



Original Article

Inflammatory Bowel Disease [IBD] and Physical Activity: A Study on the Impact of Diagnosis on the Level of Exercise Amongst Patients With IBD

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Abstract

Background and Aims: Inflammatory bowel disease [IBD] can impair patients' functional capacity with significant negative effects on their quality of life. Our aim was to determine the impact of IBD diagnosis on fitness levels and to assess the levels of engagement in physical activity and fatigue in IBD patient before and after diagnosis.

Methods: A prospective multi-centre cross-sectional study was performed. Patients diagnosed with IBD in the previous 18 months were recruited. Inclusion criteria included clinical remission and/or no treatment changes within the previous 6 months. Physical exercise levels were assessed by the Godin score and fatigue levels was assessed by the functional assessment of chronic illness therapy [FACIT] score.

Results: In total, 158 patients (100 Crohn's disease [CD]) were recruited. Mean age was 35.1 years (95% confidence interval [CI] \pm 2.0). Gender distribution was approximately equal [51.3% male]. The Mean Harvey Bradshaw and Simple Clinical Colitis Activity indices were 2.25 [95% CI \pm 0.40] and 1.64 [95% CI \pm 0.49], respectively. The mean Godin score difference before and after IBD diagnosis was 6.94 [p = 0.002]. Patients with ulcerative colitis [UC] [41.8%] were more likely than patients with CD [23.0%] to reduce their exercise levels [p = 0.04]. FACIT scores were lower in patients who had experienced relapses [p = 0.012] and had severe disease [p = 0.011]. Approximately one-third of patients reduced their activity level following IBD diagnosis.

Conclusions: Patients were significantly less physically active after a diagnosis of IBD and this was more apparent in UC. Identification of the risk factors associated with loss of fitness levels would help to address the reduced patient quality of life.

Key Words: IBD; UC; CD; physical exercise; fitness; quality of life

1. Introduction

Inflammatory bowel disease [IBD], mainly comprising ulcerative colitis [UC] and Crohn's disease [CD], are chronic, idiopathic inflammatory conditions that affect the gastrointestinal tract [GIT]. Although the aetiology is as yet unknown, it is proposed that IBD develops in genetically susceptible individuals via a complex interaction of multiple environmental factors [exposome], with a dysfunctional mucosal immune system.^{1,2}

UC and CD have a varied clinical spectrum ranging from an asymptomatic quiescent state to more serious clinical conditions, which may ultimately require treatment with a combination of immunomodulatory drugs and/or surgery. Patients usually present with gastrointestinal symptoms, such as abdominal pain, bloating, liquid and/or bloody diarrhoea, constitutional symptoms, such as anorexia, malaise, fatigue, weight loss, fever and lethargy, and a variety of extra-intestinal manifestations.³ In view of its unpredictable behaviour and multitude of complications, a diagnosis of IBD can greatly impact the quality of life of patients and affect their work, family life and recreational activity.^{4,5}

There is evidence that exercise is of potential benefit in various chronic diseases.⁶ Regular physical activity can help to improve one's physical fitness, general wellbeing and psychological health, ultimately leading to a reduction in morbidity and mortality.^{7–10} IBD can impair the functional capacity of patients in view of its restrictive symptoms and it may discourage them to take up or continue fitness activities after diagnosis. Nevertheless, there is some evidence that IBD patients perceive exercise and sports as being helpful in managing their psychological health and reducing some of the symptoms and complications of IBD.^{11–14} Table 1 summarizes the available data on studies pertaining to exercise and IBD.^{10,11,15–19}

Obesity may complicate the clinical course of IBD by increasing relapse rates, hospitalization, development of anoperineal complications and requiring earlier surgical intervention with a higher risk of post-surgical morbidity.^{20,21} Sonnenberg suggested that patients with a sedentary or less physically demanding jobs are associated with an increased prevalence of IBD.²² Additionally, patients who exercised regularly during the previous 5 years may have a lower chance of developing CD, especially if this exercise is performed daily.^{16,17,23,24} IBD patients tend to report a less active lifestyle than their unaffected counterparts.²⁵

The primary aim of our study was to determine the level of exercise before and after IBD diagnosis. We also aimed to determine the impact of IBD diagnosis on exercising, and vice versa. We assessed for any correlation between severity of disease, medications used and level of activity and attempted to determine any correlation between level of exercise after diagnosis [while in clinical remission] and the Functional Assessment of Chronic Illness Therapy [FACIT] Fatigue Scale as a patient-related outcome score [PRO].²⁶

Our findings will help to identify any limiting factors pointed out by IBD patients and ascertain areas where healthcare professionals can assist the individual in clarifying any misconceptions about exercise and its impact on their condition.

2. Materials and Methods

Patients were identified through each centre's database. All patients between the ages of 16 and 65 years who had a confirmed diagnosis of CD and UC according to established criteria^{27,28} were included in the study. The patients included were diagnosed with IBD within the previous 18 months and were in clinical remission for the past

6 months. This is defined as a Harvey Bradshaw index [HBI] of 4 or less or a Simple Clinical Colitis Activity Index [SCCAI] score of ≤ 2 , for CD and UC, respectively.

Any patients with co-morbidities affecting physical exercise and/or mobility or with another chronic medical diagnosis made since their IBD diagnosis were excluded. Patients with a history of a fracture [which is not secondary to physical activity] or a significant change in IBD-related medications over the past 6 months were also excluded. Patients with severe, active musculoskeletal extra-intestinal manifestation[s] despite disease remission in the gut which was unresponsive to treatment and impaired significantly exercise [or daily activities] were excluded from the study.

Clinical data were collected from medical databases and patient case notes. A standard questionnaire was distributed to patients to fill in.

The level of exercise before and after diagnosis was recorded using the Godin Leisure-Time Exercise Questionnaire. Patients were asked to complete a self-explanatory, brief four-item query of usual leisure-time exercise habits. A score of ≥ 24 units was interpreted as active, 14–23 units as moderately active and < 14 units as insufficiently active/ sedentary [Supplementary Material].

Sedentary work is defined as occasionally lifting no more than 5 kg, and sitting with occasional walking and standing. A sedentary job is defined as one which involves sitting, with a certain amount of walking and standing often necessary in carrying out job duties. Although sitting is primarily involved in a sedentary job, walking and standing should be required only occasionally. Standing and walking should total no more than 2 h per 8-h working day, while sitting would total about 6 h per 8-h working day.

Severe disease was defined as need for IBD-related surgery and/or anti-tumour necrosis factor [TNF]-alpha agents.

The FACIT Fatigue Scale [Version 4] [Supplementary Material] was used in our questionnaire to measure fatigue in IBD patients. Scores are in the range 0–52; the lower the score the more fatigue experienced by the patient, with scores of < 30 indicating severe fatigue.

3. Results

3.1. Demographics and general characteristics

In total, 158 patients [100 CD] from six different European centres [Greece, Cyprus, Malta and Hungary] and Israel were recruited. The mean age of patients was 35.1 years (95% confidence interval [CI \pm 2.0]). Gender distribution was approximately equal [51.3% male].

Table 2 provides clinical characteristics of the patients. The majority of patients were diagnosed with IBD between 17 and 40 years of age [71.9%]. A minority [4.4%] were less than 17 years old and the rest [23.7%] were above the age of 40 years. There was no significant change in body mass index [BMI] in patients with CD and UC before and after IBD diagnosis. Their level of education is given in Table 3.

Overall, only 38.3% of patients required corticosteroid therapy in the previous 18 months. Of these 24.0% were CD and 14.3% were UC patients. All patients were in clinical remission in the previous 6 months as defined by the HBI and SCCAI score.

3.2. Exercise and IBD

The majority of patients [87.5%] considered physical activity to be important in their daily lives. This was described as being very

Table 1. Summary of the studies on exercise and IBD

Author [year]	Type of study	No. of patients	Aims	Results
Lykouras D.[2017]	Prospective observational study	18	To determine the exercise potential in IBD patients	IBD patients were found to have competitive exercise potential
Jones P.D. [2015]	Prospective observational cohort study	1857	To evaluate the link between exercise and subsequent disease activity.	Highly active patients with CD in remission were less likely to develop active disease at 6 months [$p = 0.01$].
Klare P. [2015]	Randomized controlled trials	30	To investigate the effects of 10 weeks of moderate physical activity on health-related quality of life in patients with IBD	Patients with moderately active IBD were not limited by symptoms and were able to enjoy regular endurance exercise. Health-related quality of life was significantly improved [$p = 0.023$]
Khalili H. [2013]	Prospective cohort study	647	To assess the link between physical activity and risk of UC and CD	Exercise decreased the risk of CD [$p = 0.02$], but not UC
Chan D.[2013]	Retrospective [survey] study	918	To explore sports and physical activity in UK IBD patients	A significant number of IBD patients stated that their diagnosis affected their ability to participate in exercise
Ng V. [2007]	Randomized controlled trials	32	To assess the effect of a low-intensity walking programme on the quality of life in patients with CD	Improvement in quality of life [$p < 0.05$] with no adverse effect on disease activity
Loudon C.P.[1999]	Pilot prospective study	12	To evaluate the effect of regular light-intensity exercise on sedentary patients with CD	Physical and psychological improvement. No adverse effect on disease activity

IBD, inflammatory bowel disease; CD, Crohn's disease; UC, ulcerative colitis.

Table 2. Patients' clinical characteristics including mean BMI and Godin scores before and after diagnosis

CD	Percentage CD	UC	Percentage UC
L1	41.2	E1	21.6
L2	16.5	E2	45.1
L3	38.1	E3	33.3
L4	4.1		
P	11		
B1	73.4		
B2	16		
B3	10.6		
Smoker	30		26.3
Ex-smoker	25		17.5
Non-smoker	45		56.1
5-ASA	37		81
Thiopurines	37		17.2
Anti-TNF agents	41		15.5
Methotrexate	3		1.72
Integrin receptor antagonists	2		1.72
Surgery + 5-ASA	2		2.6
Surgery + thiopurines	3		0
Surgery + anti-TNF agents	7		0
Mean BMI before diagnosis	24.9 [\pm 1.1]		23.5 [\pm 1.2]
Mean BMI after diagnosis	25.7 [\pm 1.1]		23.5 [\pm 1.1]
Mean Godin before diagnosis	26.9 [\pm 5.0]		32.2 [\pm 6.0]
Mean Godin after diagnosis	21.1 [\pm 4.5]		22.8 [\pm 5.2]

L: location of disease. L1: ileal; L2: colonic; L3: ileocolonic; L4: upper gastrointestinal disease. B: behaviour. B1: non-stricturing, non-penetrating; B2: stricturing; B3: penetrating; P: perianal disease modifier; E1: proctitis; E2: left-sided; E3: pancolitis. CD, Crohn's disease; UC, ulcerative colitis; 5-ASA, 5-aminosalicylic acid; anti-TNF, anti-tumour necrosis factor.

important by 29.6% of patients, of moderate importance by 30.9% and of some importance by 27%. The rest [12.5%] stated that physical activity was of no importance.

The majority of patients [69.5%] mentioned that IBD diagnosis affected their level of fitness [significantly: 25.4%; moderately:

Table 3. Level of education

Education level	%
No schooling completed	9.7
High school	39.6
College degree	16.9
Bachelor degree	24.0
Masters degree	9.1
Doctorate degree	0.7

22.7%; minimally: 21.4%], while 30.5% felt that diagnosis had no effect.

3.3. Patient perception of physical activity and IBD

Patient perception on the effect of exercise in IBD varied: 45.8% of patients reported that exercise helped symptom control, 41.3% believed that exercise reduced relapse rates, whilst 79.4% believed that exercise could improve their quality of life.

Interestingly, 46.1% of patients felt that medical professionals did not give enough importance to their physical activity level and the majority of patients [75.5%] considered that alternative and complimentary methods to control their condition was an important issue to be discussed with them.

Patient responses to what they needed to take up physical activity or to improve their activity levels were: better symptom control [29.9%], more support from healthcare professionals [13.2%], family support [12.5%], better education on IBD and physical activity [7.6%], and better support from instructors [2.8%].

3.4. Levels of physical activity

3.4.1. Patient's physical activity level

When patients were interviewed about their exercise activity before and after diagnosis of IBD, there was a reduction in physical activity in all those patients who performed sports at all levels: amateur, semi-professionally and professionally.

Before IBD diagnosis, 5% of patients engaged in sports on a professional level. This number decreased to 2.2% after IBD diagnosis. Similarly, those patients who practised sports on a semi-professional basis decreased from 7.1% to 3% after the IBD diagnosis. In those patients who were involved at an amateur level, there was also a drop from 43.6% before diagnosis to 34.6% after diagnosis. It was only in patients who rarely performed sport prior to their diagnosis [44.3%] who increased their level of exercise [60.2%] after diagnosis [Wilcoxon-signed rank test $p < 0.001$].

Figure 1 depicts sports performance prior to and after IBD diagnosis.

3.4.2. Godin leisure-time exercise score

The Godin Leisure-Time Exercise Questionnaire was used to objectively determine the levels of exercise before and after IBD diagnosis.

In both UC and CD, there was a reduction in mean Godin scores before and after diagnosis, with the overall mean score difference being 6.94 [95% CI ± 4.28 , t -test $p = 0.002$]. Whilst a larger proportion of UC patients [41.8%] reduced their level of exercise after diagnosis compared to individuals diagnosed with CD [23.2%; $\chi^2 p = 0.04$], mean Godin scores between the two conditions remained similar before and after diagnosis [Table 2]. In 65.3% of CD and 45.5% of UC patients there was no change in exercise levels, whilst an increase in exercise activity was noted in 11.5% of CD and 12.7% of UC patients.

On univariate analysis, patients with lower BMI, a younger age at diagnosis and a high pre-morbid Godin score were associated with a significant reduction in Godin score after diagnosis.

Multivariate regression was carried out to determine if the above characteristics remained significant.

A model was constructed using the pre- and post-diagnosis Godin score difference as the outcome variable and as a surrogate measure of change in exercise levels experienced by patients. Gender, IBD type, level of education, Montreal age at diagnosis, use of anti-TNF, need for surgery, relapses/flare-ups, pre- and post-diagnosis BMI categories and pre-diagnosis Godin category were used as model predictors. On multivariate regression analysis, a younger age at

diagnosis and a high pre-morbid Godin level remained the only significant predictors of change in Godin score after diagnosis [Table 2]. A parsimonious two-factor model using only these two predictors was relatively weak and able to explain 22.2% of the observed variability in mean scores.

3.5. Patient related outcome—FACIT-F

Mean FACIT-F score among IBD patients was 40.1 [95% CI 40.12 \pm 1.9]. The mean FACIT score in patients with UC was 42.2 [95% CI 42.23 \pm 3.1] and that in CD was 38.9 [95% CI 38.92 \pm 2.4] [Supplementary Material].

FACIT scores were lower in patients who had severe disease (37.1 [95% CI \pm 3.1] $p = 0.011$) and in CD patients (38.9 [95% CI \pm 2.4] $p = 0.095$), although the latter failed to reach statistical significance. FACIT scores were not related to Godin scores or BMIs [Table 4].

Overall a slightly larger proportion of CD patients had FACIT scores under 30 [24.0%] compared to UC [19.3%] but this did not reach statistical significance [$\chi^2 p = 0.554$].

4. Discussion

Physical activity and prescribed exercise may potentially play a role in the management of patients with IBD. In patients with chronic inflammation, exercise exerts an anti-inflammatory effect by means of interleukin 6 [IL-6] released from muscles, which inhibits TNF production and stimulates the release of IL-1ra and IL-10. Myokines are considered to contribute to the anti-inflammatory effect of exercise.⁶ Physical activity has been shown to counteract bone mineral loss and target pain management and fatigue in IBD patients.²⁹

IBD has a significant impact on the lives of patients and physical activity has been found to improve their quality of life.^{10,30} We looked at patients' concerns and beliefs regarding exercise and IBD and found that the majority of them [79.4%] believed that exercise could improve their quality of life, reduce relapse rates [41.3%] and help in symptom control [45.8%]. Patients felt that medical professionals did not give enough importance to their level of physical activity [46.1%] and 13.2% felt that the support of healthcare

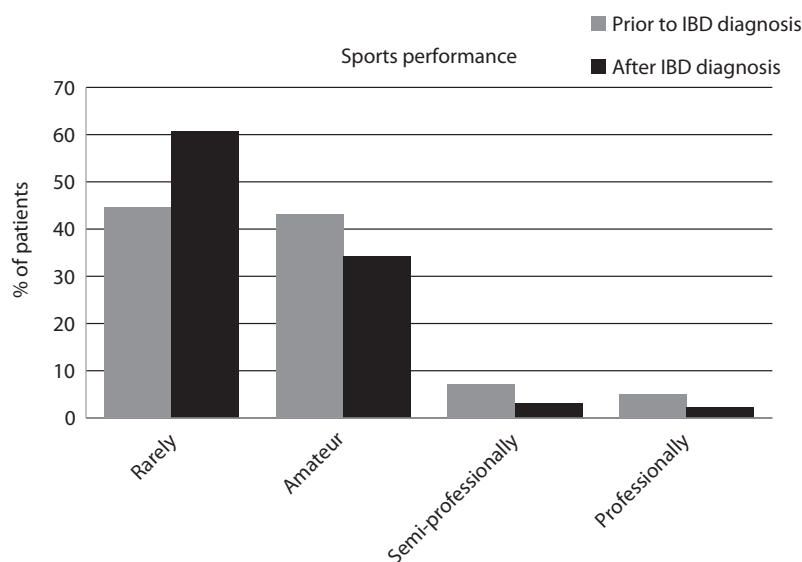


Figure 1. Sports performance before and after IBD diagnosis. Comparison of sports performance before and after diagnosis of IBD. In amateur, semi-professional and professional categories a decrease in sports performance is noted after diagnosis, whilst patients who rarely performed sports before diagnosis increased their level of sports performance after diagnosis.

Table 4. FACIT-F scores

	FACIT score		<i>p</i> value
	No. of patients	Mean	
Gender			0.28
Male	81	41.1	
Female	76	39	
IBD type			0.1
UC	57	42.2	
CD	100	38.9	
Relapses			0.01
Yes	88	38.1	
No	62	42.9	
Disease severity*			0.01
Severe	60	37.1	
Not severe	97	42	
Post-diagnosis Godin score			0.51
Sedentary	68	40.7	
Moderately active	27	37.6	
Active	61	40.5	
Post-diagnosis BMI			0.26
Underweight	6	43	
Normal	84	39	
Overweight/obese	59	42.2	

IBD, inflammatory bowel disease; CD, Crohn's disease; UC, ulcerative colitis; BMI, body mass index.

*Severe disease was defined as need for surgery and/or anti-TNF-alpha medications.

professionals would empower them in achieving better levels of exercise. Thus, given these figures it would be useful for physicians to address physical activity during consultation, and programmes to engage IBD patients in exercise regimes should be introduced. Furthermore, it would be important to discuss the possible roles of complementary and alternative therapies during clinical visits so as to avoid any possible misconceptions.

One limitation of this study was recall bias, as patients were asked about their physical activity prior to IBD diagnosis. Their clinical case notes were reviewed in order to reduce this type of bias. Patients might also have under- or overestimated their physical activity. However, the fact that their perceived levels of physical activity correlated with the Godin score suggests that recall bias might not be a major issue. Another source of bias might have been that clinical indices such as HBI and SSSCAI scores were used to establish remission and not endoscopy or histology. However, these scores have been validated and are used in most IBD studies.

The relapsing nature of IBD might influence patients' ability to participate in physical activity. Most IBD patients [87.5%] considered physical activity to be of importance in their daily lives and this was subsequently impaired by their IBD diagnosis. The majority of patients [69.5%] felt that their diagnosis had affected their fitness level with 25.4% of patients stating that their fitness was significantly impaired by their diagnosis.

There was a decrease in sports performance after IBD diagnosis in patients who performed sports at a professional, semi-professional or amateur level. However, patients who rarely performed sports prior to IBD diagnosis increased their level of exercise. Thus, IBD seems to affect patients who perform sports actively rather than patients who rarely perform any sport pre-morbidly. Patients who decreased their levels of physical activity after diagnosis attributed this to various factors, although the majority commented about lack of

time and fatigue. Approximately one-third of patients [29.9%] were in agreement that better symptom control would empower them to take up sports and increase their level of physical activity.

We used the Godin Leisure-Time Exercise Questionnaire to calculate a Godin score before and after diagnosis for patients with UC and CD. Mean Godin scores were lower after diagnosis in both UC and CD. This was more evident in patients with UC who had a reduction in their exercise levels. Pre-morbid Godin scores were significantly higher in patients who experienced a decrease in their activity, compared to patients who experienced no change or even an improvement in their exercise levels. This correlates with the part of the questionnaire on physical activity levels, where patients who performed sports at a professional or semi-professional level decreased their level of performance more significantly than patients who performed sports at an amateur level. A younger age at diagnosis was also independently associated with a decrease in Godin scores. Therefore, it would seem that young active patients may benefit from advice and interventions aimed to maintain their pre-morbid level of physical activity. The reasons why patients with UC showed a reduction in their score are unknown and were not directly assessed. One possible reason could be increased stool frequency, but this needs further clarification in future studies.

It was previously thought that patients with IBD have a low BMI at diagnosis. However, in various studies, obesity was present in 15–40% of patients with IBD and this could potentially play a role in the development of IBD.²¹ We looked at BMI in IBD and its correlation with diagnosis. Across both genders as well as UC and CD, there was no significant changes in BMI.

Several studies looking at physical activity and IBD show that exercise can have a protective effect against CD.^{16,18,20,24} In a study by Jones *et al.*, it was demonstrated that in patients with inactive CD, patients who performed higher levels of exercise were less likely to develop active CD at 6 months. This was also demonstrated in UC patients, although the association was not statistically significant.¹⁶ In patients with active disease, rigorous exercise could interfere with absorption and promote bleeding.³¹

Tinsley *et al.* described the FACIT-F score to be an ideal tool to evaluate fatigue in IBD patients. They looked into FACIT-F scores in IBD and demonstrated that patients with IBD had lower FACIT-F scores (38.9 [11.0]) compared to the general population (43.6 [9.4]).³² In our study we compared FACIT scores with Godin scores and BMI after IBD diagnosis, but no associations were found.

Figure 2 compares FACIT scores in UC and CD with regard to severity. Our mean FACIT-F score was slightly higher than in the validation study, but lower than that reported in the general population. A possible reason for this is that our patients were in remission, while in the validation study patients both with active disease and in clinical remission were included. Overall no significant overlap was noted between the box and whisker plots, as the overall difference between FACIT scores after diagnosis was not found to be significant. Since we did not look into FACIT scores before IBD diagnosis, we could not compare scores before and after diagnosis, and thus this is a possible limitation. More information might be obtained if the questionnaire were to be repeated in a prospective manner.

Further studies looking into FACIT scores before and after IBD diagnosis would better aid in understanding the impact of IBD diagnosis on patient fatigue and ultimately quality of life. The reduction in physical activity could be multi-factorial and the impact of medical appointments and psychological factors needs to be assessed prospectively.

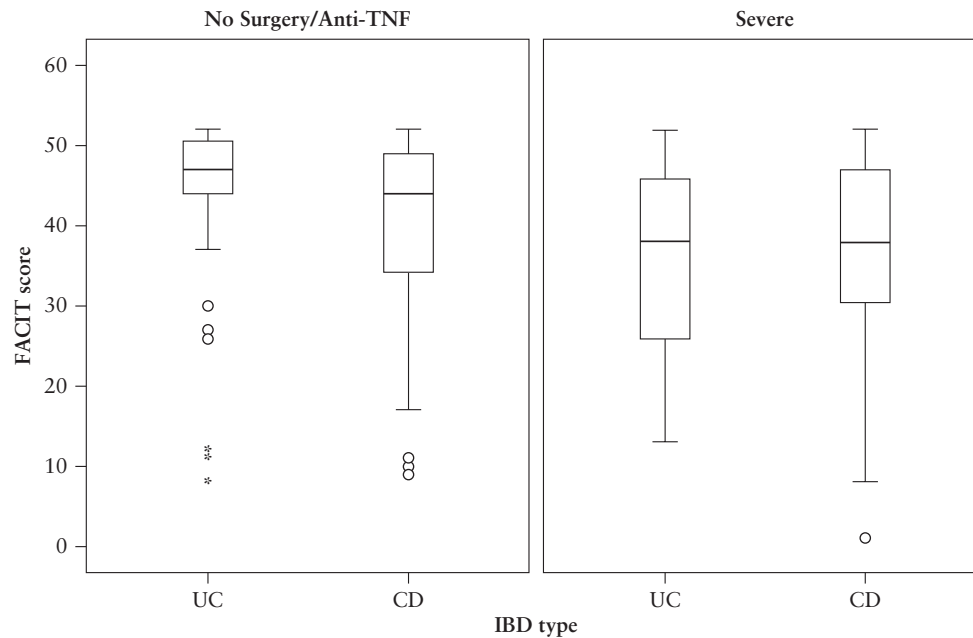


Figure 2. FACIT scores by IBD type and severity. A comparison of FACIT scores in UC and CD with regard to severity. Overlap is not significant between box and whisker plots, as the overall difference between FACIT scores after diagnosis was not significant.

In conclusion, IBD diagnosis has an impact on exercise levels and the potential contributors to the reduction in exercise remains a considerable challenge so that IBD patients can return to a normal lifestyle.

Conflict of Interest

None of the authors have any conflicts of interest or financial ties to disclose.

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Author Contributions

All authors contributed towards data collection, reviewing of the manuscript and final approval of the manuscript. KG, JS, GJM and PE contributed towards the original idea for the study, literature review, protocol for patient inclusion and writing of the manuscript. JS contributed towards statistical analysis.

Supplementary Data

Supplementary data are available at *ECCO-JCC* online.

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