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Review Article

A Comprehensive Review on Ulcerative Colitis: Diagnosis, Etiology, Epidemiology, Current Trends, Treatment Innovation and Future Prospects

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ABSTRACT

Ulcerative colitis (UC) is a chronic, idiopathic inflammatory bowel disease (IBD) primarily affecting the colonic mucosa. Characterized by periods of remission and relapse, UC leads to significant morbidity and affects quality of life. The disease typically begins in the rectum and may extend proximally to involve the entire colon. Although its exact etiology remains unclear, a combination of genetic, immunological, and environmental factors contributes to disease development. Common clinical features include abdominal pain, bloody diarrhea, urgency, and weight loss. Diagnosis is based on clinical evaluation, endoscopic findings, and histological examination. Management strategies range from pharmacologic interventions such as aminosalicylates, corticosteroids, immunosuppressants, and biologics to surgical options in refractory cases. Recent advances in diagnostics, including fecal biomarkers and imaging techniques, have improved disease monitoring. Lifestyle modifications and dietary interventions also play a crucial role in disease management. This review summarizes current knowledge on the epidemiology, etiology, pathogenesis, clinical features, diagnostic tools, treatment modalities, and future directions in the management of Ulcerative Colitis.

INTRODUCTION

Ulcerative colitis (UC) is a chronic relapsing inflammatory bowel disease (IBD) that affects the mucosal lining of the colon and rectum. First described in the 19th century, it remains a significant public health concern due to its increasing global incidence and impact on quality

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of life. Unlike Crohn's disease, which can affect any part of the gastrointestinal tract, UC is limited to the colon and always involves the rectum to some extent. The disease follows a pattern of flares and remission, with symptoms ranging from mild to severe. These ulcers can bleed and produce mucus or pus, leading to symptoms such as frequent diarrhea, abdominal cramps, rectal bleeding, weight loss, and fatigue. These episodes can significantly impair daily functioning and contribute to emotional and psychological distress. The rising incidence in industrialized and developing nations suggests a strong influence of environmental and lifestyle factors alongside genetic susceptibility. The goal of this review is to provide an updated and comprehensive overview of UC, covering its etiology, epidemiology, clinical presentation, diagnostic approaches, treatment strategies, lifestyle modifications, and preventive measures. Additionally, we will explore emerging therapies and future directions in disease management. [6]

TYPES OF ULCERATIVE COLITIS:

Ulcerative colitis (UC) is a chronic inflammatory bowel disease characterized by continuous inflammation of the colonic mucosa, starting from the rectum and extending proximally to varying extents. Based on the anatomical distribution of inflammation, UC is classified into different types. Understanding these types is important for diagnosis, prognosis, and therapeutic decision-making.

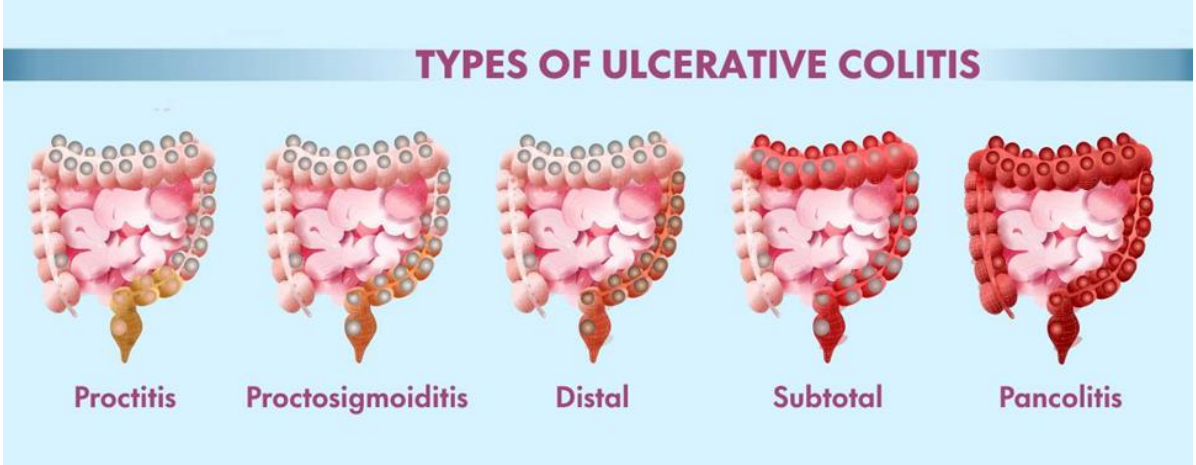
Ulcerative Proctitis: In this type, inflammation is limited to the rectum. It usually presents with symptoms such as rectal bleeding, urgency, and tenesmus, while systemic symptoms are less common. Ulcerative proctitis is often considered a milder form but can progress proximally in some patients.

Proctosigmoiditis: Here, both the rectum and sigmoid colon are affected. Patients may present with left lower abdominal pain, diarrhea with blood, and urgency. Compared to proctitis, symptoms are more severe and the disease may require stronger treatment.

Left-Sided Colitis (Distal Colitis): In this type, inflammation extends from the rectum up to the splenic flexure. Symptoms include bloody diarrhea, crampy abdominal pain, and weight loss. Left-sided colitis often shows more pronounced systemic features compared to proctitis and proctosigmoiditis.

Extensive Colitis: This form involves inflammation that extends beyond the splenic flexure but does not include the entire colon. Patients often experience severe diarrhea, abdominal pain, and systemic manifestations such as fatigue and anemia.

Pancolitis: Pancolitis involves the entire colon. It is considered the most severe form of UC, with widespread mucosal inflammation. Symptoms include frequent bloody diarrhea, significant abdominal pain, fever, and extra-intestinal manifestations. Pancolitis carries a higher risk of complications such as colorectal cancer.



ETIOLOGY:

The precise cause of ulcerative colitis (UC) remains unknown; however, it is widely believed to be the result of a complex interplay between genetic, environmental, microbial, and immunological factors. [6]

1. Genetic Factors: Several genetic loci have been linked to UC, including genes involved in immune regulation such as IL23R, HLA genes, and ECM1. People with a family history of UC are at higher risk, suggesting single strand. annealing (SSA) genetic link. While a family history increases susceptibility, genetic predisposition alone does not account for disease development, suggesting the involvement of environmental triggers. [6]

2. Immune Dysregulation: UC is characterized by an inappropriate immune response to colonic microbiota. Unlike Crohn's disease, which shows a Th1/Th17-dominated response, UC predominantly exhibits a Th2-like cytokine profile with elevated interleukin-5 (IL-5) and IL-13. These cytokines contribute to epithelial cell apoptosis and mucosal inflammation. [7]

3. Environmental Factors: Environmental triggers such as diet, stress, antibiotic use, pollution, and appendectomy history influence the onset or exacerbation of UC. Interestingly, smoking appears to have a protective effect against UC, although the mechanisms remain unclear.

4. Gut Microbiota: Alterations in the gut microbiome (dysbiosis) have been observed in UC patients, including decreased diversity and shifts in bacterial composition. These changes may disrupt the mucosal barrier and provoke immune activation.

EPIDEMIOLOGY:

Ulcerative colitis exhibits a varying prevalence globally, with higher rates in industrialized regions. [4]

Incidence & Prevalence: The global incidence of UC ranges from 1.2 to 20.3 per 100,000 persons annually, while prevalence ranges from 7.6 to 245 per 100,000 persons. Northern Europe and North America report the highest prevalence. [4]

Age of Onset: UC typically presents in young adults between 15–30 years, with a smaller second peak in individuals aged 50–70 years.

Gender Distribution: UC affects both genders equally, though some studies suggest a slightly higher incidence in males.

Geographic Trends: The increasing incidence in Asia, Africa, and South America reflects the

influence of urbanization, Westernized diets, and improved hygiene.

Risk factors: Genetics, smoking, Environmental factors. [6]

SYMPTOMS:

Its clinical presentation can range from mild and intermittent symptoms to severe and persistent manifestations, depending on the extent and intensity of inflammation. The hallmark symptom is diarrhea, often accompanied by blood, mucus, or pus, resulting from inflammation and ulceration of the colonic mucosa. In some cases, patients may report frequent bowel movements, including nocturnal episodes, which can significantly disrupt daily routines and sleep. Abdominal pain and cramping, particularly in the lower left quadrant, are also common and tend to worsen before bowel movements. As the disease progresses or during active flare-ups, systemic symptoms may emerge. These include fatigue, weight loss, fever, and loss of appetite, often linked to ongoing inflammation and nutrient malabsorption. In more severe cases, dehydration, anemia from chronic blood loss, and electrolyte imbalances can occur, particularly if diarrhea is prolonged and severe.

DIAGNOSIS:

The diagnosis of ulcerative colitis (UC) is based on a combination of clinical symptoms, laboratory investigations, endoscopy, histopathology, and radiologic imaging.

1. Clinical Evaluation: Initial suspicion arises from the patient's history of chronic or relapsing bloody diarrhea, abdominal pain, urgency, and weight loss.

2. Laboratory Tests: Complete Blood Count (CBC): May reveal anemia and leukocytosis. C-Reactive Protein (CRP) & Erythrocyte Sedimentation Rate (ESR): Markers of inflammation.

Stool Studies: Rule out infections (e.g., Clostridioides difficile, parasites).

Fecal Calprotectin/Lactoferrin: Non-invasive markers of intestinal inflammation, useful for monitoring disease activity.

3.Endoscopy: Flexible Sigmoidoscopy or Colonoscopy: Gold standard for diagnosis. [9]

Findings: Erythema, friability, loss of vascular pattern, ulceration.

Biopsy is essential to confirm the diagnosis and rule out Crohn's disease or infections.

4. Histopathology: Features include crypt abscesses, goblet cell depletion, mucosal ulceration, and continuous inflammation limited to the mucosa.

5. Advanced Diagnostics: Magnetic Resonance Enterography (MRE): Useful in assessing disease activity and complications. CT Abdomen with Contrast: Occasionally used in acute severe colitis to evaluate extent and complications.

Capsule Endoscopy: Rarely used in UC, more relevant in Crohn's disease.

MANAGEMENT:

1. General Management:

In severe UC cases, patients often experience symptoms such as weight loss, fever, rapid heart rate, anemia, and abdominal tenderness. Diagnosis involves physical examination, blood tests (including CRP, ESR, full blood count), stool analysis, and colonoscopy with biopsy.

2. Treatment Options:

Aminosalicylates: Drugs like sulfasalazine, mesalamine, and olsalazine are used to reduce inflammation. Mesalamine is usually preferred due to fewer side effects, and 5-ASA works in up to 80% of mild-to-moderate cases.

Corticosteroids: Prednisone and budesonide help control flares. Budesonide acts faster with fewer side effects. These are generally used short-term to manage active disease.

Immunomodulators: Medications like azathioprine and 6-mercaptopurine help maintain remission. Studies show these are effective in both active and long-term UC management.

Biologic Therapies: Anti-TNF drugs such as infliximab and adalimumab reduce inflammation. Biosimilar versions of adalimumab have shown effectiveness in inducing and maintaining remission, though some patients may experience side effects like rashes or infections. [19]

JAK Inhibitors: These block pathways involved in inflammation and are considered in resistant cases. [15]

3. Surgery (Colectomy):

Surgical removal of the colon may be considered early for patients with complications like bowel perforation or uncontrolled bleeding. It's usually recommended after 3 days of hospitalization in non-responsive cases or after 7 days if no improvement is seen with rescue therapy. Colectomy significantly improves outcomes, and reconstructive surgery (with pouch formation) can be scheduled later when the patient is stable.

Drug Class	Examples	Mechanism Of Action
Aminosalicylates	Mesalamine, Sulfasalazine, olsalazine	Inhibit cyclooxygenase and lipoxygenase pathways to reduce mucosal inflammation. First-line for mild to moderate.
Corticosteroids	Prednisone, Budesonide	Broad anti-inflammatory effects by suppressing multiple inflammatory genes. Used for remission.
Immunomodulators	Azathioprine, 6-Methopurine	Inhibit purine synthesis, reducing lymphocyte proliferation. Used for maintenance in steroid-dependent UC.
Biologics	Infliximab, Adalimumab, Vedolizumab	Target specific inflammatory cytokines used in moderate to severe UC.
JAK Inhibitors	Tofacitinib	Inhibit Janus kinase pathways, reducing cytokine signaling. Oral small molecule for moderate- severe cases.

LIFESTYLE AND PREVENTION: Although ulcerative colitis (UC) cannot currently be prevented due to its idiopathic nature, lifestyle modifications can significantly reduce flare-ups, improve symptoms, and enhance quality of life.

1.Diet and Nutrition: Low-residue diet during flare-ups to minimize bowel movements. High-fiber diet during remission may help maintain gut health.

Avoid trigger foods: dairy (if lactose intolerant), spicy foods, caffeine, alcohol, and processed sugars. Probiotics may help restore gut flora balance in some patients.

2.Stress Management: Psychological stress has been linked to symptom exacerbation. Techniques such as mindfulness, cognitive behavioral therapy (CBT), yoga, and regular exercise may help reduce stress-induced flares.

3.Smoking: Interestingly, smoking appears to have a protective effect in UC, though it is not recommended due to overall health risks.

4. Medication Adherence: Non-compliance is a leading cause of relapse. Patient education and regular follow-up are essential.

5.Vaccination and Health Maintenance: Due to immunosuppression from some therapies, routine vaccination (e.g., influenza, pneumococcus, hepatitis B) is essential. Regular cancer screening (e.g., colonoscopy) is recommended after 8–10 years of disease duration.

Preventive measures:

Even though the exact cause of UC is not fully known, certain habits may help prevent flare-ups and support gut health:

Avoid smoking and alcohol, maintain a healthy weight, Take prescribed medications regularly, go for routine medical checkups, use probiotics if recommended by a doctor, Stay updated with vaccinations to avoid infections.

Future directions in ulcerative colitis:

Ulcerative colitis is a chronic inflammatory bowel disease with a complex and evolving therapeutic landscape. While significant advancements have been made in recent years, several areas remain promising for future development.

1. Personalized and Precision Medicine: One of the most significant future goals is tailoring treatment strategies to individual patients. This includes using genetic, microbial, and immunological profiles to predict which therapies are likely to be most effective or well-tolerated. Biomarkers that can accurately forecast disease course, flare-ups, or response to specific drugs will be essential in this approach. [6]

2. Advances in Biologic and Small Molecule Therapies: Though biologic agents like anti-TNF drugs have transformed treatment, a substantial number of patients do not respond or lose responsiveness over time. Newer biologics and small molecule inhibitors—such as JAK inhibitors, S1P modulators, and anti-integrin agents—are being explored to improve efficacy and reduce side effects. Future therapies may focus more on targeting specific immune pathways involved in the disease. [19] [15]

3. Microbiome-Based Therapies: The gut microbiota plays a key role in UC pathogenesis, and modifying it may offer therapeutic benefits. Future research is focusing on fecal microbiota transplantation (FMT), probiotics, and dietary interventions to restore a healthy microbial balance and reduce inflammation. [17]

4. Mucosal Healing as a Treatment Goal: There is increasing emphasis on achieving mucosal healing rather than just symptom control. Future treatment strategies will likely focus on deep remission, which includes endoscopic and histological healing, as a predictor of better long-term outcomes. [10]

5. Non-Invasive Monitoring Tools: Currently, colonoscopy remains the gold standard for disease

monitoring, but it is invasive and uncomfortable. New approaches, such as fecal biomarkers (e.g., calprotectin), blood tests, imaging techniques, and wearable health devices, are being developed for easier, real-time disease tracking.

6. Early Intervention and Disease Modification: Emerging evidence suggests that treating UC aggressively early in the disease course may prevent complications and improve long-term outcomes. Research is focusing on identifying patients at high risk of severe disease early and initiating prompt, targeted therapy. [20]

7. Integrative and Holistic Approaches: There's growing interest in addressing UC through a more comprehensive approach, incorporating mental health, lifestyle, and nutritional support alongside pharmacologic treatment. Mind-gut therapies, stress management, and personalized diets may become part of routine care.

8. Gene and Cell-Based Therapies:

Though still in early stages, experimental therapies involving stem cells or gene editing may offer long-term or even curative options for UC in the future. Mesenchymal stem cell therapy and immune modulation at the genetic level are being actively explored. [6]

CONCLUSION:

Ulcerative colitis remains a challenging chronic inflammatory condition with a multifactorial origin. With rising global prevalence, comprehensive management approaches are necessary to control symptoms, induce remission, and prevent complications. Advances in biologic therapies and diagnostic techniques have significantly improved outcomes. However, continued research is vital to identify more effective and personalized treatments, improve quality of life, and potentially find a cure. Emphasis on patient education, lifestyle modification, and adherence to treatment can play a transformative role in disease control.

REFERENCES

1. Ungaro R, Mehandru S, Allen PB, et al. Ulcerative colitis. Lancet. 2017;389(10080):1756-70.
2. Danese S, Fiocchi C. Ulcerative colitis. N Engl J Med. 2011;365(18):1713-25.
3. Ordás I, Eckmann L, Talamini M, et al. Ulcerative colitis. Lancet. 2012;380(9853):1606-19.
4. Ananthakrishnan AN. Epidemiology and risk factors for IBD. Nat Rev Gastroenterol Hepatol. 2015;12(4):205-17.
5. Xavier RJ, Podolsky DK. Unravelling the pathogenesis of inflammatory bowel disease. Nature. 2007;448(7152):427-34.
6. Khor B, Gardet A, Xavier RJ. Genetics and pathogenesis of IBD. Nature. 2011;474(7351):307-17. [6]
7. Neurath MF. Cytokines in inflammatory bowel disease. Nat Rev Immunol. 2014;14(5):329-42. [7]
8. Ko JK, Auyeung KK. Inflammatory bowel disease: etiology, pathogenesis, and current therapy. Curr Pharm Des. 2014;20(7):1082-96.
9. Harbord M, Eliakim R, Bettenworth D, et al. European consensus on diagnosis and management of ulcerative colitis. J Crohns Colitis. 2017;11(6):649-70.
10. Dignass A, Lindsay JO, Sturm A, et al. Second European evidence-based consensus on the diagnosis and management of UC. J Crohns Colitis. 2012;6(10):991-1030.
11. Ford AC, Moayyedi P, Hanauer SB. Ulcerative colitis. BMJ. 2013;346\:f432.
12. Rubin DT, Ananthakrishnan AN, Siegel CA, et al. ACG clinical guideline: ulcerative colitis in

adults. Am J Gastroenterol. 2019;114(3):384-413.
13. Lichtenstein GR, Loftus EV, Isaacs KL, et al. ACG ulcerative colitis activity index. Am J Gastroenterol. 2015;110(4):481-90.
14. Sands BE, Peyrin-Biroulet L, Loftus EV Jr, et al. Vedolizumab versus adalimumab for UC. N Engl J Med. 2019;381(13):1215-26. [19]
15. Sandborn WJ, Su C, Sands BE, et al. Tofacitinib as induction and maintenance therapy for UC. N Engl J Med. 2017;376(18):1723-36. [15]
16. D'Haens G, Reinisch W, Panaccione R, et al. Lymphocyte trafficking and anti-integrins in IBD. Nat Rev Gastroenterol Hepatol. 2014;11(12):739-47.
17. Paramsothy S, Paramsothy R, Rubin DT, et al. Fecal microbiota transplantation for UC. JAMA. 2017;318(20):1987-1995. [17]
18. Hanauer SB. Update on the pathogenesis, diagnosis, and management of ulcerative colitis. Clin Gastroenterol Hepatol. 2004;2(7):525-34.
19. Nielsen OH, Ainsworth MA. Tumor necrosis factor inhibitors in IBD. Expert Opin Drug Saf. 2013;12(4):491-503.
20. Ho GT, Mowat C, Goddard CJ, et al. Predicting the outcome of UC. Gut. 2004;53(10):1470-5.

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