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REVIEW ARTICLE

Problematic Clostridium difficile infection

Problematik Infeksi *Clostridium difficile*

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ABSTRACT

Clostridium difficile is a Gram-positive, strictly anaerobic, spore-forming bacterium. The virulence factor of this bacterium is the toxins it produces, namely enterotoxin A (TcdA) and cytotoxin B (TcdB). Transmission occurs fecally orally by ingesting the spores of this bacteria. *Clostridium difficile* is the most common cause of fulminant-associated in hospitals and other healthcare facilities and is of significant concern because of the increasing morbidity and mortality rates as well as increased healthcare costs. Elderly patients or patients with compromised immune systems are patients at the highest risk for this case. Clostridiosis present a varied spectrum of infection, ranging from self-limited diarrhea, mild to moderate diarrhea, to serious diarrhea, pseudomembranous colitis, and life-threatening fulminant colitis which can be life-threatening and can cause death. The diagnosis is made by direct detection of *Clostridium difficile* toxin in the feces. Although empiric therapy known as vancomycin and fidaxomycin have been used as the antibiotic choice, prompt identification of patients with symptoms of *Clostridium difficile* infection is very important because most patients respond quickly to antimicrobial therapy. may result in death. Prompt identification of patients with symptomatic *Clostridium difficile* infection is essential as the majority of patients respond quickly to antimicrobial therapy. Prevention is best achieved by implementing infection control measures and appropriate use of antimicrobial agents. Health professional education regarding preventive measures such as hand washing, wearing gloves, decontamination of medical equipment, and the proper environment is highly recommended.

Keywords: *Clostridium difficile;* diagnosis; diarrhea; toxin

ABSTRAK

Clostridium difficile merupakan bakteri Gram-positif, bersifat anaerob penghasil spora. Faktor virulensi dari bakteri ini adalah toksin yang dihasilkannya, yaitu enterotoksin A (TcdA) dan sitotoksin B (TcdB). Transmisi terjadi secara fekal oral dengan menelan spora bakteri ini. *Clostridium difficile* penyebab paling umum dari diare terkait fulminan di rumah sakit dan fasilitas kesehatan lainnya dan menjadi perhatian yang signifikan karena meningkatnya angka morbiditas dan mortalitas serta peningkatan biaya perawatan kesehatan. Pasien lanjut usia atau pasien dengan gangguan sistem imun merupakan pasien dengan risiko tertinggi untuk kasus ini. *Clostridiosis* menunjukkan spektrum infeksi bervariasi, berkisar dari diare ringan yang sembuh sendiri, diare derajat ringan-sedang, hingga diare serius, *pseudomembran colitis* dan *fulminant colitis* yang mengancam jiwa sehingga dapat mengakibatkan kematian. Diagnosis ditegakkan dengan deteksi langsung toksin *Clostridium difficile* dalam feses. Walaupun terapi empirik telah diketahui sebagaimana vankomisin dan fidaksomisin telah digunakan sebagai antibiotik pilihan, namun identifikasi segera pasien dengan gejala infeksi *Clostridium difficile* sangat penting karena sebagian besar pasien merespon dengan cepat terhadap terapi antimikroba. Pencegahan paling baik dilakukan dengan penerapan tindakan pengendalian infeksi dan penggunaan agen antimikroba secara tepat. Pendidikan profesional kesehatan mengenai tindakan pencegahan seperti mencuci tangan, memakai sarung tangan, dekontaminasi peralatan medis dan lingkungan pasien yang tepat merupakan tindakan yang sangat dianjurkan.

Kata kunci: *Clostridium difficile;* diagnosis; diare; toksin

INTRODUCTION

Clostridium difficile (C. difficile) is a Gram-positive, anaerobic, spore-forming, toxin-producing bacillus, which was officially renamed in 2016 to Clostridioides difficile. The new name reflects taxonomic differences between this species and other members of the genus Clostridium. C. difficile spores are transmitted via the fecal-oral route, and this pathogen is widely found in the environment. Potential reservoirs for C. difficile include asymptomatic carriers, infected patients, contaminated environments, and the intestinal tract of animals (dogs, cats, pigs, poultry). Approximately 5% of adults and 15–70% of infants are colonized by C. difficile, and the prevalence of colonization is several times higher in hospitalized patients or nursing home residents. C. difficile was first isolated from the feces of healthy newborns in 1935 by Hall and O'Toole. Until the 1970s, it was considered a rare microorganism but was present in the normal gut microbiota. After antibiotics became widely known, the role of C. difficile in the pathogenesis of colon disease increased. In 1974, Tedesco et al. found 21% of patients treated with clindamycin experienced diarrhea, on further endoscopic examination pseudomembranes were found in 50% of cases. In the late 20th century, the incidence of Clostridium difficile infection (CDI) increased sharply. Currently, CDI has become one of the most significant nosocomial infections, affecting all hospital wards.[1,2]

C. difficile infection (CDI) is primarily a healthcare-associated disease (80%), however, community-acquired infections (20%) are also a concern.[2] There are approximately 12,000 cases

of Clostridium difficile infection (CDI) each year in the UK and over the period of 1999-2007, deaths due to CDI reached its peak, namely around 4,000 per year. This bacterium is an asymptomatic commensal in 2-3% of the adult population, but among some patients prescribed antimicrobials, it is also a major cause of antibiotic-associated diarrhea and can cause colitis.[2] Epidemiological data in England and Wales shows that between 2004-2008, Quarterly CDI rates fluctuated from 10,000 to 17,000 cases. From 2008-2016, this figure has decreased to around 3,000 cases per quarter. The decline in case rates is largely due to changes in infection prevention and control and antimicrobial management. High rates of CDI have also been observed throughout Europe and the United States. CDI has important budget implications for healthcare providers. A systematic review published in 2012 identified costs of £4,577 per case in Ireland, £6,986 in the UK, and £8,843 in Germany, but only £2,917 in Finland. Of greater concern is that deaths related to CDI from 1999 to 2007 increased eightfold, peaking at more than 4,000 deaths per year in the UK.[3] To date, epidemiological data on CDI in Indonesia are not yet available.

Based on the above problems, it is necessary to conduct a literature review regarding CDI related to etiology, virulence factors, pathogenesis, risk factors how the diagnosis is made, and how to prevent this infection so that the transmission of infection can be stopped or eliminated..

ETIOLOGY

C. difficile is an opportunistic bacterium that is part of the normal intestinal flora. Pathogenicity is usually related to the production of two toxins, A (enterotoxin) and B (cytotoxin). Strains that do not produce the toxin are not associated with CDI. When the normal intestinal flora is disrupted in patients with antimicrobial use, colonization resistance is lost and these bacteria can overgrow and cause infections. In contrast, actively replicating (vegetative) strains of C. difficile produce toxins and cause CDI. The spore form does not produce toxins or cause disease unless it is converted into a vegetative form.[4,5]

C. difficile strains show great genetic variation and are divided into several toxin types based on the genetic variations of tcdA and tcdB, encoding toxin A (TcdA) and toxin B (TcdB), respectively.[6,7] Initially it was known that toxin A was the most common toxin. important in C. difficile infection, but studies show that toxin B has higher toxicity. The genes for toxins A and B, TcdA and TcdB respectively, are found at the pathogenicity locus (PaLoc) on the

chromosomes of some C. difficile strains. Apart from these two toxins, it is known that there is a binary toxin, namely C. difficile transferase (CDT) which is produced by several strains and is closely related to the Clostridium perfringens binary toxin. Only some C. difficile strains can produce CDT in the absence of TcdA and TcdB. Until now, the role of CDT in C. difficile infection is still not known with certainty.[8,9]

Although strains producing only CDT have been isolated from colitis patients supporting the hypothesis that CDT is involved in the pathogenesis process. However, the incidence of C. difficile infections associated with CDT-only-producing strains is low, and symptoms are moderate. Additionally, this strain does not produce severe enteritis lesions in experimental animal models.[10,11]

CDI CLASSIFICATION

Before CDI treatment is initiated, the severity of the episode should be assessed. CDI was classified as mild to moderate, severe, or fulminant (previously with severe complications) based on laboratory findings and clinical features. The usual criteria for classification are severe CDI if the white blood cell count is >15,000,106/l, or the serum creatinine increases >1.5-fold from baseline or >1.5 mg/dl. CDI is fulminant if the patient experiences hypotension, shock, or sepsis, requires intensive care unit treatment, experiences megacolon or intestinal perforation, or requires a colectomy due to CDI. Mild to moderate CDI when criteria for severe or fulminant disease are not met.[12,13]

VIRULENCE FACTORS

C. difficile is an anaerobic Gram-positive bacterium, two main virulence factors make C. difficile highly pathogenic for humans. Virulence factors are molecules produced by pathogenic bacteria and other microorganisms that increase their effectiveness and allow them to achieve the following, such as colonization and attachment to cells, immune evasion (evasion of the host's immune response), immunosuppression, inhibition of the host's immune response. In the case of C. difficile, this bacterium is capable of sporulation, and these spores can remain viable on various types of surfaces and materials for long periods and cannot be killed by various cleaning products. Therefore, C. difficile can spread rapidly through and between healthcare facilities by patients, medical staff, and objects (e.g., clothing, equipment, and furniture in healthcare-associated infections). After ingestion and passing through the low pH stomach environment, these spores germinate and C. difficile establishes an intestinal colonization. Infection (not colonization) with C. difficile is linked to two exo-proteins, namely toxin A (TcdA) and toxin B (TcdB). [14,15]

PATHOGENESIS

CDI develops when patients ingest spores of toxic strains of C. difficile through personal or environmental contact. Among healthy people, C. difficile does not cause problems due in part to commensal gut flora and antibody-mediated immunity; however, in the presence of abnormal or compromised colonic mucosa, these spores colonize the intestine and then germinate, and the vegetative bacteria begin to produce two major toxins, the enterotoxin, TcdA, and the cytotoxin, TcdB, encoded by tcdA and tcdB, respectively. Both genes are part of the Pathogenicity Locus (PaLoc) operon, which also contains tcdR, tcdE, and tcdC, where tcdC is a putative negative regulator of tcdA and tcdB. TcdA acts primarily on the intestinal epithelium, causing fluid secretion, inflammation, and tissue necrosis, whereas TcdB with its broad cell tropism acts as a potent cytotoxin. Some strains of C. difficile known as NAP1/BI/027, contain additional potential virulence factors (binary toxins) expressed from the cdtA (enzymatic component) and cdtB (binding component) operons. The extent to which these toxins contribute to the pathogenicity of C. difficile is unknown; however, the C. difficile strain in which the binary toxin was first detected causes severe pseudomembranous colitis. Figure 1, explains the pathogenesis of CDI.[15,16]

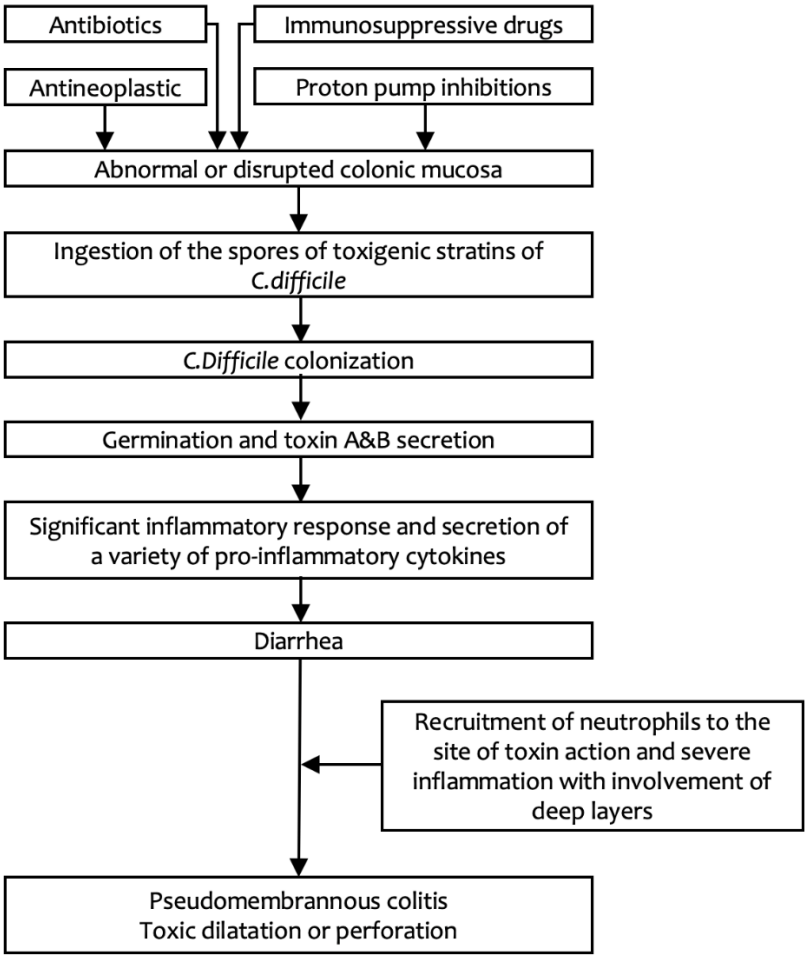

Figure 1. Pathogenesis of CDI[15]

After binding to the appropriate receptor, this toxin is internalized and exerts its cellular effects through its glucosyltransferase activity by targeting and disrupting intracellular signaling pathways regulated by the Rho family of small GTPases. Changes in cellular function caused by TcdA and TcdB disrupt the integrity of the colonic mucosa, activate apoptosis of colonic epithelial cells, and induce the secretion of various pro-inflammatory cytokines. Many of these effects, direct the recruitment of polymorphonuclear neutrophils (PMN) to the site of toxin action. PMN infiltration is a feature of a severe form of CDI known as pseudomembranous colitis. There is no correlation between disease severity and fecal toxin levels.[16]

RISK FACTORS

There are two main risk factors for this infection, namely long-term use of antibiotics and exposure to C. difficile bacteria. Apart from this, the risk of infection is much greater in the elderly and patients with a history of prolonged hospitalization (more than 15 days). Other risk factors include comorbid conditions such as inflammatory bowel disease, history of

gastrointestinal surgery, malignancy, chronic kidney failure, and use of immunosuppressants.[17,18]

In hospitals, most cases of CDI are associated with antibiotic use. However, 2/3 of community-acquired CDI cases in a recent study were not on antibiotics in the 90 days before onset of symptoms suggesting a different disease pattern between community-acquired and nosocomial cases.[17,18]

Nearly all antimicrobials have been reported to be associated with CDI. Agents active against anaerobic bacteria are considered the greatest risk factor, probably because of their ability to alter intestinal microecology. The risk of developing disease after exposure to antimicrobials varies greatly and depends on host factors, such as age, diet, immune system function, type and dose of antibiotic, and duration of treatment. Although clindamycin use has been closely associated with the disease historically and remains a major risk factor, more cases are currently associated with therapy with β-lactam agents because of their common use.[18,19]

CLINICAL SYMPTOMS

Asymptomatic carriers vary from 2% in the community to 20%-30% or more in hospitalized adults. Although asymptomatic, these individuals serve as reservoirs for environmental pollution. The incubation period between ingestion of spores and the onset of disease has not been determined. However, most patients experience diarrhea during or immediately after taking antibiotics, or up to 8-10 weeks after stopping them. CDI has a wide spectrum of clinical presentations from mild, self-limiting diarrhea, serious diarrhea, pseudomembranous colitis, and life-threatening fulminant colitis, which can result in death.[20,21] Watery diarrhea is the main symptom of CDI; varies from mild, to moderate to severe. Patients with colitis (with or without pseudomembranous colitis) typically present with watery diarrhea up to 10-15 times daily, abdominal cramps and pain, fever, anorexia, and nausea. Leukemoid reactions, hypoalbuminemia, and occult colonic bleeding may occur, but visible blood is rare. Approximately, 3% to 8% of CDI patients develop fulminant disease, defined as patients whose course is complicated by perforation, severe ileus with toxic megacolon, hypotension requiring suppressants, or refractory septicemia. Although diarrhea may be present, these patients may have little or no diarrhea due to toxic megacolon and paralytic ileus.[22,23]

DIAGNOSIS

The diagnosis of CDI is based on clinical features, confirmation of the presence of toxin A alone or toxins A and B together in the feces, and sometimes endoscopy to verify pseudomembranous colitis. CDI should be suspected in any hospitalized patient who experiences diarrhea or anyone in the community who experiences diarrhea following antibiotic administration or in association with immunosuppressive therapy. However, diagnostic tests to confirm CDI are essential. Testing for C. difficile or its toxin should be performed only on diarrheal (unformed) stools except for ileus because C. difficile is suspected. Table 1 summarizes the accuracy of various diagnostic tools used for the diagnosis of CDI.[24,25]

Table 1. Sensitivity and specificity of tests performed for the diagnosis of CDI[24]

Laboratory test	Sensitivity	Specifity
Tissue culture cytotoxicity assay	94-100	99-100
Glutamate dehydrogenase enzyme immunoassay	75-90	<50
Enzyme immunoassay for *C. Difficile* toxin	65-85	95-100
RT-PCR	88-100	96-100
Anaerobic culture of stool	89-100	48-68

The tissue culture cytotoxicity test that detects the presence of C. Difficile cytotoxin (toxin B) in fecal filtrate is considered the "gold standard" for diagnosis because it can detect as little as 10 pg of toxin in feces and has high sensitivity (94%-100%) and specificity (99%-100%) is shown in Table 1. However, this test has a long turnaround time (1-3 days) and high costs and requires tissue culture facilities.[26,27]

Enzyme immunoassay (EIA) for the C. difficile glutamate dehydrogenase (GDH) antigen was used to detect the presence of the GDH enzyme, produced by all strains of C. difficile isolates, with toxigenic and non-toxicogenic properties. This test is highly sensitive (75%-90%), and has a high negative predictive value (95%-100%). However, it is not more than 50% specific with a low positive predictive value, as it does not differentiate toxin-producing from non-toxic C. difficile strains. In addition, antibodies to C. difficile GDH in this test may cross-react with the same enzyme in other clostridial species. To overcome this problem and to increase specificity, this method is recommended by the Infectious Diseases Society of America/Society for Healthcare of America guidelines on C. difficile diagnostic testing. This strategy uses EIA detection of GDH and then uses cell cytotoxicity testing or toxigenic culture as a confirmatory test for stool specimens that are positive for glutamate dehydrogenase only.[28,29]

Enzyme immunoassay for C. difficile toxin is used to detect the presence of C. difficile toxins A and B in feces. It will become the primary diagnostic modality in most clinical settings, due to its speed and ease of performance. This test provides results in 2 to 6 hours with a specificity of 95%-100%; however, the sensitivity is reduced (65%-85%). The relatively high false negative rate, however, may be explained by the fact that 100 to 1,000 pg of toxin must be present for the test to be positive.[29,30]

Diagnostic strategies targeting nucleic acids, including PCR methods and RT-PCR methods have been developed to detect genes encoding TcdA and/or TcdB. The Infectious Diseases Society of America/Society for Healthcare of America guidelines on C. difficile diagnostic testing suggest that more data are needed on nucleic acid amplification tests before they can be implemented for wide-scale use. However, RT-PCR methods for detecting C. difficile toxin B gene have recently been used with high sensitivity (88%-100%) and specificity (96%-100%).[31,32]

C. difficile can be isolated by anaerobic culture from feces. Although highly sensitive, this test is rarely used for clinical diagnosis, as it takes 2–3 days to complete and does not differentiate toxigenic from non-toxic strains. However, this test is important for epidemiological studies, namely to determine strains in nosocomial infection outbreaks.[33,34]

Sigmoidoscopy and colonoscopy are not indicated for patients with classic clinical findings and a positive fecal toxin test and should be avoided in fulminant colitis due to the risk of perforation. However, endoscopy is helpful in special situations such as when other diseases need to be excluded, the diagnosis is in doubt the clinical situation demands rapid diagnosis, or a stool sample cannot be obtained because ileus is developing.[35,36]

Radiographic imaging studies may be used to help assess the severity of CDI. Abdominal imaging studies may reveal colonic dilatation, air-fluid levels (mimicking bowel obstruction or ischemia), and thumb printing (scalloping of the bowel wall) due to edematous colonic mucosa. Abdominal CT scans can also help categorize the severity of colitis and can diagnose fulminant colitis quickly. This may indicate ascites, free air, thickening of the colon wall or dilation.[37,38]

PREVENTION AND TREATMENT

Precautions are taken such as implementing infection control measures, such as recommended hand washing. Additionally, the cornerstone of controlling these infections is controlling antimicrobial prescribing. A multidisciplinary antibiotic management program to limit inappropriate antibiotic use could lead to a significant reduction in nosocomial infections caused by C. difficile.[39,40]

The first steps in treating patients with CDI include discontinuing the offending agent such as antimicrobials, if possible, and providing appropriate supportive care with hydration and electrolyte replacement as needed. Anti-diarrhea medications should be avoided as they can obscure symptoms and trigger toxic megacolon. Metronidazole and vancomycin are the mainstays of antimicrobial therapy for CDI. Although both drugs are effective for the treatment of this disease, they are still subject to debate, as neither of them is superior to the initial treatment of this infection. Therefore, local guidelines, based on the local epidemiology of CDI, should be developed in each country to resolve the debate, as most treatment guidelines are formulated in developed countries, as listed in Table 2.[40,41]

Table 2. Treatment of CDI[41]

Clinical Picture	Treatment
Non-severe CDI	Metronidazole: 250 mg orally 4 times daily or 500 mg orally every eight hours daily given for 10 d; If failed to response to metronidazole after 5-7 d or patient has contraindications. Vancomycin : 125-250 mg orally 4 times daily for 10 d Alternative therapy : Fidaxomicin 200 mg orally twice daily for 10 d; Fusidic acid 500 mg orally 3 times daily for 10 d; Teicoplanin 400 mg orally twice daily for 10 d; Bacitracin 20,000 IU orally 4 times daily for 10 d; Nitazoxanide 500 mg orally twice daily for 10 d.
Fulminant disease (severe CDI) (Perforation, severe ileus with toxic megacolon, hypotension requiring pressors, or refractory septicemia)	Vancomycin (125 mg p.o or via nasogastric tube/every 6 h daily for 10 d) plus intravenous metronidazole (500 mg every 8 h daily for 10 d); if severe paralytic ileus or toxic colon is suspected, treat rectal vancomycin 500 mg in 250 mL, normal saline every 6 h daily as a retention enema; If medical therapy fails or perforation develop, patients will be in surgical intervention with colectomy and ileostomy.
Recurrence of CDI (Reappearance of diarrhea and other symptoms after successful treatment)	First recurrence : It can be treated with the same drug as was used during the first episode. Second or subsequent recurrence: High dose vancomycin : 250-500 mg orally every 6 h for 10 d followed by tapered doses of vancomycin for 21 d or by pulsed-dosing of vancomycin therapy 125 mg every 3 d for 21 d Long, tapered vancomycin over six weeks : 1st week : 125 mg 4 times daily; 2nd

	week : 125 mg 2 times daily; 3rd week : 125 mg once administration of donor stool
	Vancomycin with rifampin vancomycin : 125 mg orally 4 times per day and oral rifampin 600 mg 2 times per day for 7-10 d
	Vancomycin with colestipol
	Vancomycin with the probiotic saccharomyces boulardii

Previous guidelines recommended oral metronidazole for mild to moderate CDI and vancomycin for severe CDI. Fidaxomicin is mentioned but has not been recommended due to increasing costs and evolving data. Recent IDSA/SHEA guidelines published in 2018 recommend CDI of vancomycin or fidacomycin and metronidazole may be considered. It is accepted that there is currently a large body of data supporting the efficacy of vancomycin and fidacomycin as primary treatment in non-severe disease. Fidacomycin has been shown to be generally equivalent to vancomycin for cure, with data showing reduced relapse rates. A number of industry-led cost-effectiveness analyses have reported that increased initial acquisition costs can be offset by lower repeat costs, leading to near parity with vancomycin.[40,41]

There are currently a number of studies comparing fidaxomicin with vancomycin. Research by Jacek C et al (2019) and Massimo et al (2019) revealed that in a double-blind RCT, fidaxomicin at 200 mg twice a day for 10 days was found to be lower than vancomycin at 125 mg 4 times a day for 10 days in the treatment of CDI. In the modified treatment analysis, the cure rate with fidaxomicin (82.1%) was similar to that of vancomycin (88.6%). The 30-day recurrence rate was significantly lower with fidaxomicin (13.0% vs. 26.6%). A double-blind, noninferiority RCT with the same protocol yielded similar results, showing no significant difference in clinical cure (76.2% vs. 70.5%), but a lower recurrence rate with fidaxomicin (8.3% vs. 32.6%).[41,42]

A recent Japanese study of hospitalized patients with an initial episode of CDI demonstrated statistically similar global cure rates between fidaxomicin (67.3%) and vancomycin (65.7%). A retrospective, multicenter, analysis found no statistically significant difference in the composite outcome of clinical failure or recurrence between 213 fidaxomicin treatment courses (31.9%) and 639 vancomycin treatment courses (25.5%). Mortality rates at 30 days (10.8% vs 11.7%), 90 days (22.5% vs 21.9%), and 180 days (29.1% vs 29.1%) were also similar between the 2 treatment groups.[42,43]

The role of metronidazole in patients with first-time events and non-severe disease remains controversial. The largest randomized comparison between metronidazole and

vancomycin to date was published in 2014 and reported no statistical difference between metronidazole and vancomycin for nonsevere disease, although a nonsignificant trend in favor of vancomycin was seen. A recent 2017 review of 22 trials, consisting mostly of patients with less severe disease, found vancomycin overall more effective than metronidazole for achieving symptomatic cure (79% vs 72%) and fidaxomicin more effective than vancomycin (71% vs 61%).[42,43]

The researchers concluded that vancomycin was superior to metronidazole and fidaxomicin was superior to vancomycin. The difference in effectiveness between these antibiotics is not large and the advantage of metronidazole is its much lower price compared to the other 2 antibiotics. A recent effectiveness analysis of a cohort of US veterans aged 65 years or younger with a first episode of mild CDI reported no difference between metronidazole compared with vancomycin regarding the risk of 30-day all-cause death or CDI recurrence. However, in the same study in older patients or patients hospitalized for CDI with severe comorbidities, the effectiveness of metronidazole was lower.[43]

CONCLUSIONS

Clostridium difficile (C. difficile) is a Gram-positive, spore-forming, anaerobic bacillus, which is widely distributed in the intestinal tract of humans and animals and in the environment. In the last decade, the frequency and severity of C. difficile infections have increased worldwide to become one of the most common hospital-acquired infections. Transmission of this pathogen occurs via the fecal-oral route and the most important risk factors include antibiotic therapy, old age, and residence in a hospital or nursing home. The clinical picture is diverse and ranges from asymptomatic carrier status, through varying degrees of diarrhea, to the most severe and life-threatening colitis resulting in death. Diagnosis is based on the direct detection of C. difficile toxin in feces but the EIA test is most often used, however, there is no single test suitable for confirming CDI. The antibiotics of choice are vancomycin, fidaxomycin, and metronidazole, although metronidazole is considered to be less effective.

CDI accounts for approximately 10%–35% of all cases of antibiotic-associated diarrhea and is the most common infectious cause of nosocomial diarrhea, which is associated with substantial morbidity, mortality, and increased health care costs. Prompt identification of patients with symptomatic CDI is critical because most patients respond rapidly to antimicrobial therapy. Prevention is best achieved by implementing infection control measures and judicious use of antimicrobial agents.

In the last decade, CDI has become one of the most detrimental nosocomial infections. It is important to remember that prevention of CDI begins with education of healthcare professionals regarding preventive measures such as hand washing, wearing gloves, proper decontamination of medical equipment and the patient environment, and optimal antibiotic management. Hospitalized elderly patients treated with antibiotics are at the highest risk for CDI.

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