



Original Research Article

DRUG RELATED RISK FACTORS AND TREATMENT OUTCOME OF CLOSTRIDIODES DIFFICILE IN HOSPITALIZED ADULTS WITH ANTIBIOTIC ASSOCIATED DIARRHOEA IN A SEMIURBAN POPULATION OF NORTHERN KERALA – A PROSPECTIVE STUDY

Bonitta Rachel Abraham¹, Sajaad Manzoor², Tinu Abraham Kuruvilla³

¹Assistant Professor, Department of General Medicine, Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, India

²Associate Professor, Department of Cardiology, Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, India

³Senior Resident, Department of Cardiology, Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, India

Received : 29/11/2025
Received in revised form : 12/01/2026
Accepted : 30/01/2026

Corresponding Author:

Dr. Bonitta Rachel Abraham,
Assistant Professor, Department of
General Medicine, Muzaffarnagar
Medical College, Muzaffarnagar, Uttar
Pradesh, India.
Email: bonitta.abraham@gmail.com

DOI: 10.70034/ijmedph.2026.1.551

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

Int J Med Pub Health
2026; 16 (1); 3222-3224

ABSTRACT

Background: Exposure to antibiotics and other medications plays a central role in the pathogenesis of Clostridioides difficile infection (CDI). Limited Indian data are available regarding specific drug classes associated with CDI and treatment outcomes. The objective is to evaluate drug-related risk factors associated with CDI and to assess treatment response in hospitalized patients with antibiotic-associated diarrhoea.

Materials and Methods: This prospective observational study was conducted at a tertiary care hospital in Northern Kerala during a period of 15 months. A total of 125 adult inpatients with antibiotic-associated diarrhoea were enrolled. Stool samples were tested for glutamate dehydrogenase antigen and Clostridioides difficile toxins A and B using a rapid immunoassay. Associations between drug exposure and CDI were analysed using appropriate statistical tests

Results: Clostridioides difficile infection was diagnosed in 22 patients (17.6%). Exposure to broad-spectrum antibiotics, particularly glycopeptides, fluoroquinolones, carbapenems, lincosamides and penicillins, showed a statistically significant association with CDI. Concomitant use of proton pump inhibitors, systemic steroids and Ryle's tube feeding were also significantly associated. All CDI patients responded favourably to standard therapy with either metronidazole or vancomycin, with resolution of diarrhoea and associated symptoms

Conclusion: Broad-spectrum antibiotics and adjunctive medications significantly increase the risk of CDI in hospitalized patients. Rational prescribing practices and early recognition can improve clinical outcomes.

Keywords: Clostridioides difficile, antibiotics, proton pump inhibitors, steroids, treatment outcome.

INTRODUCTION

Clostridioides difficile infection is strongly associated with disruption of normal gut flora following antibiotic exposure. Certain antibiotic classes and adjunctive medications such as proton pump inhibitors and steroids further increase susceptibility. Understanding drug-related risk factors is crucial for prevention strategies and

antibiotic stewardship. This study evaluates medication exposure patterns and treatment outcomes of CDI in hospitalized patients from a tertiary care centre in Northern Kerala.

MATERIALS AND METHODS

Study design and setting: Prospective observational study conducted at a tertiary care centre in Northern, Kerala.

Study population: Hospitalized adults with antibiotic-associated diarrhoea.

Inclusion criteria

- Adults aged ≥ 18 years
- Diarrhoea following antibiotic exposure within the previous three months

Exclusion criteria

- Inflammatory bowel disease
- Paediatric patients
- Non-consenting patients

Sample size: 125 patients.

Data collection: Data on antibiotic exposure, concomitant drug use, clinical features and outcomes were collected using a structured proforma.

Laboratory testing: Stool samples were tested using C. DIFF QUIK CHEK COMPLETE, detecting GDH antigen and toxins A and B.

Statistical analysis: Data were analysed using SPSS version 20.0. Categorical variables were compared using the chi-square test. A p-value < 0.05 was considered statistically significant.

RESULTS

Prevalence of CDI: Out of 125 patients with antibiotic-associated diarrhoea, 22 (17.6%) were diagnosed with CDI.

Antibiotic exposure and CDI.

Table 1: Association between antibiotic classes and CDI

Antibiotic Class	CDI Negative n(%)	CDI Positive n(%)	P value
Penicillin	18 (85.7)	2 (9.5)	0.05
Cephalosporin	61 (80.3)	14 (18.4)	0.68
Monobactam	2 (100)	0	0.79
Betalactamase inhibitor	61 (81.3)	13 (17.3)	0.71
Glycopeptides	5 (45.5)	6 (54.5)	$< 0.001^{**}$
Lincosamide	4 (66.7)	2 (33.3)	$< 0.001^{**}$
Oxazolidinones	2 (100)	0	0.79
Carbapenams	21 (70)	9 (30)	$< 0.001^{**}$
Amino glycoside	4 (66.7)	2 (33.3)	$< 0.001^{**}$
Macrolides	13 (92.9)	1 (7.1)	$< 0.001^{**}$
Tetracycline	3 (75)	1 (25)	0.91
Nitro furans	2 (66.7)	1 (33.3)	$< 0.001^{**}$
FQ	12 (66.7)	6 (33.3)	$< 0.001^{**}$
Poly peptides	10 (62.5)	6 (37.5)	$< 0.001^{**}$
Septran	3 (100)	0	$< 0.001^{**}$

* p value < 0.05 = statistically significant
 * < 0.001 = statistically highly significant*

Table 2: Association of non-antibiotic drugs with CDI

Drug Class	CDI Negative n(%)	CDI Positive n(%)	P value
H2 blockers / PPI	59 (81.9)	13 (81.1)	$< 0.001^{**}$
Steroids	30 (78.9)	7 (18.4)	0.31
Anti fungal	7 (70)	3 (30)	$< 0.001^{**}$
ATT	4 (80)	1 (20)	0.97
Anti motility agents	5 (83.3)	1 (16.7)	$< 0.001^{**}$
Chemotherapy / Immunosuppressants	6 (100)	0	$< 0.001^{**}$

* p value < 0.05 = statistically significant
 * < 0.001 = statistically highly significant*

Table 3: Association between RT Feeding and CDI

RT Feeds	Negative n(%)	Positive n(%)	P value
RT feeding present	34 (77.3)	10 (22.7)	$< 0.001^{**}$

* p value < 0.05 = statistically significant
 * < 0.001 = statistically highly significant*

DISCUSSION

Clostridiodes difficile diarrhea is an emerging healthcare threat in our country. CDI has traditionally been regarded as a complication of antimicrobial therapy, particularly broad-spectrum antibiotics that can disrupt the gut flora in hospitalised patientsⁱ It is one among the commonest nosocomial infections that results in increase in the cost of healthcare services and prolongation of hospital stay along with increase in morbidity and mortality of the patients. Glycopeptides followed by polypeptides, clindamycin, fluoroquinolones and aminoglycosides were associated with development of CDI. The

strength of association between carbapenams, polypeptides, fluoroquinolones, lincosamides, glycopeptides, macrolides, penicillins and aminoglycosides were highly significant.ⁱⁱ Cephalosporins and betalactamase inhibitor were also associated with CDI infection, but the strength of association in this study was insignificant. Acid suppressing agentsⁱⁱⁱ, Steroids^{iv} and RT feeding^v showed statistically significant association with CDI, but as the patients were simultaneously on antibiotics along with the above mentioned, it was tedious job to assess the relationship of each ones. 50% of CDI group was treated with oral metronidazole, whereas 50% of the study group was

treated with vancomycin^{vi}. Both of the groups showed favourable outcome, with resolution of loose stools and associated symptoms. None of the patients reported with toxic megacolon or fulminant colitis. Early diagnosis and prompt initiation of therapy resulted in favourable outcomes, underscoring the importance of clinician awareness and antibiotic stewardship.

Limitations

- Single-Centre study
- Moderate sample size
- Molecular characterization of strains was not performed

CONCLUSION

This study points towards the following recommendations. The use of broad spectrum of antibiotics should be thoroughly scrutinised in the elderly. Most of the patients had an average of 7-10 days of exposure to each antibiotic class, thus increasing the prevalence of CDI. Hence antibiotics should be de-escalated as per culture sensitivity report once stable and in those receiving multiple antibiotics, stool assay should be done at the earliest, as most of the subjects would have received prior antibiotics, not waiting for 3 days RT insertion is found to be associated with increased incidence of CDI, therefore RT feeds should be used cautiously. Acid suppressing agents and steroids can potentiate the effect of antibiotics in CDI, hence to be used judiciously.

REFERENCES

1. Freeman J, Wilcox MH. Antibiotics and Clostridium difficile. *Microbes and infection*. 1999 Apr 1;1(5):377-84.
2. Brown KA, Khanfer N, Daneman N, Fisman DN. Meta-analysis of antibiotics and the risk of community-associated Clostridium difficile infection. *Antimicrobial agents and chemotherapy*. 2013 May 1;57(5):2326-32
3. Cunningham R, Dale B, Undy B, Gaunt N. Proton pump inhibitors as a risk factor for Clostridium difficile diarrhoea. *Journal of Hospital Infection*. 2003 Jul 1;54(3):243-5.
4. Auphan N, DiDonato JA, Rosette C, Helmberg A, Karin M. Immunosuppression by glucocorticoids: inhibition of NF- κ B activity through induction of I κ B synthesis. *Science*. 1995 Oct 13;270(5234):286-90.
5. Wijampreecha K, Sornprom S, Thongprayoon C, Phatharacharukul P, Cheungpasitporn W. Nasogastric tube and outcomes of Clostridium difficile infection: A systematic review and meta-analysis. *Journal of Evidence-Based Medicine*. 2018 Feb;11(1):40-5.
6. Cohen SH, Gerding DN, Johnson S, Kelly CP, Loo VG, McDonald LC, Pepin J, Wilcox MH. Clinical practice guidelines for Clostridium difficile infection in adults: 2010 update by the society for healthcare epidemiology of America (SHEA) and the infectious diseases society of America (IDSA). *Infection Control & Hospital Epidemiology*. 2010 May;31(5):431-55.