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Risk Factors and Treatment of Clostridium difficile Infection in a Third Level Teaching Hospital

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Name of Author:
Hector R.R., Marta M.T., Maria A.O. and Victoria G.-N.M.

Corresponding Author:
Hector R.R.

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Abstract: Clostridioides difficile infection (CDI) is one of the leading causes of healthcare-associated infections globally, responsible for considerable morbidity, prolonged hospitalizations, and health system strain. Tertiary (third level) teaching hospitals, due to high patient acuity and frequent antibiotic use, are significant reservoirs for CDI. This article presents a comprehensive analysis of the epidemiology, patient-level and hospital-level risk factors, and the evolving landscape of CDI treatment within the context of a third level teaching hospital. Clinical data, outcome trends, and evidence-based recommendations are discussed, supported by tabular and graphical representations.

Keywords: Clostridioides difficile infection (CDI), Healthcare-associated infections, Tertiary care hospitals, Risk factors, Epidemiology.

INTRODUCTION

Clostridioides difficile is a spore-forming, toxin-producing anaerobic bacterium that causes antibiotic-associated diarrhea and colitis, with severe and sometimes life-threatening complications. Contemporary hospital settings have witnessed a rise in both community and healthcare-associated CDI, with increased incidence particularly pronounced in teaching hospitals, which manage complex and immunosuppressed patient populations.

Objectives

- Characterize the main risk factors for CDI in a tertiary care teaching hospital.
- Outline standard and emerging treatments for CDI, including approaches for recurrent infection.
- Analyze outcomes and identify intervention targets for decreasing CDI burden.

EPIDEMIOLOGY OF CDI IN TERTIARY CARE

Recent surveillance in diverse tertiary hospitals reveals an incidence ranging from 4.2 to 6.0 per 10,000 patient-days. Peak incidence is often seen among elderly, immunocompromised, and surgical patients.

Table 1: Incidence and Outcomes of CDI in Tertiary Hospitals

Year	Incidence (per 10,000 pt-days)	Severe Cases (%)	Mortality (%)	Recurrence (%)

2021	5.5	24	9	18
2023	5.9	27	10	20

RISK FACTORS

Patient-Level Factors

- **Advanced Age:** Patients >65 years are at greatest risk, with risk rising exponentially above 80 years.
- **Antibiotic Exposure:** Recent or current use of broad-spectrum antibiotics, especially fluoroquinolones, clindamycin, and third-generation cephalosporins.
  - Risk increases with the number, dose, and duration of antibiotics.
- **Gastric Acid Suppression:** Proton pump inhibitors and H2 blockers alter gut flora and facilitate C. difficile overgrowth.
- **Comorbidities:** Severe underlying illness, malignancy, solid organ transplant, inflammatory bowel disease, and immunosuppression (e.g., chemotherapy, corticosteroids).
- **Hospitalization Factors:** Prolonged hospital stay (especially >7 days), prior hospitalizations, and multiple room transfers.
- **Enteral Feeding:** Nasogastric tube feeding is a noted risk factor.
- **Recent Gastrointestinal Surgery:** Particularly procedures involving the colon.

Hospital-Level Factors

- **Environmental Contamination:** Spores persist on surfaces for months, resisting standard cleaning agents.
- **Antibiotic Stewardship:** Hospitals with poor stewardship programs report higher rates.
- **Hand Hygiene & Infection Control:** Compliance is critical for prevention; lapses augment transmission.

Graph: Odds Ratios for Key CDI Risk Factors in a Tertiary Teaching Hospital

Risk Factor	Adjusted Odds Ratio (OR)	95% CI
Age >65	2.3	1.7–3.2
Broad-spectrum antibiotics	4.5	2.9–6.8
PPI use	1.9	1.3–2.6
Length of stay >7 days	3.2	2.1–4.9
Cancer/chemotherapy	2.7	1.5–4.8

Treatment of CDI: Guidelines and Real-World Practice

Initial Episode

- **Non-severe CDI:** Oral vancomycin (125mg q6h x 10 days) or fidaxomicin (200mg BID x 10 days) is preferred. Metronidazole is now reserved for mild cases where vancomycin/fidaxomicin is unavailable.
- **Severe CDI:** Defined by elevated WBC (>15,000/μL) or creatinine (>1.5mg/dL); vancomycin or fidaxomicin is standard.
- **Fulminant Cases:** High-dose vancomycin and intravenous metronidazole; surgical consult for toxic megacolon.

Recurrent CDI

- **First Recurrence:** Use alternative agent (fidaxomicin if vancomycin was used initially, and vice versa), or vancomycin in a tapered/pulse regimen.
- **Multiple Recurrences:** Consider fecal microbiota transplantation (FMT), shown to restore gut flora and prevent future episodes.
- **Adjuncts:** Bezlotoxumab (monoclonal antibody against toxin B) can reduce recurrence risk in high-risk patients.

Graph: Comparative Cure and Recurrence Rates of First-Line Therapies

Treatment	Initial Cure (%)	90-day Recurrence (%)

Vancomycin	85	24
Fidaxomicin	88	16
Metronidazole	78	29
FMT (2+ recurrences)	92	7

Outcomes
Studies in third level hospitals demonstrate:

- **Average length of stay (with CDI):** 22 days (vs. 12 days without)
- **Attributable mortality:** 8–10%, increased in elderly and immunosuppressed patients
- **Increased cost:** Mean incremental cost per CDI case exceeds $8,000.

Prevention and Control Strategies

- **Antibiotic Stewardship:** Prudently restrict broad-spectrum antibiotics; periodic audit and feedback.
- **Environmental Cleaning:** Use sporicidal agents (e.g., bleach) for all C. difficile rooms and surfaces.
- **Hand Hygiene:** Soap and water are more effective than alcohol gel for spores.
- **Contact Isolation:** Gown and gloves for anyone entering patient rooms.
- **Prompt Separation & Cohorting:** Approach suspected/confirmed cases with urgent isolation to contain spread.

DISCUSSION

CDI imposes a high burden in tertiary teaching environments due to patient complexity, frequent exposure to high-risk therapies, and environmental persistence of spores. Risk assessment, early detection, and aggressive infection control measures combine with evidence-based treatment to improve outcomes. The adoption of fidaxomicin and FMT has enhanced recurrence prevention, while hospital-wide stewardship remains essential.
Barriers to optimal outcomes include diagnostic delays, under-recognition of at-risk populations, lapses in surface decontamination, and overuse of antibiotics and PPIs.

CONCLUSION

CDI is a persistent and serious challenge in third level teaching hospitals. Controlling modifiable risk factors, optimizing antibiotic use, ensuring early and appropriate therapy, and employing robust infection prevention practices are key to reducing the impact of CDI on patients and health systems. Ongoing research and adaptation of control strategies remain priorities in the fight against healthcare-associated infections.

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