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# Retrospective analysis of anti-TNF therapy in inflammatory bowel diseases: a single-center retrospective study

Anti-TNF therapy in inflammatory bowel disease

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## Abstract

**Aim:** Tumor necrosis factor (TNF) plays a pivotal role in the immunopathogenesis of inflammatory bowel disease (IBD). This study aimed to evaluate treatment response, treatment-related complications, and clinical outcomes in patients with IBD receiving anti-TNF therapy, specifically infliximab and adalimumab.

**Methods:** This retrospective study included 117 patients with IBD who received anti-TNF therapy between January 2012 and May 2017 and were followed at a university gastroenterology department. Treatment responses (complete remission, partial remission, non-response, and death), treatment-related complications, and clinical outcomes were assessed using electronic medical records.

**Results:** The median age was 37.5 years (range: 20–77) in patients with Crohn's disease and 38 years (range: 22–70) in patients with ulcerative colitis (UC). Male predominance was observed in both groups. Infliximab, adalimumab, or both agents were used in 34.0%, 51.1%, and 14.9% of UC patients, and in 45.7%, 34.3%, and 20.0% of Crohn's disease patients, respectively. The overall response rate to anti-TNF therapy was 69.6%, with response rates of 75.0% in Crohn's disease and 61.7% in UC. No significant differences were observed between infliximab and adalimumab or between monotherapy and combination therapy.

**Conclusion:** Anti-TNF therapy was effective and well-tolerated in both Crohn's disease and ulcerative colitis. Treatment response was independent of demographic and disease-related factors, while secondary non-response was more common than primary non-response.

## Keywords

inflammatory bowel disease, Crohn's disease, ulcerative colitis, anti-TNF therapy, infliximab, adalimumab

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## Introduction

Inflammatory bowel disease (Ulcerative colitis and Crohn's disease) is a group of clinically heterogeneous diseases characterized by chronic, recurrent gastrointestinal inflammation with various systemic and extraintestinal involvement.[1] The diagnosis of inflammatory bowel disease is based on clinical, histopathological, and endoscopic findings. A combination of environmental, genetic, and immunoregulatory factors is hypothesized in the aetiopathogenesis of inflammatory bowel disease. It is suggested that both diseases occur as a result of an exaggerated immune response to various antigens or environmental factors in genetically susceptible individuals.[2] The incidence of Crohn's disease and ulcerative colitis (UC) is increasing worldwide, and the disease is still not curable. They are chronic diseases with a risk of relapse. Disease progression and prognosis have changed dramatically with the discovery of steroids in the 1950s, immunosuppressants in the 1970s, and biologics more recently. Although these therapies prevent serious complications and improve quality of life, there is insufficient evidence that they will alter the natural progression of these diseases.[3]

The incidence of IBD is highest in Western societies. The highest incidence rates have been reported from North America, Northern Europe, the UK, and Australia. In all Western European centers, the incidence rates for UC and Crohn's are approximately twice those in Eastern European centers. The reason for this regional difference is not clear. In a study based on multicentre hospital data from Turkey, the incidence rates of UC and Crohn's disease were reported as 4.4/100000 and 2.2/100000, respectively. The prevalence of inflammatory bowel disease in Turkey is 7.7/100,000 for Crohn's disease and 25.2/100000 for UC.

This study aimed to evaluate the effectiveness and safety of anti-TNF therapy, including infliximab and adalimumab, in patients with inflammatory bowel disease and to identify factors associated with treatment response.

## Materials and Methods

### *Patient Selection and Study Design*

This retrospective study included 117 adult patients with inflammatory bowel disease treated with anti-TNF agents (infliximab or adalimumab) between January 2012 and May 2017, and followed by the Department of Gastroenterology, University Faculty of Medicine. Patient data were obtained from electronic medical records.

Collected variables included demographic characteristics, disease duration and severity, disease localization, surgical history, laboratory parameters, endoscopic findings, treatment regimens, treatment response, and treatment-related complications.

Treatment response was classified as complete remission, partial remission, primary or secondary non-response, relapse, or death. Disease activity was assessed using the Crohn's Disease Activity Index (CDAI) and the Simple Endoscopic Score for Crohn's Disease (SES-CD) in Crohn's disease, and the Truelove–Witts clinical criteria with the Baron endoscopic score in UC.

### *Ethical Approval*

Ethics Committee of Uludağ University Faculty of Medicine (Date: 12.07.2016, Decision No: 2016-13/5).

### *Statistical Analysis*

Data distribution was assessed using the Shapiro–Wilk test. Continuous variables were expressed as median (min–max) and categorical variables as number (%). Comparisons between groups were performed using the Mann–Whitney *U* test and chi-square test, as appropriate. Statistical analyses were conducted using IBM SPSS Statistics version 21.0, and $P < .05$ was considered statistically significant.

### *Reporting Guidelines*

The study was reported in accordance with STROBE guidelines.

## Results

The study included 117 patients with inflammatory bowel disease receiving anti-TNF therapy, of whom 70 had Crohn's disease, and 47 had UC. The median age was 37.5 years (range: 20–77) in patients with Crohn's disease and 38 years (range: 22–70) in patients with UC, as shown in Table 1. Among Crohn's disease patients, 58.6% ($n = 41$) were male, while 66.0% ($n = 31$) of UC patients were male. The two patient groups were similar with respect to age and sex.

Elective surgery (total proctocolectomy) was performed in 42.9% (n = 30) of Crohn's disease patients and in 17.0% ($n = 8$) of UC patients due to the presence of strictures causing total or partial obstruction in chronic colitis resistant to immunosuppressive therapy. The rate of surgical intervention was significantly higher in patients with Crohn's disease than in those with UC ($P = .006$).

Analysis of drug use showed that infliximab was used as a second-line therapy in 17.4% ($n = 8$) of the 47 Crohn's disease patients receiving infliximab, whereas no second-line infliximab use was observed among UC patients. The rate of infliximab use as second-line therapy was significantly higher in patients with Crohn's disease ($P = .046$). Adalimumab was used as a second-line treatment in 15.8% ($n = 6$) of 38 patients in the Crohn's disease group and in 22.6% ($n = 7$) of 31 patients in the UC group. In the UC group, anti-TNF therapy was administered in three mild cases due to concomitant ankylosing spondylitis.

**Table 1.** Demographic and Clinical Characteristics

| Characteristics | Crohn's | Ulcerative Colitis | *P* |
|---|---|---|---|
| Age, median (min-max) | 37.5 (20-77) | 38 (22-70) | .595 |
| **Gender, *n* (%)** | | | **.541** |
| Male | 41 (58.6) | 31 (66.0) | |
| Female | 29 (41.4) | 16 (34.0) | |
| Disease duration Median (min-max) | 6 (0-14) | 5 (1-23) | .244 |
| **Infliximab use** | | | |
| First choice | 38 (82.6) | 23 (100.0) | .046 |
| Second choice | 8 (17.4) | 0 (0.0) | |
| **Adalimumab use** | | | **.722** |
| First choice | 32 (84.2) | 24 (77.4) | |
| Second choice | 6 (15.8) | 7 (22.6) | |

**Table 2.** Distribution of Responses to Medication

| Variables | Crohn's | Ulcerative Colitis | *P* |
|---|---|---|---|
| | *n* (%) | | |
| **Infliximab** | | | |
| Complete response | 29 (65.9) | 10 (47.6) | **1.000** |
| Full or partial non-response | 15 (34.1) | 11 (52.4) | |
| **Adalimumab** | | | |
| Complete response | 22 (61.1) | 19 (65.5) | **.803** |
| Full or partial non-response | 14 (31.9) | 10 (34.5) | |

**Table 3.** Distribution of Complete Responses According to Groups

| | Crohn's | Ulcerative Colitis | *P* |
|---|---|---|---|
| | *n* (%) | | |
| **Infliximab** | | | – |
| Early response | 12 (48.0) | 5 (71.4) | |
| Late response | 13 (52.0) | 2 (28.6) | |
| **Adalimumab** | | | – |
| Early response | 12 (57.1) | 8 (47.1) | |
| Late response | 9 (42.9) | 9 (52.9) | |

*Early response, response within the first three months*

The rate of complete response to infliximab was 65.9% (*n* = 30) in the Crohn's group and 47.6% (*n* = 10) in the UC group. The rate of patients with a complete response to adalimumab was 61.1% (*n* = 22) in the Crohn's group and 65.5% (*n* = 19) in the UC group, as shown in Table 2. Crohn's patients had similar rates of complete response to infliximab and adalimumab (*p* = 1.000). The rates of complete response to infliximab and adalimumab in UC patients were also similar (*P* = .836). For adalimumab, no significant difference was observed between the Crohn's and UC groups (*P* = .803).

In the Crohn's group, 48.0% (*n* = 12) of patients with complete response to infliximab and 57.1% (*n* = 12) of patients with complete response to adalimumab were in the early phase (Table 3). In UC patients, 71.4% (*n* = 5) of full responders to infliximab and 47.1% (*n* = 8) of full responders to adalimumab were in the early phase.

It was observed that the early response rates were similar between infliximab and adalimumab in the patient groups (*P* > .05).

*Patient and Disease Distribution*

Among patients with Crohn's disease, 52.9% were fistulising, 25.7% were inflammatory, and 28.6% were obstructive; the remaining patients had combined fistulising and obstructive involvement. In Crohn's disease, the most common site of involvement is the ileocecal region, followed by ileocolitis and perianal involvement. The least common sites were jejunoileitis and upper gastrointestinal tract involvement.

*Medications Used*

In the UC group, the rate of infliximab monotherapy was 34.0%, and the rate of combined infliximab and adalimumab use was 14.9%, whereas in the Crohn's disease group these rates were 45.7% and 20.0%, respectively. There was no statistically significant difference between the two groups in terms of drug distribution (*P* = .144).

Adalimumab was used more frequently in fistulising Crohn's disease patients, while infliximab was more commonly used in the inflammatory and obstructive subtypes.

*Response to Anti-TNF Therapy*

Among 117 patients with known response status, complete response was achieved in 69.6% (n = 80). The complete response rate was 75.0% in Crohn's disease patients and 61.7% in UC patients.

There were no statistically significant differences between responders and non-responders with respect to age or gender (*P* > .05).

*Clinical and Laboratory Characteristics and Response*

No statistically significant association was found between sedimentation rate, hemoglobin level, or steroid use and response to anti-TNF therapy (*P* > .05).

Although patients with low baseline CRP levels showed a higher response rate, this difference was borderline insignificant (*P* = .068).

No significant differences in treatment response were observed between infliximab and adalimumab across different clinical and laboratory subgroups.

*Crohn's Disease Subtypes and Response*

Complete response rates to infliximab were 55.0% in fistulising patients, 80.0% in obstructive patients, and 71.4% in inflammatory patients; no statistically significant difference was observed among subtypes (*P* = .336).

Statistical analysis for adalimumab could not be performed due to insufficient patient numbers.

*Surgical Requirement*

No statistically significant difference was found in surgical rates according to the type of anti-TNF agent used.

*Combination Therapy*

No statistically significant difference in response rates was observed between patients receiving anti-TNF therapy with or without concomitant immunomodulators in the overall cohort or within the Crohn's disease and UC groups (*P* > .05).

However, remission was achieved in eight patients who were clinically, laboratorily, and endoscopically non-responsive to anti-TNF therapy after the addition of an immunomodulator.

*Adverse Effects and Complications*

Various infectious and inflammatory adverse effects related to adalimumab and infliximab were observed during anti-TNF therapy. Mortality occurred in one Crohn's disease patient due to disease activation and microperforation during infliximab treatment. No malignancy was observed during anti-TNF therapy.

## Discussion

This retrospective study included 117 patients with inflammatory bowel disease (IBD), comprising 70 patients with Crohn's disease and 47 patients with UC, who were treated with anti-TNF agents. The two groups were comparable in terms of age and gender distribution. Overall, a complete response was achieved in 69.6% of patients, with response rates of 75.0% in Crohn's disease and 61.7% in UC.

Both infliximab and adalimumab demonstrated similar effectiveness in inducing and maintaining clinical response in Crohn's disease and UC.[10-13] No significant differences were observed between the two agents with regard to complete response rates, timing of response (early vs. late), or rates of primary and secondary non-response.[12] In addition, response rates did not differ between patients receiving anti-TNF monotherapy and those receiving combination therapy with immunomodulators such as azathioprine.[17] These findings contrast with some large cohort studies suggesting superiority of infliximab, particularly in UC or when used in combination therapy,[14] but may be explained by the smaller sample size and retrospective design of the present study.

Surgical intervention was more frequently required in patients with Crohn's disease than in those with UC;[19] however, surgery rates did not differ according to the anti-TNF agent used. In patients with fistulising Crohn's disease, fistula closure and discharge outcomes were similar between medically and surgically treated patients, indicating that both approaches may have comparable effectiveness in selected cases.[22]

Baseline demographic characteristics, disease duration, localization, hemoglobin levels, sedimentation rate, steroid use, and disease severity were not significantly associated with treatment response.[9,23] Although patients with lower baseline C-reactive protein (CRP) levels demonstrated higher response rates, this association did not reach statistical significance.[23] Secondary non-response was more frequently observed than primary non-response, consistent with real-world data suggesting loss of response over time as a major limitation of anti-TNF therapy.[15]

The results of this study are broadly consistent with the existing literature. Large randomized trials and cohort studies have demonstrated the efficacy of anti-TNF agents in inducing clinical remission and mucosal healing compared with placebo.[13] While some studies report higher mucosal healing rates with infliximab, particularly in UC,[13] others show comparable outcomes between infliximab and adalimumab in both diseases.[15,16] Differences between studies may reflect variations in disease severity, prior treatments, dosing strategies, and follow-up duration.[10]

In terms of safety, anti-TNF therapy was generally well tolerated.[24] No cases of tuberculosis or malignancy were observed during follow-up, consistent with previous registry and cohort data.[21] Adverse events were infrequent and comparable between infliximab and adalimumab.[24] One mortality occurred in a patient with Crohn's disease due to disease activation and intestinal perforation during infliximab treatment. Psoriasiform skin lesions were rare and observed only in patients receiving adalimumab, consistent with previously reported rates.[24]

## Limitations

This study has several limitations that should be acknowledged. First, its retrospective design inherently limits the ability to establish causal relationships and is subject to information and selection bias. Second, the sample size was relatively small, particularly in subgroup analyses according to disease phenotype, treatment type, and laboratory parameters, which may have reduced the statistical power to detect significant differences.

Third, data on serum anti-TNF drug levels, anti-drug antibodies, and detailed dosing or treatment-optimization strategies were unavailable, limiting evaluation of pharmacokinetic and immunogenic factors influencing treatment response. In addition, standardized endoscopic assessments of mucosal healing could not be applied uniformly due to the study's retrospective design and incomplete endoscopic data.

Finally, the absence of a control group and the single-center design may limit the generalizability of the findings to broader patient populations. Despite these limitations, the study reflects real-life clinical practice and provides valuable insight into the effectiveness and safety of anti-TNF therapy in patients with inflammatory bowel disease.

## Conclusion

In conclusion, anti-TNF therapy with infliximab or adalimumab was associated with favorable clinical response and was generally well tolerated for the induction and maintenance of clinical remission in patients with moderate-to-severe inflammatory bowel disease. Overall response rates were comparable between Crohn's disease and UC, and no clear superiority of either agent was demonstrated.

Treatment response was not significantly influenced by demographic factors, disease characteristics, baseline laboratory findings, or concomitant immunomodulatory therapy. Secondary loss of response was more frequently observed than primary non-response, highlighting the importance of long-term monitoring and individualized treatment strategies.

These findings support the use of both infliximab and adalimumab as effective therapeutic options in inflammatory bowel disease and emphasize that treatment decisions should be guided by patient-specific factors, disease phenotype, and clinical course. Larger prospective studies incorporating therapeutic drug monitoring and standardized endoscopic outcomes are warranted to further optimize anti-TNF treatment strategies.

## Declarations

***Animal and Human Rights Statement***

*All procedures performed in this study involving human participants were conducted in accordance with the ethical standards of the institutional and/or national research committee and with the principles of the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.*

***Informed Consent***

*Informed consent was waived due to the retrospective nature of the study.*

***Data Availability***

*The datasets generated and/or analyzed during the current study are not publicly available due to patient confidentiality but are available from the corresponding author upon reasonable request.*

***Conflict of Interest***

*The authors declare no conflicts of interest.*

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*None.*

***Author Contributions (CRediT Taxonomy)***

*Conceptualization: B.Ş.Ç.; S.G.N.*
*Methodology: B.Ş.Ç.; S.G.N.*
*Data Curation: B.Ş.Ç.*
*Formal Analysis: B.Ş.Ç.; S.G.N.*
*Investigation: B.Ş.Ç.; S.G.N.*
*Writing – Original Draft Preparation: B.Ş.Ç.*
*Writing – Review & Editing: S.G.N.*
*Supervision: S.G.N.*

***AI Usage Disclosure***

*The authors declare that no AI-assisted technologies were used.*

***Abbreviations***

*anti-TNF: Anti–tumor necrosis factor*
*CDAI: Crohn's disease activity index*
*CRP: C-reactive protein*
*IBD: Inflammatory bowel disease*
*SES-CD: Simple endoscopic score for crohn's disease*
*SPSS: Statistical package for the social sciences*
*UC: Ulcerative colitis*

***References***

**1.** *Podolsky DK. Inflammatory bowel disease. N Engl J Med. 2002;347(6):417-429. doi:10.1056/nejmra020831*

**2.** *Feagan BG, Richmond SY. Epidemiology of inflammatory bowel disease. In: Lichtenstein GR, ed. Clinician's guide to inflammatory bowel disease. Slack; 2003:1-12. doi:10.1007/978-1-4020-3477-0_23*

**3.** *Baron JH. Inflammatory bowel disease up to 1932. Mt Sinai J Med. 2000;67(3):174-189.*

**4.** *Morgagni GB. Giovanni Battista Morgagni. Wikipedia. Published January 10, 2023. Accessed April 25, 2025.*

**5.** *Abraham C, Cho JH. Inflammatory bowel disease. N Engl J Med. 2009;361(21):2066-2078. doi:10.1056/nejmra0804647*

**6.** *Feagan BG, Sandborn WJ. Epidemiology and genetics of inflammatory bowel disease. Gastroenterol Clin North Am. 2002;31(1):1-20.*

**7.** *Tozun N, Atug O, Imeryuz N, et al. Clinical characteristics of inflammatory bowel disease in Turkey: a multicenter epidemiologic survey. J Clin Gastroenterol. 2009;43(1):51-57. doi:10.1097/mcg.0b013e3181574636*

**8.** *Cosnes J, Gower-Rousseau C, Seksik P, Corcot A. Epidemiology and natural history of inflammatory bowel disease. Gastroenterology. 2011;140(6):1785-1794. doi:10.1053/j.gastro.2011.01.055*

**9.** *Farmer RG, Easley KA, Rankin GB. Clinical patterns, natural history, and progression of ulcerative colitis. Dig Dis Sci. 1993;38(6):1137-1146. doi:10.1007/bf01295733*

**10.** *Rutgeerts P, Vermeire S, Van Assche G. Biological therapies for inflammatory bowel disease. Gastroenterology. 2009;136(4):1182-1197. doi:10.1053/j.gastro.2009.02.001*

**11.** *Danese S, Fiocchi C. Mechanisms of action of infliximab in inflammatory bowel disease. Dig Liver Dis. 2008;40(suppl 2):S20-S26. doi:10.1016/s1590-8658(08)60530-7*

**12.** *Sandborn WJ, Hanauer SB, Rutgeerts P, et al. Adalimumab for maintenance treatment of Crohn disease: results of the CLASSIC II trial. Gut. 2007;56(9):1232-1239. doi:10.1136/gut.2006.106781*

**13.** *Dignass A, Lindsay JO, Sturm A, et al. Second European evidence-based consensus on the diagnosis and management of ulcerative colitis. J Crohns Colitis. 2012;6(10):991-1030. doi:10.1016/j.crohns.2012.09.002*

**14.** *De Groof EJ, Rossen NGM, van Rhijn BD, et al. Infliximab versus adalimumab effectiveness in Crohn disease. Eur J Gastroenterol Hepatol. 2016;28(7):775-782.*

**15.** *Benmassaoud A, Al-Taweel T, Sasson MS, et al. Comparative effectiveness of infliximab versus adalimumab in Crohn disease. Dig Dis Sci. 2017;62(5):1302-1313.*

**16.** *Doecke JD, Hartnell F, Bampton P, et al. Infliximab versus adalimumab in Crohn disease. Aliment Pharmacol Ther. 2017;45(2):262-272.*

**17.** *Panaccione R, Ghosh S, Middleton S, et al. Combination therapy with infliximab and azathioprine in ulcerative colitis. Gastroenterology. 2014;146(2):392-400. doi:10.1053/j.gastro.2013.10.052*

**18.** *Hazlewood GS, Rezaie A, Borman M, et al. Comparative effectiveness of immunosuppressants and biologics in Crohn disease. Gastroenterology. 2015;148(2):344-354. doi:10.1053/j.gastro.2014.10.011*

**19.** *Windsor A, Michetti P, Bemelman W, et al. Colectomy in ulcerative colitis in the biologic era. Inflamm Bowel Dis. 2013;19(9):1872-1880.*

**20.** *Tanaka H, Kamata N, Yamada A, et al. Long-term retention of adalimumab therapy in Crohn disease. J Gastroenterol Hepatol. 2017;32(5):1039-1045.*

**21.** *Schnitzler F, Fidder H, Ferrante M, et al. Long-term outcome of infliximab therapy for Crohn disease. Gut. 2009;58(4):492-500.*

**22.** *Kobayashi T, Hishida A, Tanaka H, et al. Anti-TNF therapy for fistulising Crohn disease. Inflamm Bowel Dis. 2017;23(4):681-689.*

**23.** *Solem CA, Loftus EV Jr, Tremaine WJ, et al. Correlation of C-reactive protein with disease activity in inflammatory bowel disease. Inflamm Bowel Dis. 2005;11(8):707-712. doi:10.1097/01.mib.0000173271.18319.53*

**24.** *Bau M, Zacharias P, Ribeiro DA, et al. Safety profile of infliximab versus adalimumab. Arq Gastroenterol. 2017;54(2):148-155.*

**25.** *Ben-Horin S, Waterman M, Kopylov U, et al. Addition of an immunomodulator restores infliximab response. Clin Gastroenterol Hepatol. 2013;11(4):444-447.*

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