 June 2022, from **www.ncbi.nlm.nih.gov › NCBI › Literature › PubMed Central (PMC**