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ORIGINAL ARTICLE

Post-secondary education in young patients with inflammatory bowel disease: A population-based cohort study

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Abstract

Aim: Inflammatory bowel disease (IBD) diagnosed in adolescence may have adverse effects on educational attainment. The study aims to examine post-secondary educational attainment in patients with IBD and how it is affected by disease severity and comorbid mental health disorders.

Methods: This cohort study used nationwide Danish registries. In a cohort of patients with IBD and matched references, the time to attainment of post-secondary education was examined using Cox regression. In the analysis for disease severity and mental health disorders, the relative risk of attainment of post-secondary education was evaluated using binomial regression.

Results: We identified 1136 patients with IBD and 8791 references. Overall, patients with Crohn's disease (CD) or ulcerative colitis (UC) attained a post-secondary education as often as references (CD: hazard ratio (HR) 1.10 (95% confidence interval (CI) 0.99–1.22); UC: HR 0.97 (95% CI 0.88–1.06)). Patients with both severe IBD and mental health disorders had a significantly lower chance of attaining a post-secondary education compared to patients with severe IBD without mental health disorders.

Conclusions: Patients with IBD attained a post-secondary education at the same rate as references. Having both severe IBD and mental health disorder negatively affected post-secondary educational attainment.

KEYWORDS
inflammatory bowel disease, mental health, post-secondary education

Abbreviations: ATC, Anatomical Therapeutic Chemical; CD, Crohn's disease; CPR, personal identification number; DNPR, Danish National Patient Registry; IBD, inflammatory bowel disease; ISCED, International Standard Classification of Education; UC, Ulcerative colitis.

1 | INTRODUCTION

Inflammatory bowel disease (IBD) comprising Crohn's disease (CD) and ulcerative colitis (UC) is often diagnosed in the formative years in late adolescent and young adulthood,[1] when young people leave home and start higher education.[2,3] The transition from secondary school to higher education is an important transition in young people's lives,[2] and a successful transition to higher education is important as attainment of higher education affects not only income but also protects against long-term unemployment.[3,4]

Having IBD may be associated with mental health disorders,[5] and paediatric patients with IBD have been shown to be at higher risk compared to general population controls, especially for anxiety or depression.[6–8] Furthermore, paediatric patients with IBD had an increased risk of receiving antidepressant medication in the years following IBD diagnosis.[9] Anxiety and depression in young patients with IBD may have adverse effects on adherence to treatment[10] potentially increasing disease severity. In children or youth with IBD, disease severity has been shown to adversely affect educational outcomes.[11,12]

Having mental health disorders adversely affect educational attainment, with an increased rate of being NEET (not in employment, education or training),[13] not being enrolled in post-secondary education[14,15] and dropping out from post-secondary education.[16] Patients with IBD and mental health disorders are, therefore, potentially in 'double jeopardy' for not attaining post-secondary education, as their mental health disorders also may have a negative effect on IBD severity leading to worse educational outcomes. However, only a few studies have examined the educational status of patients diagnosed with IBD in adolescence and young adulthood,[17–19] with little attention to comorbid mental health disorders.

We have previously shown that patients with IBD attain an upper secondary education as often as a reference cohort,[12] but knowledge regarding the transition from upper secondary education to higher education is sparse. Therefore, this study aims to examine (1) if IBD onset in childhood affects post-secondary educational attainment and (2) the role of disease severity and comorbid mental health disorders on post-secondary educational attainment.

Key notes

- The knowledge about the post-secondary educational attainment of patients with inflammatory bowel disease onset in childhood is sparse.
- Patients with inflammatory bowel disease attained a post-secondary education as often as references.
- Patients with comorbid mental health disorders, particularly in combination with severe disease had a lower attainment of post-secondary education.

2 | MATERIALS AND METHODS

2.1 | Study design

The study is a register-based cohort study using administrative data from Denmark. All citizens are given a ten-digit unique identification number (CPR number) at birth or when taking up residence in Denmark, making it possible to link the different registries. Information on enrolment and attainment of education were retrieved from the Student Register. Information on IBD diagnoses, IBD-related hospitalisation, treatments and surgeries and mental health disorders was retrieved from the Danish National Patients Registry (DNPR) and the Danish Psychiatric Central Research Register. Information on redeemed prescriptions on IBD and mental health disorder-related medicine was obtained from the Danish National Prescription Registry. Parents were identified using the Fertility Database, and their highest educational level was retrieved from the Population Education Register.[20]

2.2 | Setting

Denmark has tax-funded healthcare and educational systems, making healthcare and education on all levels free of charge. When turning 18 years old, students can apply for the State Educational Grant and Loan Scheme for living expenses. Students with chronic physical or mental health disorders resulting in disabilities that make it difficult for them to have a spare-time job can apply for additional grants when enrolled in post-secondary education.

Upper secondary education programs in Denmark are divided into two: a general upper secondary education preparing students for higher education, and a vocational upper secondary education and training program qualifying for a specific trade (journeyman's certificate). Post-secondary education in terms of higher educational programs is offered on four levels: short-cycle, bachelor, master and PhD levels (Figure S1).[21]

2.3 | Study population

Using risk-set sampling a cohort of patients with IBD and a reference cohort were constructed. All patients with at least one inpatient or outpatient IBD-diagnoses in the DNPR before 18 years of age and born between 1979 and 1992 were identified. For Crohn's Disease the ICD-8 code 563.01, and ICD-10 code K50 were used and for ulcerative colitis, the ICD-8 codes 563.19, 569.04 and ICD-10 code K51 were used. Patients had to be diagnosed between 1980 and 2010. The admission date or date of the first outpatient visit was considered the day of diagnosis of IBD (index day). The patients were matched on age (year of birth) and sex assigned at birth with 10 references, who had to live in Denmark and not have IBD on the day of inclusion (index day). The matching was only used in the initial sampling of the cohort.

We restricted the analysis to study participants who attained a general upper secondary education (defined as level 3 according to the International Standard Classification of Education[22]), as participants who attained a journeyman's certificate would already have an education leading to vocational or occupational qualification.[21] Some participants attained a general upper secondary education after attaining a vocational upper secondary education. These participants were excluded, as they already attained an education leading to vocational or occupational qualification. (Figure 1).

2.4 | Exposure variables

To examine if IBD affects post-secondary educational attainment the exposure was being diagnosed with CD or UC before 18 years of age. To examine the role of disease severity and comorbid mental health disorders, the exposure was divided into 6 categories: (1) References without mental health disorders, (2) patients with non-severe IBD and no mental health disorders, (3) patients with severe IBD and no mental health disorders, (4) references with mental health disorders, (5) patients with non-severe IBD and mental health disorders or (6) patients with severe IBD and mental health disorders. IBD severity and mental health disorders were assessed from the end of general upper secondary education until the end of follow-up. (Figure S2).

2.4.1 | IBD severity

The degree of disease severity (non-severe/severe) was evaluated using information from the DNPR and the National Danish Prescription Register. To be classified as having severe IBD patients had to have either two or more redeemed prescriptions of prednisolone (Anatomical Therapeutic Chemical Classification (ATC): H02AB06) or prednisone (ATC: H02AB07) within a 365-day period, more than 30 accumulated days with hospitalisation, having IBD-related surgery or receiving anti-TNF-alpha during the period from finishing upper secondary education until the end of follow up. For hospital admissions only admissions with an IBD diagnosis as the primary code was included. Diagnostic codes for IBD-related surgery are listed in Table S1. Due to an initial 3-dose

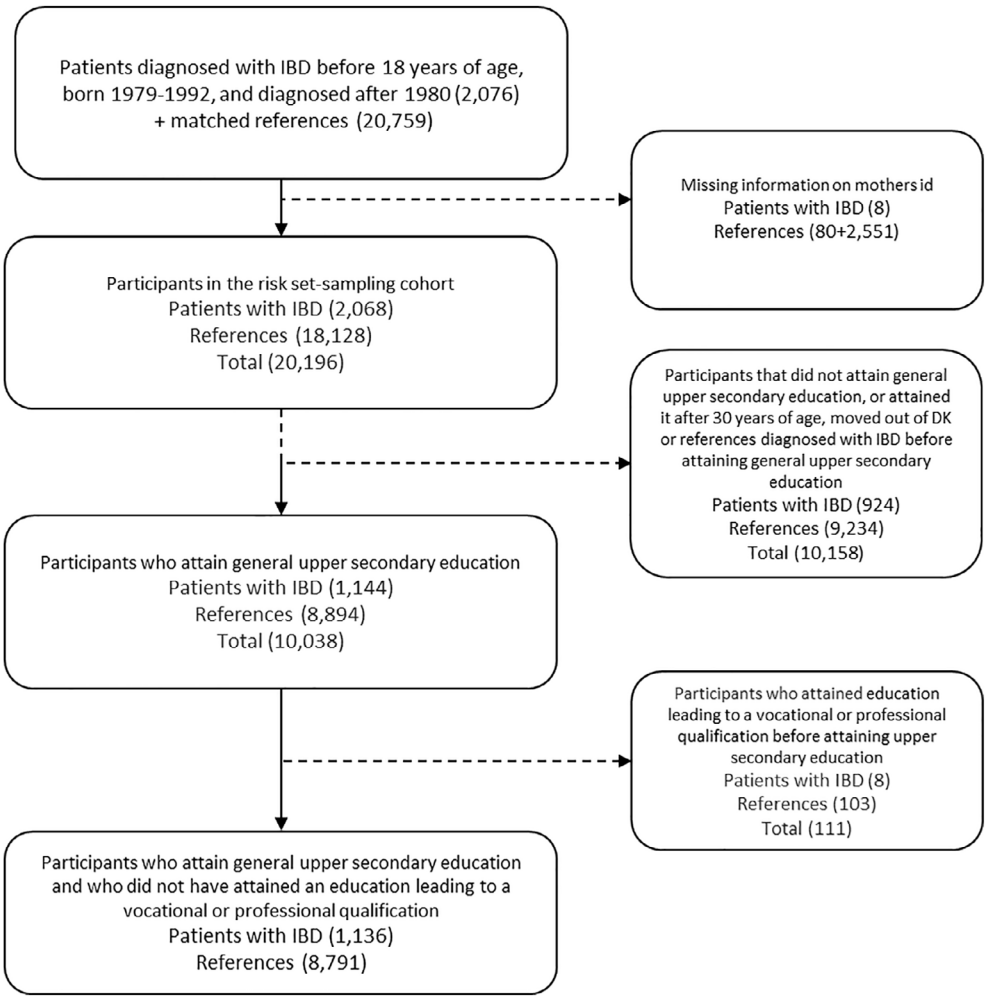

FIGURE 1 Flowchart for the study. When forming the risk set- sampling cohort, references were excluded when the patients they were matched to was excluded. This is marked (xx+yy) in the flowchart. xx represents the references that were excluded along with the patients.

induction, treatment with anti-TNF was defined as more than four registered treatments. The included codes were infliximab (BOHJ18A1), adalimumab (BOHJ18A3), golimumab (BOHJ18A4) and certolizumab pegol (BOHJ18A5).

2.4.2 | Mental health disorders

Mental health disorders were defined as having a psychiatric diagnosis: (ICD-8: 290.00–319.90 or ICD-10: F00-99) in DNPR; or having two or more prescriptions of antidepressants (ATC: N06A), CNS stimulating agents (ATC: N06B), antipsychotics (ATC: N05A), anxiolytics (ATC: N05B) or sedative/hypnotics (ATC: N05C) from end of general upper secondary education until the end of follow-up.

2.5 | Outcome

Attainment of post-secondary education was defined as an attainment of an education leading to a vocational or professional qualification in the Student Register.

2.6 | Follow-up

Participants were followed until attaining post-secondary education, death, moving out of Denmark for more than 15 months, turning 30 years of age, 31 December 2019 and for references further being diagnosed with IBD. (Figure S2).

2.7 | Covariates

2.7.1 | Parental educational level

When evaluating socioeconomic status, parental educational level is regarded as the most important factor in educational attainment in Denmark.[23,24] Parents' educational level was defined using the ISCED classification. Parents' highest educational levels were defined as the parent with the highest educational level at the index date. For participants with information on only one parent, the educational level of this parent was used. The levels were classified as upper secondary education or less [ISCED 0–3], and Higher education [ISCED 4–8].

2.7.2 | Psychiatric diagnosis prior to the index day

Prior psychiatric diagnosis was defined as having a psychiatric diagnosis: (ICD-8: 290.00-319.90 or ICD-10: F00-99) in DNPR or Danish Psychiatric Central Research Register before the index day.

2.7.3 | Sex, inclusion year and age

As the initial matching was not retained, we adjusted for matching variable sex assigned at birth, age, and calendar year at inclusion. When adjusting for the calendar year and age at inclusion restricted cubic spline with three knots was used.

2.8 | Statistical method

Contingency tables were constructed for characteristics of the main study variables on index day. A table with information on treatment used to define severity appears in the Supplementary material. Data were given as numbers and proportions or medians and interquartile ranges.

To evaluate the attainment of post-secondary education, we used Cox regression with robust variance estimation to calculate hazard ratio (HR) with a 95% confidence interval (CI). HR were computed for patients with CD or UC compared to references. We adjusted for the year of inclusion, age at inclusion, sex and parents' highest educational level. When adjusting for parental educational level upper secondary education was used as the reference. The proportional hazard assumption was assessed graphically by Schoenfeld residuals over risk time.

In the analysis for disease severity and mental health disorders the relative risk (RR) of attainment of post-secondary education was evaluated using binomial regression. We adjusted for the same variables as in the main analysis, as well as prior mental health disorders.

Data were analysed using STATA 18.0 (Collage Station, Texas, USA).

2.9 | Ethics

According to Danish regulations, register-based studies using administrative data do not need approval by scientific or ethical committees. The study has been registered in the North Denmark Region's record of processing activities (2021–104) and complies with the General Data Protection Regulation. Other approvals are not necessary according to Danish regulations.[25] Data was analysed on Statistics Denmark's research machine in a pseudonymised form.

3 | RESULTS

There were 1136 patients with IBD and 8791 references that had completed a general upper secondary education. The number of patients who had Crohn's disease (CD) was 485 and 651 had ulcerative colitis (UC). The median age at inclusion was 15.4 years for patients as well as references. Of the 1136 patients with IBD, 37 (3.3%) had psychiatric diagnosis prior to inclusion, which applied to 254 (2.9%) of references. (Table 1).

For references and patients with CD, 82% attained a post-secondary education, while it was 80% of patients with UC. Patients with CD or UC attained a post-secondary education as often as references (adjusted HR 1.10 [95% CI 0.99–1.22] and 0.96 [95% CI 0.87–1.05] respectively).

Of the 1136 patients, 630 had non-severe IBD and no mental health disorders, 355 had severe IBD and no mental health disorders, 78 had non-severe IBD and mental health disorders and 73 had severe IBD and mental health disorder. (Table S2) Of the 8971 references 1057 had mental health disorders.

For patients with non-severe IBD 84% attained a post-secondary education, 86% of patients with severe IBD and 85% of references. For individuals without mental disorders, there was no difference in RR of attainment of post-secondary education between patients with non-severe IBD and severe IBD, respectively, compared to references (adjusted RR 0.99 [95% CI 0.96–1.02] and 1.00 [95% CI 0.96–1.03] respectively). Both patients with IBD and references with mental health disorders had lower chances of attaining post-secondary education, with 66% of references attaining a post-secondary education, while applying to 64% of patients with non-severe IBD and 55% of patients with severe IBD. Patients with severe IBD and mental health disorders had the lowest chance of attaining post-secondary education compared to references without mental health disorders (RR 0.74 [95% CI 0.63–0.87]) and tended to have a lower chance than all other groups ($p = 0.069$ compared to references with mental health disorders, and $p = 0.131$ compared with patients with non-severe IBD) (Figure 2).

TABLE 1 Characteristics of patients with IBD and references at the index day (day of diagnosis for patients with IBD or day of inclusion for references).

	Patients with IBD	References
n (%)	1136 (11.4)	8791 (88.6)
Demographic		
Inflammatory disease, *n* (%)		
Reference	0 (0.0)	8791 (100.0)
Crohn's disease (CD)	485 (42.7)	0 (0.0)
Ulcerative colitis (UC)	651 (57.3)	0 (0.0)
Sex (male), *n* (%)	483 (42.5)	3512 (39.9)
Age, median (iqi*sparse)	15.4 (13.2; 16.8)	15.4 (13.1; 16.8)
Inclusion year, *n* (%)		
1980–1994	114 (10.0)	867 (9.9)
1995–2004	706 (62.1)	5272 (60.0)
2005–2014	316 (27.8)	2652 (30.2)
Parents highest education, *n* (%)		
Lower secondary or less	33 (2.9)	229 (2.6)
Upper secondary	206 (18.2)	1466 (16.9)
Bachelor or more	890 (78.8)	6994 (80.5)
Psychiatric diagnosis before index day, *n* (%)		
No	1099 (96.7)	8537 (97.1)
Yes	37 (3.3)	254 (2.9)

*iqr: Interquartile range.

4 | DISCUSSION

In this large register-based cohort study, we found that patients with IBD in general attained a post-secondary education as often as references. Our subgroup analysis showed that having mental health disorders adversely affected the attainment of post-secondary education, particularly in patients with severe IBD.

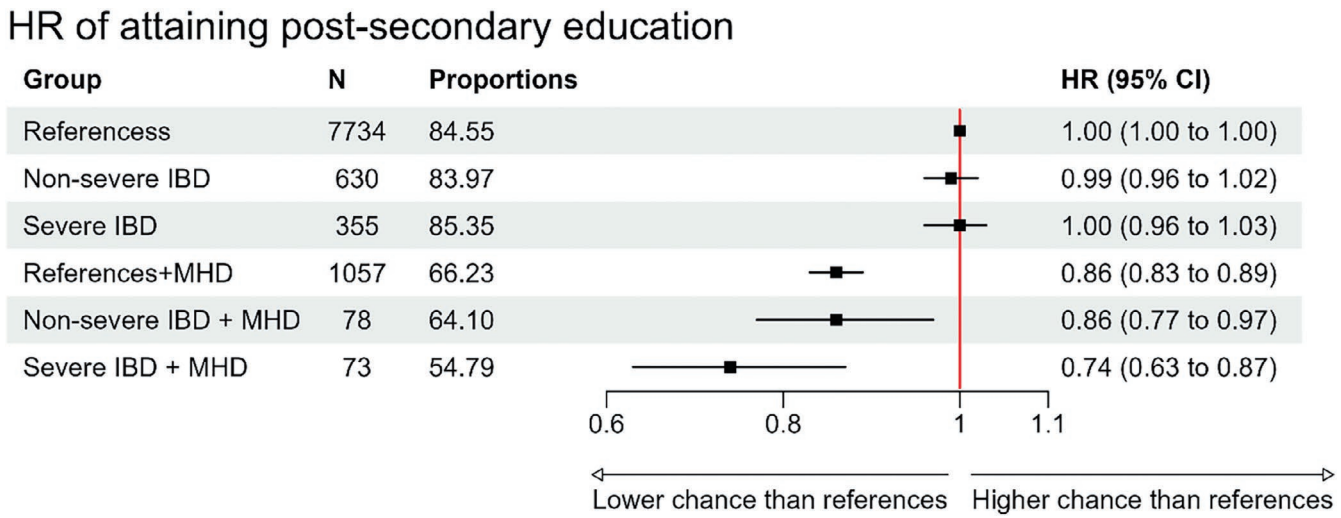

FIGURE 2 Adjusted hazard ratio of post-secondary education. Number of participants (*N*), proportion(%) and adjusted hazard ratio (HR) of attainment of post-secondary education leading to vocational or occupational qualification for patients with IBD and references group by disease severity and mental health disorders.

Post-secondary education in patients diagnosed with IBD in childhood or adolescence has been examined in smaller cross-sectional studies and showed either no difference[18,19] or higher educational levels[17] compared to controls. In a population-based cohort study from Sweden, patients with IBD had similar educational levels as matched references.[26] None of these studies examined the possible effect of comorbid psychiatric disorders. A Canadian study on upper secondary education found that having a psychiatric diagnosis 6 months before or after having an IBD diagnosis negatively affected educational outcomes.[27] Other studies on patients with other underlying diseases, such as childhood cancer survivors and childhood atopic dermatitis, also found that patients who finished upper secondary education had the same levels of higher educational attainment as controls.[28,29]

Mental health disorders have been shown to be a risk of not undertaking post-secondary education[15] and dropout,[16] and the severity of IBD negatively affected grades[11] and attainment.[12] Surprisingly severe IBD did not affect post-secondary education in our study, but we found that patients with mental health disorders (both among patients with IBD and references) had a lower chance of completing post-secondary education even though they finished general upper secondary education. This study showed that patients with non-severe IBD and mental health disorders had the same chance of attaining post-secondary education, as references with mental health disorders. The combination of having both mental health disorders and severe IBD seemed to have a more pronounced negative effect on the attainment of post-secondary education, however, compared to references with mental health disorders there was no statistically significant difference.

Patients with IBD are thought to have a higher risk of emotional disorders,[5–8] but the mechanism is not fully understood. A bidirectional link between IBD and emotional disorders has been suggested where the diseases interact and can exacerbate each other.[30] This could lead to a negative spiral, with IBD worsening emotional disorder and the emotional disorder worsening the IBD, in the end affecting the possibility for educational attainment. This indicates the importance of an awareness of mental health disorders in patients with severe IBD, as they may need extra support to be able to attain a post-secondary education.

4.1 | Strengths and limitations

There are several strengths to this study. The Danish registers contain high-quality data[25] on a population level that allows long-term follow-up with low levels of missing data. Data for all registers are collected independently of the study question, minimising the risk of differential misclassification.

Even though the study design has many strengths, there are some weaknesses. As the analysis was limited to patients with IBD and references who completed upper secondary education, the initial matching could not be maintained as the number of references per patient would be under four. By adjusting for the matching variables, we were able to account for the differences between the patients with IBD and references, which the original matching would otherwise have accounted for.

No studies have validated IBD diagnosis in children in the DNPR, but in a small subsample of patients in the validation study by Lo et al. the validity of using one diagnosis with either CD or UC was high (For CD the positive predictive value was 0.86 and 0.93 for UC).[31]

Only mental health disorders of patients seeking medical care or patients receiving medication during the exposure windows would be classified. This could lead to some participants being misclassified as having no mental health disorders if the mental health disorders were milder and not in need of medication. The misclassification would be non-differential.

Different types of treatment were used as a proxy for disease severity. During the study period, the treatment regime has changed. The number of patients with severe disease was stable, but with a change from long admissions to treatment with anti-TNF-alpha. Treatment with anti-TNF-alpha has changed over the years, from being second- or third-line treatment, it is now first-line treatment, and, therefore, not necessarily a marker of a severe disease course. However, in the study period, anti-TNF-alpha would have been the second or third line of treatment, and, therefore, a proxy for severe disease.

It is surprising that post-secondary education in patients with severe IBD are not affected. One of the explanations could be the Danish welfare state secures both free health care and post-secondary education. Furthermore, municipalities and educational institutions are obligated to assist individuals with disability, and young people with disabilities have the possibility of additional financial support. Therefore, the findings from this study can only be generalised to similar settings.

4.2 | Interpretation

Overall, young patients with IBD and their parents can be reassured that attainment of post-secondary education leading to vocational or professional qualification is not affected in patients with IBD. Patients with comorbid mental health disorders, especially those with severe IBD should raise concerns and are in need of extra support.

AUTHOR CONTRIBUTIONS

All authors contributed to the conceiving and designing of the study. JR conducted the data analysis, all authors contributed to data interpretation. JR drafted the first manuscript, all authors revised it, provided critical comments and approved the final version.

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CONFLICT OF INTEREST STATEMENT

No conflict to declare.

DATA AVAILABILITY STATEMENT

The data that supports the results of this study is accessible from Statistics Denmark. However, restrictions do apply to the availability, so data are not publicly available. Questions or requests regarding this data must be directed to the corresponding author.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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