Section: Microbiology

Original Research Article

A HOSPITAL BASED PROSPECTIVE STUDY TO DETERMINE THE CONTRIBUTION OF HEALTH CARE ASSOCIATED INFECTIONS TO INFECTIOUS MORBIDITY IN OBSTETRICS & GYNECOLOGY IN PATIENTS AT NEWLY ESTABLISHED TERTIARY CARE CENTER

Arvind Kishor Chandora[1], Rajiv Jain[2], Moti Lal Khatri[3]

[1]Professor, Department of Microbiology, Government Medical College & Attached Group of District Hospital, Barmer, Rajasthan, India.
[2]Junior Specialist, Department of Obstetrics & Gynecology, Government Medical College & Attached Group of District Hospital, Barmer, Rajasthan, India.
[3]Associate Professor, Department of Microbiology, Government Medical College & Attached Group of District Hospital, Barmer, Rajasthan, India.

Received *: 15/05/2025*
Received in revised form *: 04/06/2025*
Accepted *: 20/06/2025*

Corresponding Author:
Dr. Moti Lal Khatri,
Associate Professor, Department of Microbiology, Government Medical College & Attached Group of District Hospital, Barmer, Rajasthan, India.
Email: drmotilalkhatri@gmail.com

DOI: 10.70034/ijmedph.2025.3.349

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

Int J Med Pub Health
2025; 15 (3); 1895-1900

ABSTRACT

Background: Health care associated infections are among the major causes of death and increased morbidity among hospitalized patients. Rates of Health care associated infections vary by surgical subspecialty, low in ophthalmology and high in general surgery. The aim of this study to determine the contribution of health care associated infections to infectious morbidity in obstetrics & gynecology in patients at newly established tertiary care center.

Materials & Methods: This is a hospital based observational study in the setting of a tertiary care service hospital during one-year period. This study has been conceptualized to study the contribution of health care associated infections to infectious morbidity in obstetrics and gynaecology in-patients, to determine the various factors contributing to the same and to determine complications/interventions required in patients with health care associated infections.

Results: Out of total 1000 patients, 400 patients were in gynecology group and 600 patients in obstetric group. Out of 1000 patients HAI was found in 40 patients i.e. 4 patients in per 100 patients included in the study. The incidence of CAUTI, SSI and CRBSI was found to be 7.88, 4.97 and 0.13 per 100 patients developing Health Care associated infections. HAI was found in all the sub groups however a significant correlation (p value<0.001*) was found between a high BMI/ obesity and development of HAI. The occurrence of HAI was relatively higher in the group with anemia but was not statistically significant (p value 0.8). A relatively higher proportion of HAI was seen in procedures carried out as an emergency however it was statistically not significant with a p value of 0.6.

Conclusion: The surgical interventions following any Health Care associated infections result in additional morbidity, prolonged hospital stay. Health Care associated infections also effect readmissions in patients owing to the development of infections. There were two pregnancy losses owing to health care associated infection developing in patients following amniocentesis. The obstetric procedures need to be carried out with utmost sterility precautions.

Keywords: Health care associated infections, CAUTI, SSI, CRBSI, BMI.

INTRODUCTION

Health care associated infection (HAI) is an infection occurring in a patient in a hospital or other health care facility in whom the infection was not present or incubating at the time of admission and was acquired by the patient during admission for a reason other than that infection. These infections impose a burden on the primary, secondary, tertiary health care sectors, the patient themselves and those who care for them.

Infection in obstetrics accounts for the second most common cause of maternal mortality next to post partum haemorrhage. Among surgical patients in obstetrics and gynaecology, urinary tract infections and surgical site infections are the most common health care associated infections.

Morbidity and mortality due to hospitalization have been long known but the documentation and data for the same have been relatively of recent origin.[1] One of the earliest records of hospital infections are perhaps those found in an Egyptian papyrus written around 3000 B.C. Antisepsis developed into asepsis and the introduction of antibiotics (sulfonamides in 1935 and penicillin in 1945) brought a wave of premature optimism that, diseases, especially those acquired in hospital could be readily treated. In the 1950s penicillin-resistant staphylococcal epidemics began to plague the hospitals in the USA and Europe and the interest in infection surveillance and control was renewed.[2]

During the last decade there has been an increasing focus worldwide in these issues and the World Health Organization (WHO) has recently (2005), started a campaign addressing this problem "Clean Care is Safer Care": the first Global Challenge of the WHO World Alliance for Patient Safety led by amongst others Prof. D. Pittet and MD L. Donaldson from Geneva.[3,4]

The prevalence of health care-associated infection varies between 5.7% and 19.1% in low and middle income countries. Average prevalence is significantly higher in high- than in low-quality studies (15.5% vs 8.5%, respectively). The proportion of patients with ICU-acquired infection ranged from 4.4% to 88.9% with a frequency of overall infections as high as 42.7 episodes per 1000 patient- days.

HAIs are considered an undesirable outcome, and as some are preventable, they are considered an indicator of the quality of patient care, an adverse event, and a patient safety issue. The health care associated infection rate in patients in a facility is an indicator of quality and safety of care. Infection control and hospital epidemiology has now taken on a global dimension, with the growing global concern over health care associated infections and the emergence of antibiotic resistance.

Health care associated infections are among the major causes of death and increased morbidity among hospitalized patients. HAIs inflict unnecessary suffering on the patients, as well as increased costs on society, mainly due to the extended hospital stay required by patients with HAIs. The increased length of stay varies from 3.3 days for gynecological procedures to 21 days for orthopedic procedures.[5] Other costs include additional drugs, isolation, and revision surgeries.

Control/ prevention of HAIs require clear infection control policies and guidelines with strict adherence to evidence-based protocols and procedures. Observational studies confirm that evidence-based approaches can reduce infections. [5]

Care bundles, in general, are groupings of best practices with respect to a disease process that individually improves care, but when applied together, results in substantially greater improvement. Such bundles have been applied for VAP, CRBSIs, CAUTIs and SSIs.

Several factors related to the hospital environment contribute to an increased propensity for HAIs and the transmission of antimicrobial resistant pathogens, including the physical plant design, engineering controls (generally defined as sink placement, design of space to facilitate good hygiene practices, ease of hand washing and ability to maintain general environmental hygiene, ventilation, air conditioning, air filtration), use of aseptic techniques and other infection control practices and relationship between various departments.

Health care associated infections rates vary substantially by body site, by type of hospital and by the infection control capabilities of the institution.[6] The proportion of infections at each site is also considerably different in each of the major hospital services and by level of patient risk. This is exemplified by surgical site infections (SSIs) which are most common in general survey, whereas urinary tract infections and blood stream infections are most frequent in medical services and nurseries. Rates of Health care associated infections vary by surgical subspecialty, low in ophthalmology and high in general surgery. The differences are largely due to variations in exposure to high-risk devices or procedures.[7]

Urinary tract infections (UTIs) account for ~40% of all Health care associated infections[8] and ~18%–25% of all Health care associated bacteremia.[9] Most UTIs (80%) are associated with indwelling urinary catheters while others are caused by genito-urinary procedures. Numerous studies have shown that Healthcare associated UTIs are usually asymptomatic and are exceedingly difficult to eradicate as long as the catheter remains in place. Catheter-associated UTIs (CAUTIs) are considered to be complicated infections, because normal host defence mechanisms are compromised by the presence of a foreign body.[10]

Most infections presenting in hospital in-patients are caused by endogenous bacteria. Specific bacteria are found in specific parts of the body and the exposed anatomic areas during hospital stay or surgical

procedure are usually the source of microorganisms that cause infection. It is helpful to know the normal microbial flora of the body, since this helps direct prophylactic antibiotics, start intelligent empiric therapy, and suspect the origin of an unknown source of infection in patients with positive blood culture. It is also helpful to be familiar with the different classification of bacteria since it can take up to 72 hours for a final culture to give the result as a specific bacteria; however, Gram stain and biochemical tests can help in providing earlier guidance regarding which group of bacteria may be responsible for an infection. The aim of this study to determine the contribution of health care associated infections to infectious morbidity in obstetrics & gynecology in patients at newly established tertiary care center.

MATERIALS AND METHODS

This is a hospital based observational study in the setting of a tertiary care service hospital during one-year period. This study has been conceptualized to study the contribution of health care associated infections to infectious morbidity in obstetrics and gynaecology in-patients, to determine the various factors contributing to the same and to determine complications/interventions required in patients with health care associated infections.

Inclusion Criteria

- Catheter associated urinary tract infection
- Puerperal pyrexia
- Infectious complications associated with medical termination of pregnancy
- Surgical site infection
- Postoperative infections
- Puerperal sepsis
- Infectious complications associated with intrauterine contraceptive devices

Exclusion Criteria:

- Community acquired infections
- Pre-existing infections prior to hospitalization/obstetrics and gynaecologic interventions.

Methods of Determination:

The study was an observational study, every patient's records was documented and maintained as per the proforma, and the data was compiled for analysis. Conclusion was drawn based on the observations made during the study period.

Pre-operative Preparations

a) All patients taken up for elective surgery were pre-operatively evaluated for the disease needing surgery and co-morbidities.

b) Review by the concerned specialist for optimisation of the co-morbid condition was done with multi-speciality approach.

c) Pre-anaesthetic check-up and clearance was obtained from anaesthesiologist before appointment for surgery.

d) A blood demand of two units was confirmed before surgery.

e) Part Preparation was done by clipping the hair at the operation site.

f) Scrub bath on the day of surgery.

g) Prophylactic antibiotic was given half an hour prior to surgery as per the antibiotic policy.

h) Thrombo-prophylaxis is considered for patient

Post operative care

a) Hydration & adequate analgesia was ensured.

b) Continuation of antibiotics was individualised.

c) In patients with febrile morbidity, sepsis screening tests were sent to actively search for focus of infection. Sepsis screening includes haematological & biochemical parameters, peripheral blood smear for toxic granules or malarial parasite, high vaginal swab, blood & urine for culture sensitivity. Any patient confirmed to have a pre existing or community acquired infection was excluded from the study.

Statistical analysis: Data was analyzed using Statistical Package for the Social Sciences (SPSS) version 21.0. Descriptive statistics were used to describe categorical variables (frequency and percentages). Comparison of quantitative between the groups was done using chi-square test.

RESULTS

The patients were divided into gynecology and obstetric group and the obstetric group had a subgroup of those patients who had undergone obstetric procedures such as extra amniotic saline infusion and amniocentesis. Out of total 1000 patients, 400 patients were in gynecology group and 600 patients in obstetric group. Of the 600 patients in obstetric group, 20 patients were in the obstetric procedure group. Out of 1000 patients HAI was found in 40 patients i.e. 4 patients in per 100 patients included in the study. The CDC criteria's were used to classify an infection as Health
care associated. The incidence of HAI was found to be almost similar in both obstetrics and gynecology group.

A total of 203 patients underwent catheterization. CDC criteria were implemented for diagnosing Catheter Associated Urinary Tract Infection. 16 patients out of 203 patients developed CAUTI. The incidence being 7.88 patients per 100 patients catheterized. Every patient underwent urine analysis on admission. A urine report negative for presence of pus cells was considered as an asymptomatic patient. Patients having pre-existing urinary tract infection were excluded.

A total of 402 obstetrical and gynaecological surgeries were considered in which there could be a surgical site infection. 20 out 402 surgeries developed surgical site infection, the incidence rate being 4.97 per 100 patients undergoing surgery. HAI was found in all the subgroups however a significant correlation (p value<0.001*) was found between a high BMI/ obesity and development of HAI. The occurrence of HAI was relatively higher in the group with anemia

but was not statistically significant (p value 0.8). A relatively higher proportion of HAI was seen in procedures carried out as an emergency however it was statistically not significant with a p value of 0.6.

Table 1: Comparison of risk factors in between groups

VARIABLES	No HAI (N=960)	HAI (N=40)	Total no. of patients	P-value
BMI				
<19.9 Kg/m^2	38	0	38	<0.001*
20.0-24.9 Kg/m^2	350	7	357	
25.0-29.9 Kg/m^2	423	13	436	
>30.0 Kg/m^2	149	20	169	
HAEMOGLOBIN (gm/dl)				
<11 g/dl	392	19	411	>0.05
>11 g/dl	568	21	589	
TYPE OF SURGERY				
Elective	212	13	225	>0.05
Emergency	748	27	775	

DISCUSSION

The incidence of Health Care Associated infections in Obstetrics & gynaecology group was found to be 4 per 100 patients. The incidence of CAUTI, SSI and CRBSI was found to be 7.88, 4.97 and 0.13 per 100 patients developing Health Care associated infections.

Urinary tract infections (UTIs) account for ~40% of all Health care associated infections[8] and ~18%–25% of all Health care associated bacteremia.[9]

Hospital acquired surgical site infection (SSI) is one of the major health problems throughout the world. It represents 14-16 % of the Health care associated infections and are the second most common hospital acquired infections and has been associated with increased morbidity and economic impact.[11] Surgical site infection is the leading infection in the general patient population in countries with limited resources, affecting up to two third of operated patients and with a frequency up to nine times higher than in developed countries. In Nigeria, Health care associated infections rate of 2.7 % was reported from Ife[12], while 3.8 %[13] from Lagos and 4.2 % from Ilorin.[14]

Lower respiratory infection (LRI) or pneumonia represents 13 % of Health care associated infections.[15] This is the most dangerous of all Health care associated infections with a case fatality rate of 30 %. Healthcare associated blood stream infections (BSIs) represent 14% of healthcare associated infections.[15] Healthcare associated bacteraemia can be classified as primary or secondary. Primary Healthcare associated bacteraemia occurs without any infection in other sites. Secondary bacteraemia is the presence of infection in a site such as urinary tract, surgical wound or lower respiratory tract which can lead to a blood stream infection with the same organism. Mortality from Healthcare associated bacteraemia is greater than primary bacteraemia and is greater if it is community – acquired.

One patient out of 741 patients developed CRBSI; the incidence being 0.13 per 100 patients who were underwent an intravenous access. The catheter related blood stream infections specially the peripheral catheters are considered only when septicaemia is present while if they are associated with only phlebitis, they are excluded. The CRBSI included in this study showed bacteremia and hence were included under the same.

It was found that in most countries 5-10% of patients in hospitals at any time have acquired an infection. The National Prevalence Survey in the U.K. and Ireland showed a prevalence of hospital-acquired infection of 9% (range: 2-29 %).[16] The relatively lower rate of Health Care associated infections may be attributed to the high standards of the protocols followed in this hospital regarding patient care and patient safety and to their strict regulation and supervision and also to the availability of resources being a tertiary care hospital.

In a prospective study of 8474 patients, Mead et al[17] demonstrated an increased clean wound infection rate in patients less than 1 year old (2.7%) or greater than 50 years old (2.8%), versus those 1 to 50 years old (0.7%). Even in clean contaminated procedures, age has been associated with an increased infection rate, as in the 1988 study by Claesson and Holmlund[18] in a relatively homogeneous population of patients undergoing elective colorectal procedures. This association
remained valid even after multivariate analysis. Not all studies, however, have corroborated this finding.[19-22] Gil-Egea et al[20] studied 4468 clean wounds and found an infection rate of 3.4% in patients less than 65 years old and 2.7% in those 65 or older. Haley et al,[21] using stepwise multiple logistic regressions, did not find age to be an independent predictor of wound infection in 58,498 patients.

In 2009 a study looked at data from 4,107 caesarean operations from 14 acute hospitals across England. It was found that that younger woman (those under 20, compared to those 25-30) were 1.9 times more likely to develop an infection.[23] Age, obviously, is an immutable patient characteristic and, even if it is a risk factor for wound infection, it appears to be at most a modest one.

The incidence of health care associated infections was found to be nil, 1.96, 2.98 and 11.83 per 100 patients in that group, respectively. The p value being

<0.001 which is statistically significant and hence making obesity an independent risk factor for development of health care associated infection in a patient. Nima Khavanin, BS et al studied complications occurrence in 9917 patients .and found out that obese patients experienced significantly higher rates of morbidity compared with overweight and non-obese patients (13.2%, 9.7%, and 9.0%, respectively; P < .001). Adjusted odds ratios (ORs) found both overweight and obese patients to be at a significantly higher risk of surgical complications (OR, 1.6 and 3.0, respectively) and wound infections (OR, 1.7 and 3.0, respectively). Overweight patients were also at higher risk for DVTs (OR, 4.6) and obese patients for overall morbidity (OR, 1.4) and wound disruption (OR, 3.6).[24]

This study showed that incidence of health care associated infection in patients was relatively higher in patients with anemia (defined as Hb < 11g per dl), the p value being 0.094. In Studies undertaken by the National Institute of Nutrition, Hyderabad, showed that proportion of T and B lymphocytes showed a tendency to fall in anemic women which was significant when hemoglobin levels were less than 8 g/dl. This alteration in immune status of anemic pregnant women causes increased risk of infections and consequent increased morbidity especially urinary tract infection.[25,26]

This denotes a relative higher proportion of infections in emergency procedures when compared to elective procedures. The infection rate however was not found to be statistically significant (p value of 0.16) in our study. Of the 4465 wounds studied by Gil-Egea et al[20] 34,623 were made under emergent situations, and the wound infection rate for these was 5.1%, versus the 3842 elective wounds with an infection rate of 2.9%. This appreciable difference may be a cause effect of the strict protocols followed at this tertiary care centre. As reported by a Swiss university hospital study, there was 16% of surgical site infection in emergency surgery.[1] However, there are studies like Garibaldi et al[27] who reported a wound infection odds ratio of 7.6 (95% confidence interval, 3.2 to 18.2) for emergency versus elective operations, but after multivariate analysis, this factor was no longer significant.

Surgical site infections also increase with hospital stay and are more common in those patients who stay in hospital for more than 7 days. The preoperative hospital stay is considered a major risk factor for development of health care associated infection. In this study group, the preoperative stay was mostly 48hrs or less and prolonged hospital stay was an exception rather than a rule. However, the average hospital stay of patients with health care associated infection was found to be 8 days versus 3 days in a patient with an uneventful recovery. A longer duration of preoperative hospitalization is associated with wound infection, theoretically via colonization with multiply resistant organisms. Both 5-year and 10-year studies by Cruse and Foord[28,29] appear to support this in the latter study, for example, patients hospitalized for 0 to 1 days a clean wound infection rate of 1.2%, whereas those hospitalized for more than 2 weeks had a 3.4% infection rate.

Mead et al[17], using Cruse's epidemiologic techniques, also found a higher risk of wound infection in patients with prolonged preoperative hospitalization.

CONCLUSION

Health Care associated infections result in longer duration of hospital stay thereby affecting the turnover of patients and increasing the bed occupancy rate per patient. The surgical interventions following any Health Care associated infections result in additional morbidity, prolonged hospital stay. Health Care associated infections also effect readmissions in patients owing to the development of infections. There were two pregnancy losses owing to health care associated infection developing in patients following amniocentesis. The obstetric procedures need to be carried out with utmost sterility precautions.

REFERENCES

1. J. Pidduc. Puerperal Fever, Prevention of Infection. The Lancet; 69(1740):22.
2. Williams REO, Blowers R, Garrod LP, Shooter RA: Hospital Infection. London, Lloyd-Luke (Medical Books), 1960.
3. Pittet D, Allegranzi B, Sax H, Bertinato E, Concia E, Cookson B, Fabry J, Richet H, Philip P, Spencer RC, Ganter BW & Lazzari S (2005) Considerations for a WHO European strategy on health-care-associated infection, surveillance, and control. Lancet Infect Dis 5(4): 242-250.
4. WHO, Clean Care is Safer Care www.who.int/gpsc.
5. Laforce FM. The control of infections in hospitals: 1750 to 1950. In: Prevention and control of nosocomial infections. Wenzel RP ed. London: Williams and Wilkins 1987.
6. Italey Riv, Schachtman RH. The emergence of infection surveillance and control programmes in US. Hospitals: an assessment, 1976.
7. Tolu Odugbemi. Setting up An infection control programmes in the Hospital: Role of the policy-makers. Journal of the Nigeria Infection Association. 1999; 2(1): 4-8.
8. Centers for Disease Control and Prevention. Public health focus: surveillance, prevention, and control of nosocomial infections. MMWR Morb Mortal Wkly Rep,1992;41:783–7.
9. Kunin CM. Care of the urinary catheter. In: Kunin CM. Urinary tract infections: detection, prevention, and management. 5th ed. Balti- more: Williams & Wilkins,1997:226–78.
10. Cope M, Cevallos ME, Cadle RM, Darouiche RO, Musher DM, Trautner BW. Inappropriate treatment of catheter-associated asymptomatic bacteriuria in a tertiary care hospital. Clin Infect Dis 2009;48:1182–8.
11. Kirkland KB, Briggs JP, Trivette SL, Wilkinson WE, Sexton DJ. The impact of surgical-site infections in the 1990s: attributable mortality, excess length of hospitalization, and extra costs. Infect Control Hosp Epidemiol. 1999 Nov;20(11):725-30.
12. Onipede AO, Oluyede CO, Aboderin AO et al. A survey of hospital acquired infections in Obafemi Awolowo University Teaching Hospital. Afri .J. Clin. Experi. Microbiol. 2004; 5(1): 108-118.
13. Kesah CN, Egri-Okwaji MTC, Odugbemi TO, Iroha EO. Bacteria associated with nosocomial infection and their antimicrobial pattern in pediatric patients in a tertiary health institution. J Med. Med Sci.1999;1:6-13.

14. Odimayo M.S, Nwabuisi C., Adegboro B. Hospital acquired Infections in Nigeria. Tropical Journal of Health Sciences. 2008; 15(1) : 49-54.
15. Taiwo SS, Onile BA, Akanbi II AA. Methicillin-Resistant Staphylococcus aureus (MRSA) isolates in Ilorin, Nigeria. Afr .J. Clin. Exper. Microbiol,2004;5(2):189-197.
16. Meers PD, Ayliffe GAJ, Emmerson AM, Leigh DA, Mayon-White RT, Mackintosh CA, Strange JL. Report on the National Survey of infection in Hospitals, 1980. J Hosp Infect 1981; 2: (Supplement)1-51.
17. Mead PB, Pories SE, Hall P. Decreasing the incidence of surgical wound infections. Arch Surg 1986; 121: 458.
18. Claesson BEB, Holmlund DEW. Predictors of intraoperative bacterial contamination and postoperative infection in elective colorectal surgery. J Hosp Infect 1988; 11:127.
19. Ehrenkranz NJ. Surgical wound infection occurrence in clean operations: Risk stratification for interhospital comparisons. Am J Med 1981; 70: 909.
20. Gil-Egea MJ, Pi-Sunyer MT, Verdaguer A. Surgical wound infections. Prospective study of 4,468 clean wounds. Infect Control Hosp Epidemiol 1987;8: 277.
21. Haley RW, Culver DH, Morgan WM. Identifying patients at high risk of surgical wound infection. Am J Epidemiol 121:206, 1985.
22. Nagachinta T, Stephens M, Reitz B. Risk factors for surgical-wound infection following cardiac surgery. J Infect Dis 1987; 156: 967.
23. C Wloch, J Wilson , T Lamagni , P Harrington, A Charlett, E Sheridan. Risk factors for surgical site infection following caesarean section in England: Results from a multicentre cohort study. BJOG: An International Journal of Obstetrics & Gynaecology, 2012;119 (11):1324–33.
24. Nima Khavanin, Francis C. Lovecchio, , Philip J. Hanwright, Elizabeth Brill, Magdy Milad, Karl Y. Bilimoria, John Y.S. Kim. The influence of BMI on perioperative morbidity following abdominal hysterectomy. American Journal of Obstetrics & Gynecology. 2013Jun;208(6):449.
25. Prema K, Ramalakshmi BA, Madhavapeddi R, Babu S. Immune status of anaemic pregnant women. Br J Obstet Gynaecol 1982; 89 : 222-5.
26. K. Kalaivani. Prevalence & Consequences of Anaemia in Pregnancy. Indian J Med Res, Nov.2009;130:627-33.
27. Garibaldi RA, Cushing D, Lerer T. Risk factors for postoperative infection. An J Med 1991; 91(Suppl 3B): 158S.
28. Cruse PJE, Foord RA. Five-year prospective study of 23, 649 surgical wounds. Arch Surg 1973; 107: 206.
29. Cruse PJE, Foord R. The epidemiology of wound infection: A 10 year prospective study of 62,939 wounds. Surg Clin North Am 1980; 60: 27.