Section: Obstetrics and Gynecology

Original Research Article

A STUDY OF THE PATTERN OF HOSPITAL-ACQUIRED INFECTIONS IN THE DEPARTMENT OF OBSTETRICS AND GYNECOLOGY IN A TERTIARY CARE CENTRE

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Received : 07/08/2025
Received in revised form : 22/09/2025
Accepted : 10/10/2025

Keywords:
HAI (Healthcare-associated infections), SSI (Surgical site infection), CAUTI (catheter-associated urinary tract infection), CLABSI (Central line-associated bloodstream infection), VAP (Ventilator-associated pneumonia).

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DOI: 10.47009/jamp.2025.7.5.223

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (5); 1177-1182

ABSTRACT

Background: Hospital-acquired Infections or Healthcare-associated infections(HAIs) are infections that occur in a patient while receiving healthcare in a hospital or other healthcare setting. The burden of HAI significantly affects the cost of medical treatment. Haphazard antibiotic use for the treatment of these infections would lead to the development of resistance among the microbes, and factors that complicate microbial eradication further worsen the scenario. Healthcare-associated infections (HAIs) are a major source of morbidity and mortality. This study aims to look into HAIs in OBG patients and to identify risk factors for the acquisition of HAIs and their morbidity and mortality. **Materials and Methods:** This study analyzes HAI patterns in the 426 patients who acquired HAI during hospitalization in the OBG department over a period of 1 year in a tertiary care centre at the Department of Obstetrics and Gynaecology, Thanjavur Medical College, Tamilnadu. Patient characterization, risk factors, surgical procedures, and infection outcomes are evaluated to identify risk factors and trends. **Result:** The study revealed an incidence rate of HAIs of 2.1% among the hospitalizations during the study period, with SSI being predominant. Age, Obesity, Diabetes, and emergency procedures were identified as significant risk factors for the development of HAI. **Conclusion:** Simple infection-control measures such as proper method of handwash, cleaning hands with an alcohol-based hand rub, proper use of PPE, proper methods of disinfection and sterilization of equipment and environment, and rational antibiotics usage as per policy can help prevent HAI and save lives, reduce morbidity, and minimize health care costs.

INTRODUCTION

Healthcare-associated infections (HAIs), also referred to as nosocomial or hospital-acquired infections, occur in a patient during the process of care in a hospital or other healthcare facility and were not present or incubating at the time of admission (Mohfw-2020). HAI are one of the most common adverse events in healthcare delivery and a major public health problem with an impact on morbidity, mortality, and quality of life. At any one time, up to 7 % of patients in developed countries, and 10% in developing countries, will acquire at least one HAI. However, a large percentage are preventable through effective infection prevention and control measures (IPC). Hand hygiene is the simplest, cost-effective intervention for preventing the spread of infections, not only in healthcare facilities but also in the community.[1] Healthcare facilities are high-risk environments for the development and spread of drug resistance and frequently have the highest burden of multidrug-resistant organisms (MDRO). Increasing trends of antimicrobial resistance (AMR) are a major concern. Inappropriate antibiotic use is a major driver of AMR.[2-5]

The majority of HAIs manifest after 48 hours of admission. Among surgical patients in Obstetrics and Gynecology, urinary tract infections and SSI are the most common healthcare-associated infections. Hospital-acquired infections are caused by viral, bacterial, and fungal pathogens causing bloodstream infection associated with central line catheter (CLABSI)or venflon site infection, Pneumonia (eg, ventilator-associated pneumonia), urinary tract infection (CAUTI), and surgical site infection (SSI).

ISSN (O): 2687-5365; ISSN (P): 2753-6556

HAI prevention Care bundles have shown a significant impact on the prevention of HAI.

MATERIALS AND METHODS

The present study was a retrospective observational study of the HAI observed over a period of one year, from November 2023 to October 2024. Inclusion criteria were those admitted in the hospital for more than 48 hours and those who developed symptoms and signs of infection, which fall into categories of HAI like CLABSI, peripheral IV line site infection characterized by redness, fever, pus discharge at the site of cannula insertion, CAUTI, VAP, and patients presenting with features of SSI up to 30 days after surgery. Those presented with signs of infection on admission and those who were handled in other hospitals were excluded. A total of 426 patients had HAIs during the study period 80% of the patients were obstetric patients and 20 % were non-obstetric patients presenting with gynaecological problems.

The aim and objective of this study

1. Is to determine the contribution of healthcare-associated infections to infectious morbidity in obstetrics and gynecology.
2. To determine the factors resulting in healthcare-associated infection in the study population.

Table 1: Distribution

Distribution	Total Cases		HAIs	
	N	%	n	%
Gynecology	2013	10%	86	20%
Obstetrics	18111	90 %	340	80 %
Total	20124		426	

Table 2: Age

Age	N	%
<20 years	46	10.8%
21-25 years	124	29.11%
26-30 years	109	25.59%
31-35 years	46	10.8%
36-40 years	35	8.21%
>40 years	66	15.5%

Table 3: BMI

BMI	N	%
<18.5	26	6.1%
18.5-24.9	180	42.25%
25-29.9	104	24.413%
≥30	50	11.74%
Total	426	

Table 4: Comorbidities

Comorbidities	N	%
Anemia	237	55.63%
Diabetes	106	24.89%
Hypertension	14	3.3%
Obesity	50	11.74%
Heart disease	6	1.41%
Bronchial Asthma	3	0.71%
No morbidities	10	2.35%

Table 5: Duration of Hospital Stay

Duration	N	%
<10 days	26	6.1%
10-15 days	186	43.7%
15-20 days	178	41.8%
>20 days	36	8.45%

Table 6: HAI

HAI	N	%
SSI	280	65.72%
CLABSI/ venflon site infection	60	14.08%
CAUTI	86	20.19%
VAP	-	-

Table 7: Common isolates from the bloodstream

Organisms	n	%
E.coli	8	13.3%
Klebsiella Pneumonia	15	25%

ISSN (O): 2687-5365; ISSN (P): 2753-6556

MRSA	13	21.67%
Pseudomonas Aeruginosa	9	15%
MSSA	1	0.5%
Enterococcus	3	1.7%
Acinetobacter	11	17.3%
Total	60	

Table 8: Antibiogram (Organism isolated from blood culture and their sensitivity pattern)

Organisms	Sensitivity	Resistant
E.coli	Meropenam>Piperacillin>Amikacin>Gentamycin> Cipro> Ceftriaxone	Ampicillin Cefotaxim
Klebsiella	Meropenam>Piperacillin>Amikacin>Gentamycin >Cipro > ceftriaxone	Ampicillin Cefotaxim
MRSA	Linezolid>Vancomycin>Amikacin	Ampicillin Cefotaxim
Pseudomonas	Meropenam>Piperacillin>Amikacin	Ampicillin Cefotaxim
Acinetobacter	Meropenam>Piperacillin>Gentamycin	Ampicillin Cefotaxim
Enterococcus	Meropenam > Piperacillin > Gentamycin> Cipro	Ampicillin Cefotaxim

Table 9: Organisms isolated from urine.

Organisms	N	%
E.coli	41	47.7%
Klebsiella	21	24.42%
Pseudomonas	7	8.1%
MRSA	1	1.2%
MSSA	1	1.2%
Enterococcus	3	3.5%
Acinetobacter	7	8.14%
Proteins	1	1.2%
Citrobacter	1	1.2%
Candida	3	3.5%
Total	86	

Table 10: Organism isolated from urine culture and their sensitivity pattern

	Sensitivity	Resistant
E.coli	Meropenam>Piperacillin>Nitrofurantoin>Amikacin	Ampicillin Taxim
Klebsiella	Piperacillin> Norflox>Amikacin>Gentamycin	Ampicillin Taxim
Pseudomonas	Meropenam>Piperacillin>Amikacin> Norflox	Ampicillin Taxim
Acinetobacter	Meropenam>Piperacillin>Amikacin>Gentamycin	Ampicillin Taxim
Enterococcus	Vancomycin> Colistin> Cipro>Nitrofurantoin	Ampicillin Taxim
MRSA	Linezolid>Doxycyclin >Nitrofurantoin	Ampicillin Taxim

Table 11: Organisms isolated from pus.

Organisms	N	%
E.coli	56	24%
MRSA	57	24%
Pseudomonas aeruginosa	51	22%
Acinetobacter	52	22%
Klebsiella	28	12%
MSSA	23	10%
Proteus	13	6%
Total	280	

Table 12: Organism isolated from pus and its sensitivity pattern

Organisms	Sensitivity	Resistant
E.coli	Piperacillin >Amikacin>Gentamycin	Ampicillin Taxim
MRSA	Linezolid>Vancomycin> Doxycyclin	Ampicillin Taxim
Pseudomonas aeruginosa	Meropenam>Piperacillin>Amikacin	Ampicillin Taxim
Acinetobacter	Piperacillin>Amikacin> Doxycyclin	Ampicillin Taxim
Klebsiella	Piperacillin>Amikacin>Gentamycin>Doxycyclin	Ampicillin Taxim

Table 13: Surgical procedure

Surgical procedure	N	%
Emergency Primary LSCS	106	24.9%
Repeat Emergency LSCS	196	46.1%
C. Hysterectomy	10	2.35%
Elective Primary LSCS	36	8.5%
Elective Repeat LSCS	58	13.62%
Post myomectomy	4	0.9%
Post TAH	16	3.8%
Total	426	

ISSN (O): 2687-5365; ISSN (P): 2753-6556

RESULTS

The total number of patients who stayed >48 hours in this study period were 20124. In this study period, hospital-acquired infections were 426. Incidence of HAI was 2.1%.

Out of 426 patients, 10.8% (46) were in the age group <20 years, 29.11% (124) were in the age group of 21-25 years, 25.59% (109) were in the age group 26-30 years, and 23.7 % (101) were in the age group >35 years.

In our study, out of 426 patients, obesity (BMI ≥30) was identified in 11.74% of patients, and 6.1% had a BMI ≤18.5. Out of 426 patients, 24.41% (104) were overweight.

Patients with anemia showed an increased incidence of healthcare-associated infections, probably because of the increasing prevalence of anemia compared to other risk factors and associated immunosuppression. Comorbidities such as anemia (55.63%), diabetes (24.89%), obesity (11.74%), and hypertension (3.3%) were associated with HAI in decreasing order.

Regarding the duration of hospital stay, 41.8% (178) of patients with HAIs stayed for more than 15 days, 43.7% (178) of patients with HAIs stayed up to 15 days, and 8.45% (36) of patients stayed for more than 20 days.

Out of 426 patients with HAI, SSI were reported in 65.72% (280) of the patients. 14.08% (60) contributed by CLABSI or venflon site infection, and CAUTI accounts for 20.19% (86) of the patients.

The surgical site infections were more common after emergency Surgeries (63.1%) compared to elective surgeries (25.2%). 46.1% was contributed by emergency repeat cesarean section compared to primary C-section, probably due to prolonged duration of surgery and more tissue handling in the presence of adhesions.

In those with CAUTI, out of 86 patients, the most common isolates were E.coli (47.7%), followed by Klebsiella (24.42%), Pseudomonas (8.1%), and Acinetobacter (8.14%), and all these isolates were resistant to Ampicillin and Cefotaxim and are most susceptible to Piperacillin and Meropenem, which is worrisome.

Out of 426 patients with healthcare-associated infections, surgical site infections account for about 280 patients (65.72%). The most common isolates were MRSA (20.4%), followed by E.Coli (20%), Acinetobacter (18.57%), Pseudomonas (18.21%), and Klebsiella (10%). All were resistant to Ampicillin and Cefotaxime. MRSA were sensitive to Linezolid. E.coli, Acinetobacter, and Klebsiella were most sensitive to piperacillin, and Pseudomonas were sensitive to Meropenem.

In those with CLABSI or venflon site infection, out of 60 patients, Klebsiella pneumonia was isolated in 25% (15) of patients, followed by MRSA in 21.67% (13), and Acinetobacter in 17.3% patients. E.coli was reported in 13.3% (8) of patients, and Pseudomonas in 15% (9) of patients. All organisms were most susceptible to Meropenem.

DISCUSSION

Healthcare-associated infections are one of the most important public health problems. In this study, a total of 20,124 patients were admitted to Obstetrics and Gynecology wards, and they stayed in the hospital for a minimum of 48 hours from November 2023 to October 2024.

The incidence of HAIs in our study was 2.1 %. In a study conducted by Dr. Nupur Anand et al.,2024, the incidence rate of HAIs was 3.7/100 patients. In another study conducted by A Despotovic et.al., 2020, the incidence rate was 32.7% but in that study, the total number of patients admitted and discharged was 355, and HAIs were reported in 116 patients. It was found that in most of countries, 5-10% of patients in hospitals at any time have acquired an infection5 (Nupur et al,2024)

According to our study, the incidence of healthcare-associated infections varied by age groups, with an incidence of 29.11 % in the age group of 21-25 years, followed by 25.59% in the age group 26-30 years. The study conducted by Dr. Nupur Anand et al.,2024, showed that the maximum incidence of 33 % occurs in the age group, more than 70 years. But in our study, which includes young pregnant women and the reproductive age group population in the majority, most of them were in the age group between 20-30 years, and hence the incidence is more in this age group, and moreover, pregnancy itself is an immunocompromised state. In another study by Kulkarni et al.,2023, a higher proportion of 65.1% in the 18-40 years and a lower proportion of 34.9% for age groups 41-60 years.

In our study, 42.25% of patients had normal BMI, and 36.1% of patients had BMI ≥25 (both overweight and obese), whereas in a study by Kulkarni et al.,2023, the higher proportion of 82.7% had BMI 25-30 kg/m2, and 17.3% had BMI 18-24.9 kg/m2. In another study by Dr.Nupur Anand et al.,2024, the incidence of HAIs was a maximum of about 6.2/100 patients in those with BMI >30 kg/m2.

In our study, associated comorbidities include 55.63% patients who had anemia which was treated during pregnancy, followed by 24.89% had diabetes, and 11.74% had obesity, which was in accordance with the study by Dr. Nupur Anand et al., 2024. In studies by the National Institute of Nutrition, Hyderabad, the proportion of T and B lymphocytes showed a tendency to fall in anemic women, which was significant when hemoglobin levels were less than 8 gm/dl. In another study by Kulkarni et al. (2023, wound infections were higher in patients operated on with hemoglobin of less than 11 gm/dl. In another study by Malone et al.,2001, demonstrated that anemia, both preoperatively and postoperatively, was associated with increased risk of wound infection.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

In our study, 43.7% of patients stayed in hospital for up to 15 days, and 8.45% patients stayed in hospital for more than 20 days. Increased duration of hospital stay increases the incidence of HAI and the duration of hospital stay was increased if the patient had HAI, which increases the cost of the patient's care.

In this study, we found that surgical site infections were the most common HAI in obstetrics and gynecology ward (65.72%) followed by catheter-associated urinary tract infection (20.19%) followed by iv line site infection(14.08%). But in a study conducted by Dr. Nupur Anand et al, 2024. Catheter-associated UTIs were more common than surgical site infections. The overall incidence of SSI in the present study was 1.4% which is less than the study conducted by Kulkarani et al., 2023. (9.2%), and less than the study conducted by Amrita R Bhaduria et al., (6.12%) and by Umare Mangesh et al., 2021 (2.69%). The microbial profile of those with SSI was E.coli (20%), MRSA (20.4%), Pseudomonas aeruginosa (18.21%), and Acinetobacter (18.57%). In a study conducted by Kulkarani et al.,2023, E.coli was the most frequently isolated organism (30.5%). But in our study, MRSA accounts for 20.4% followed by E.coli (20%). MRSA is resistant to several antibiotics. In order to reduce the risk of MRSA infections, the following preventive measures, like hand washing/ hand sanitizer, should be used. 5 moments of hand hygiene, proper PPE should be followed, and proper isolation of infected cases to prevent cross-infection. A similar study was conducted by Payal et al.,2019. in which Staphylococcus Aureus (17.39%) was the predominant bacterium isolated.

In our study, all these Gram-positive cocci were sensitive to linezolid and vancomycin, and all Gram-negative bacteria were susceptible to Imipenems, which was in accordance with a study conducted by Payal et al., 2019.

In our study, Acinetobacter was grown in 18.57% of cases with SSI. Acinetobacter, being a multidrug-resistant and invasive pathogen, is one of the major causes of nosocomial infection, and it is associated with high mortality.[1]

Acinetobacter can live on the skin and may survive in the environment for several days, which makes Acinetobacter prevention a delicate issue.7 Hand hygiene and PPE are the most fundamental, effective, and cost-effective strategies for reducing cross-infection and avoiding the spread of resistant bacteria.[2]

In our study, catheter-associated UTI accounts for 20.19% of HAIs. The organisms isolated were E.coli (47.7%), followed by Klebsiella (24.42%), Acinetobacter (8.14%), and Pseudomonas (8.1%). This is in contrast to the study conducted by A. Despotovic et al.,2020. where more than a third of HAI were due to UTI. The Gram-negative bacteria were sensitive to Imipenems, and all were resistant to Cefotaxim and Ampicillins.

In our study, IV line site infection accounts for 0.2% which is in accordance with the study conducted by Dr. Nupur Anand et al., 2024. The organisms most commonly isolated from the bloodstream were Klebsiella pneumoniae (25%), followed by MRSA (21.67%), Acinetobacter (17.3%), and Pseudomonas aeruginosa (15.1%).

In our study, emergency procedures account for about 73.35% of HAIs. This shows a relatively higher proportion of infections in emergency procedures when compared to elective procedures. This finding was similar to a study conducted by Dr Nupur Anand et al. (2024 and A. Despotovic et al. (2020).

As effective therapeutic approaches for HAIs continue to shrink in number, the use of colistin will increase, but may invariably lead to higher resistance rates. For this reason, it is imperative to reserve colistin until antimicrobial susceptibility pattern mandates its use.[6,7]

Given that practically all invasive devices have been associated with an increased risk of HAI acquisition, SOPs about the use and disinfection, and sterilization of invasive devices in general must be revised and strictly followed.

CONCLUSION

Some risk factors for HAI are modifiable, and best practices should be established and followed to reduce those risks. Haphazard use of empirical antibiotics for the treatment of infections has led to the development of resistance among the microbes, and factors that complicate microbial eradication further worsen the scenario. Organised infection control measures, trained hospital staff, continuous surveillance of HAI in healthcare settings, regular revision of hospital antibiotic policy, and rational antibiotics use will help to reduce nosocomial infections. Although the ability to effectively recognise and deal with HAI in a patient might determine her survival after acquiring a nosocomial infection, prevention remains the best option at all times.

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