

RESEARCH ARTICLE

Sleep as a mediator in the context of emotional problems in adolescents with IBD: A pilot study

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Abstract: Background: Sleep has an impact on daily life. Particularly among adolescents with IBD, adequate sleep seems to be important, as the disease itself and the associated symptoms can cause distress and impair daytime functioning. However, often parental and youth reports differ regarding perceived sleep problems of adolescents. Besides sleep problems, depression and anxiety are often prominent in young IBD patients. To date, the interplay between sleep, anxiety/depression symptoms and IBD is not fully understood. Therefore, the aim of this study was to 1) evaluate sleep problems in adolescents suffering from IBD, 2) compare adolescents' sleep quality and impairments according to self- and parental reports, and 3) investigate the interaction between IBD symptomatology, emotional problems and sleep disturbances. Methods: 29 adolescents (age 10–22; M = 14.44, SD = 1.78) with IBD and their parents took part in the study. Adolescents and parents completed questionnaires concerning sleep, emotional problems, and IBD symptomatology. Results: Especially overtiredness, insomnia symptoms, and nightmares play a prominent role regarding sleep problems in youths. Self-rated sleep problems and parental ratings were inconsistent, particularly for nightmares ($Z = -2.12$; $p = 0.034$). However, other ratings concerning emotional problems and sleep, especially anxiety and nightmares, were significantly related ($r = 0.426$, $p = 0.034$), even though we found no mediation effect for the association between IBD, nightmares and anxiety. Discussion: The present study revealed the importance of sleep and emotional well-being for adolescents suffering from IBD. Moreover, it became clear that the role of anxiety in youths suffering from IBD and sleep problems is not sufficiently answered yet. Not only emotional behavior but also sleep should be addressed when diagnosing IBD or during treatment of IBD. In addition, these results show the need for further investigation regarding the differences between parental and self-reports concerning sleep problems in young IBD patients.

Keywords: inflammation, pain, insomnia, nightmares, anxiety, daytime consequences

1 Introduction

For youths with chronic pain, the risk of developing sleep problems increases with age [1]. Several studies showed that children and adolescents suffering from pain experience more sleep disturbances than healthy controls, which points towards an increased risk for developing sleep disturbances [2–7]. Additionally, sleep problems in children and adolescents suffering from pain disorders lead to further negative effects (*i.e.*, psychosocial problems) in daily life [8]. However, sufficient sleep is important for proper daytime functioning and overall wellbeing. Approximately 30% of adolescents and young adults between 13 and 25 years suffer from sleeping disorders and 4% to 9.5% from insomnia symptoms [9–12]. Sleep problems in youths tend to become chronic with the risk of reaching into adulthood [13–17]. Daytime impairments of sleep disturbances in adolescence vary from academic impairments and impaired quality of life to behavioral concerns such as aggression, depression, and suicidality [17–20]. On the other hand, sleep disturbances in adolescents have found to be correlated with fatigue, somatic symptoms such as headache, abdominal pain, backache, and poor health in general [12, 21–24]. Sleep disturbances are common in adolescents with chronic diseases such as juvenile idiopathic arthritis, migraine, or irritable bowel syndrome [25–27]. Thus, the relationship between pain and sleep seems to be reciprocal [28–31].

IBD with its subtypes Crohn's disease (CD) and Colitis ulcerosa (UC) is a chronic illness of the gastrointestinal tract and typically occurs in relapses. Both subtypes include inflammatory processes of the intestinal mucosa within different areas of the digestive system as well as different histological hallmarks. Characteristic symptoms are episodes of abdominal

pain, diarrhea, bloody stools, weight loss, and the influx of neutrophils and macrophages that produce cytokines, enzymes and free radicals that lead to inflammation and ulceration. The etiology of the disease is still not fully understood yet; however risk factors as genetic and environmental factors are thought to be important in its pathogenesis [32, 33]. 25% of the affected patients are younger than 20 years of age with a peak during adolescence [34, 35]. An early onset of IBD seems to involve a more aggressive form of IBD with more complications (e.g., poor nutrient supply leading to insufficient growth) [36–38]. Thus, younger IBD patients are compromised concerning adequate physical development, hence being more challenged to master this developmental period with its particular psychiatric vulnerability [39]. Furthermore, an early onset of IBD involves several other impairments concerning health and quality of life (e.g., diarrhea, fever, cramps, tiredness, weight loss, and a general feeling of sickness) [40].

It has been shown that depression and anxiety are prominent in IBD patients [21, 41–43]. The prevalence of anxiety and depression (21% to 35%) is similar to patients with other chronic diseases, however, depressive disorders appear to be more common in older patients and those with preceding psychiatric disorders [44, 45]. Further, adolescents with IBD have 4.6 times greater odds for clinically significant symptoms of anxiety and/or depression compared to healthy peers [46]. Moreover, a recent study revealed that increased anxiety or depression are predictors of fatigue in young IBD patients [47]. However, there is still controversy concerning the interplay between anxiety/depression symptoms and the onset and clinical progress of IBD [45, 48].

An epidemiological study on adults emphasized that impaired sleep has an essential effect on the course of IBD, with sleep deprivation worsening disease symptoms (e.g., provoking an episode of IBD symptoms) [49]. Hence, an increased disease activity might lead to disturbed sleep, whereas poor sleep quality in turn might aggravate inflammation [49, 50]. Beyond medical treatment (corticosteroids), disease symptoms and disease-related immune changes are potential causes for sleep disturbances [51].

Our review concerning IBD and sleep in children and adolescents also found an association of sleep and IBD severity in children and adolescents [52]. Among adolescents with IBD, adequate sleep seems to be important as the disease itself and the associated symptoms can cause distress and impair daytime functioning [42, 52–54]. Particularly, sleep problems, nightmares, hypersomnia, and overtiredness seem to stain these young patients [55]. Beyond, IBD, symptoms might cause stress symptoms and as a result of these, nightmares [56]. Besides symptomatology, self- and parental reports might be diverse. A study by Pirinen and colleagues (2010) showed that the awareness of sleep problems differs [55]. Parents of young IBD sufferers reported significantly more sleep disturbances in their teens, more nightmares, and more overtiredness than parents of healthy adolescents. In contrast, adolescents with IBD did not report significant more sleep disturbances and overtiredness compared to the healthy control group in self-report measures. Besides subjective sleep impairment, also objective sleep patterns seems to be impaired in young IBD patients [57].

Up to date, there are few studies investigating the association between IBD, emotional problems, and sleep problems in adolescents. The study at hand intended to explore if there is relevance for further investigation of IBD in adolescents regarding emotional problems as well as sleep disturbances.

Therefore, the aim of this study was to 1) evaluate sleep problems in adolescents suffering from IBD, 2) compare adolescents' sleep quality according to parental and self-reports, and 3) to investigate the interaction between IBD, emotional problems and sleep disturbances in youths.

2 Methods

2.1 Participants

Participants were recruited via information sessions in clinics as well as leaflets in pediatric practices clinics. Participants and their parents gave their informed consent including voluntary participation and the possibility to withdraw from the study at any time without any consequences. Ethics approval for the research project was obtained from the ethics committee of the University of Tübingen.

Inclusion criteria were diagnosed Crohn's disease or colitis ulcerosa since at least 6 months by a professional. Further, no clinical relevant mental disorders and no participation in another psychological treatment were required for participation. All in all, 35 adolescents and their parents participated in the study. However, 6 adolescents withdrew in the beginning of the study. The final sample size was 29 non-institutionalized adolescents and young adults aged 10 to

22 years ($M = 14.44$; $SD = 1.78$). 19 male and 10 female participants with Crohn's disease or colitis ulcerosa and their parents took part in the study. Characteristics of the sample are shown in Table 1.

Table 1 Sample characteristics

Variable	N (%)
Disease	
Crohn's disease	7 (24.1%)
Colitis ulcerosa	22 (75.9%)
Age	10-22 years ($M = 14.44$; $SD = 1.78$)
Gender	
male	19 (65.5%)
female	10 (34.5%)
Other chronic disease (e.g. allergies)	
yes	10 (34.5%)
no	19 (65.5%)
IBD in the family	
yes	3 (11.1%)
no	24 (88.9%)

2.2 Instruments

2.2.1 IBD symptoms

The disease-specific Impact-III questionnaire measures the frequency and intensity of IBD on several health aspects during the last two weeks. The Impact III is derived from Impact II [58]. It consists of 35 items including six subscales (bowel symptoms, emotional functioning, social functioning, body image, treatment/intervention (e.g., operations, taking medication)). It also assesses the health-related quality of life (HRQoL) by self-report. Higher scores represent a more negative impact on HRQoL.

2.2.2 Sleep problems

Parents reported on their child's sleeping problems using the Child Behavior Checklist (CBCL/4-18) [59]. The CBCL refers to the last 2 months and provides values for eight subscales (anxiety/depression, withdrawn, aggressive behavior, attention problems, thought problems, delinquent behavior, somatic complaints, and social problems), two secondary scales concerning internalizing (anxiety/depression, withdrawn, somatic complaints) and externalizing (aggressive and delinquent behavior) behavior, as well as a total problem index score. Parents rate their response on a three-point Likert scale from 0 (not true) to 2 (very true or often true).

The Youth Self Report (YSR) is derived from the Child Behavior Checklist/4-18 (CBCL) inventory [60]. It is a questionnaire for adolescents between the ages of 11 and 18. The YSR contains 112 items that measure eight subscales: withdrawn, somatic complaints, anxiety and depression, social problems, thought problems, attention problems, aggressive behavior, and delinquent behavior [60]. The inventory has two secondary scales referred to as internalizing and externalizing behavior. The remaining three scales are categorized as 'neither internalizing nor externalizing'. Overall behavioral and emotional functioning is measured by the total problem scale. Items are rated on a three-point Likert scale from 0 (not true) to 2 (very true or often true).

The items concerning sleep in the YSR and the CBCL were used to measure different aspects of sleep troubles (according to Alfano and Collegues (2007)) [61]. The sleep items in the CBCL and YSR contain: sleep problems in general, nightmares, sleeping more/sleeping, less, overtiredness, and sleepwalking/sleeptalking. Corresponding to Alfano and colleagues, the sleep items were dichotomized; hence a response of either sometimes true 1) or often/always true 2) was coded as yes.

2.2.3 Emotional problems

To measure anxiety symptoms in adolescents with IBD, the Becks Anxiety Inventory (BAI) was implemented [62]. The BAI is a 21 item self-report questionnaire that can be filled out as of the age of 12. Items are rated on a Likert scale ranging from 0 to 3 (0 = not at all; 1 = a little/does not bother me a lot; 2 = medium, uncongenial but I could endure; 3 = a lot, I couldn't endure).

To measure depressive symptoms in youngsters the Children's Depression Inventory (CDI) was applied [63]. The questionnaire can be conducted for children between 8 and 17 years. The CDI contains 21 items based on the Beck's Depression Inventory (BDI) [64]. Items range from 0 to 2 (0 = symptom doesn't apply; 1 = symptom applies, medium intensity; 2 = symptom applies, potent intensity) and are rated on a three-point Likert scale.

2.3 Data analysis

Prior to analysis, the data for all variables were inspected for missing values. Data was analysed with the Statistical Package for Social Sciences version 22 (IBM, 2012). Each variable was tested for normal distribution (Shapiro-Wilk). All variables showed significant deviation from a normal distribution. Hence, a Wilcoxon signed-rank test was used to test differences between parental and youth reports concerning sleep problems. For correlational analyses, Spearman's rank-order correlation, the nonparametric version of the Pearson product-moment correlation was used [65]. To investigate if the association between IBD and sleep problems is influenced by their relationship to emotional problems, a mediation model was applied. Mediation was tested with the SPSS Process Macro, version 22.0 for Windows. As recommended by Preacher and Hayes [66], bootstrapping was used as it is considered the most powerful as well as the most effective method to use with small samples, as well as the least vulnerable to Type I errors. Moreover, this method does not assume normal distribution for any variable and is a nonparametric resampling procedure. Data were resampled 10,000 as recommended by Hayes [67]. The significance level was set to $\alpha = 0.05$, a tendency of significance was detected at $p < 0.10$.

3 Results

3.1 Sleep problems reported by adolescents

29 of the 35 adolescents completed the YSR. 20.7% of the adolescents reported having sometimes sleep problems, 55.2% were overtired, and 41.3% suffered from nightmares. 24.1% reported to be sleeping less compared to their peers, whereas 24.1% stated to sleep more than their peers. Percentages for the different items concerning sleep are presented in Figure 1.

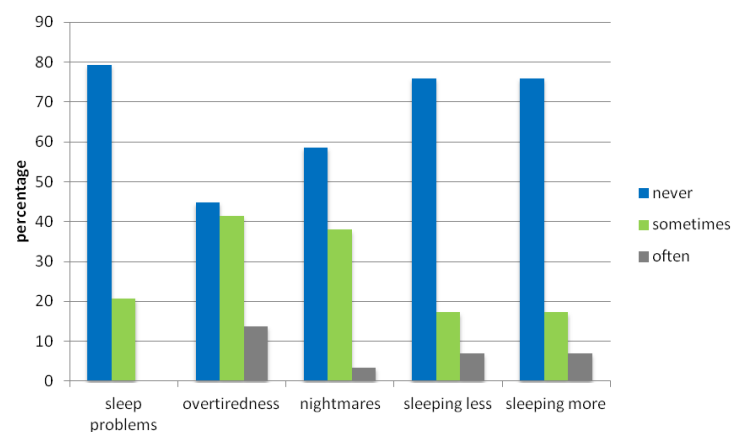


Figure 1 Percentages concerning sleep troubles according to the adolescents

3.2 Sleep problems reported by parents

29 of the 35 participating parents filled in the CBCL. In the parental report, 20.7% indicated that their child had sleep problems, 51.7% reported that their child was sometimes or often overtired, 20.7% indicated that the adolescents had nightmares and 13.8% of the parents indicated their child was walking and/or was talking during sleeping. 24.1% of the parents stated that their child was sleeping less compared to their peers. In contrast, 17.2% reported their child to sleep more compared to their peers. Percentages for the different items concerning sleep are presented in Figure 2.

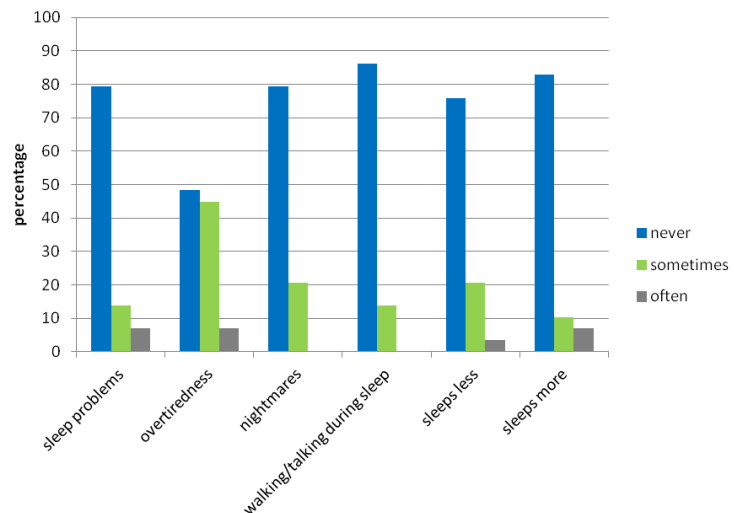


Figure 2 Percentages concerning sleep troubles according to the parents

Concerning all sleep difficulties, self- and parental ratings were similar. However, parents and adolescents rated the nightmare frequency significantly differently, with adolescents reporting more nightmares ($Z = -2.12; p = 0.034$).

3.3 IBD, emotional problems and sleep

Based on previous findings, we tested if IBD and sleep problems are mediated by anxiety. In a first step, summary measurements of IBD symptomatology, anxiety, and depression were calculated. IBD symptomatology according to the scale of the IMPACT III was rated in the middle areas ($M = 13.48; SD = 4.006$). Adolescents stated a mild anxiety symptomatology according to the BAI ($M = 8.17, SD = 5.568$). Depressive symptoms according to the DIKJ were not revealed ($M = 8.18; SD = 5.278$). In a next step, correlations were calculated to assess the relationship between IBD symptomatology, anxiety, depressive symptoms, and sleep problems in adolescents. IBD symptoms and nightmares correlated significantly ($r = 0.466; p = 0.019$) as well as IBD and anxiety ($r = 0.574, p = 0.001$), besides there was a tendency for significance between IBD symptoms and sleeping more ($r = 0.346, p = 0.090$). Furthermore, anxiety and nightmares ($r = 0.426, p = 0.034$) as well as anxiety and overtiredness ($r = 0.565, p = 0.003$) correlated significantly. Beyond the correlation between anxiety and sleeping less showed a trend towards significance ($r = 0.365, p = 0.078$). Other correlations, especially regarding depressive symptoms, were not significant (see Table 2).

Table 2 Spearman’s rank-order correlation (r_s) between IBD symptoms, emotional problems, and sleep problems

	IBD symptoms	Anxiety symptoms	Depressive symptoms
IBD symptoms	$r_s = 1^{**}$ $p \leq 0.001$	$r_s = 0.574^{**}$ $p = 0.001$	$r_s = 0.161$ $p = 0.412$
Sleep problems	$r_s = -0.021$ $p = 0.922$	$r_s = -0.039$ $p = 0.852$	$r_s = 0.285$ $p = 0.167$
Overtiredness	$r_s = 0.330$ $p = 0.108$	$r_s = 0.565^{**}$ $p = 0.003$	$r_s = -0.144$ $p = 0.493$
Nightmares	$r_s = 0.466^*$ $p = 0.019$	$r_s = 0.426^*$ $p = 0.034$	$r_s = 0.310$ $p = 0.131$
Sleeping less	$r_s = 0.314$ $p = 0.127$	$r_s = 0.365^T$ $p = 0.078$	$r_s = 0.001$ $p = 0.996$
Sleeping more	$r_s = 0.346^T$ $p = 0.090$	$r_s = 0.122$ $p = 0.560$	$r_s = -0.072$ $p = 0.733$

Notes: p = significance, $** p < 0.01, * p < 0.05, ^T$ (tendency of significance) $p < 0.10$

In a second step, regression analyses with 2,000 bootstrap iterations for the mediation model were calculated. Due to the missing of further significant correlations between IBD and other sleep troubles, only nightmares were considered in the mediation. The regression analysis between IBD and anxiety was significant ($\beta = 0.574, t = 3.64, p = 0.001$), as well as the

regression between IBD and nightmares ($\beta = 0.466$, $t = 2.52$, $p = 0.019$). Nightmares were significantly predicted by anxiety ($\beta = 0.426$, $t = 2.26$, $p = 0.034$). Finally, the prediction of nightmares by IBD and anxiety was calculated, showing a significant prediction of nightmares through IBD and anxiety ($R^2 = 0.244$, $p = 0.04$). An overview of the unstandardized and standardized coefficients is given in Table 3.

Table 3 Unstandardized and standardized coefficients of the regression analyses

	<i>B</i>	SE	β	<i>p</i>
IBD → Nightmares	0.065	0.026	0.466	0.019*
Anxiety → Nightmares	0.042	0.018	0.426	0.034*
IBD → Anxiety	0.798	0.219	0.574	0.001*

Notes: *B* = Regression coefficient; β = standardized regression coefficient; * $p < 0.05$

3.4 Mediation effects

The association between IBD and anxiety was significant ($\beta = 0.922$, $p \leq 0.001^*$) as well as the association between anxiety and nightmares ($\beta = 0.426$, $p = 0.034$). In addition, the total standardized effect of IBD on nightmares in adolescents was significant ($\beta = 0.652$, $p = 0.019$). However, this result did not remain significant for the direct effect of IBD on nightmares ($\beta = 0.045$, $p = 0.193$). Consequently, the indirect effect of IBD on nightmares in adolescents in the mediation model was not significant ($\beta = 0.019$, $p = 0.398$). In sum, these results show that anxiety is not a mediator in the relationship of IBD and nightmares. The results for the mediation model with anxiety included as the mediators are shown in Figure 3.

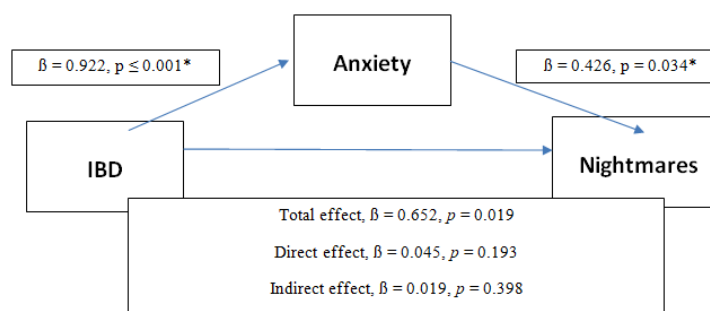


Figure 3 Mediation model of IBD, anxiety and nightmares

4 Discussion

To our knowledge, the present study was the first examining the association between emotional problems and sleep troubles in young IBD patients. A closer look was taken concerning the comparison between parental and self-report on sleep problems in adolescents suffering from IBD. Regarding sleep difficulties, self- and parental ratings were mostly congruent. However, parents and adolescents significantly differed concerning nightmare frequency ratings, with adolescents reporting a higher occurrence of nightmares. Correlational analysis showed a significant association between IBD and nightmares, as well as a tendency for significance between IBD and hypersomnia symptoms. Furthermore, our data revealed a significant correlation between anxiety and overtiredness as well as anxiety and nightmares. A tendency for significance was shown between anxiety and insomnia. Surprisingly, no significant correlation was found regarding depressive symptoms and sleep problems. These results indicate that there is an association between IBD, anxiety, and sleep problems. The occurrence of anxiety involves sleeping less in youths, whereas the presence of IBD symptoms comes along with more sleep. It becomes clear that further studies addressing this relationship are needed. Concerning the association between emotional problems and sleep troubles, especially anxiety and nightmares seemed to be relevant since those variables fulfilled the conditions to apply a mediation analysis. However, no mediation effect was found for the association of IBD, nightmares, and anxiety.

The data regarding all sleep difficulties given by the parents showed that overtiredness was ranked as the most occurring sleep problem followed by insomnia symptoms. Subsequently, the existence of sleep problems and nightmares was named, followed by hypersomnia symptoms and

finally walking and/or talking during sleep. Looking at the ratings concerning sleep difficulties given by the youths, overtiredness was mentioned as the most frequent sleep disturbance, followed by nightmares. Then insomnia as well as hypersomnia symptoms were stated by the youngsters. Finally, according to the self-report, the adolescents were the least bothered by sleep problems. These results concerning sleep problems are in line with former findings reported by parents and adolescents concerning sleep troubles [55]. In our study, the prevalence regarding hypersomnia as well as nightmares slightly differed between adolescents and parents, with adolescents reporting significantly more nightmares. Moreover, the number of sleep problems based on self-report was higher compared to parents. This significant discrepancy was also found by Prinininen and colleagues (2010, 2014), with parents reporting more sleep difficulties of their children than the children themselves [55,68]. The discrepancy between parental and youth reports regarding nightmares, found in our study goes in line with the findings by Mindell and Barrett (2002) [69]. In their study, 75% of the young patients reported having experienced nightmares with 28.2% indicating experiencing one per month, whereas only 49% of the parents reported their child having nightmares with 17.2% stated that their child experienced one nightmare per month [69]. The existing literature shows that parents underestimate their child's occurrence of nightmares, leading to the assumption that it seems adequate to use self-reports to evaluate nightmares in children and adolescents.

Since the age range of this sample is broad, the developmental differences concerning sleep between pre- to young adolescents and young adults should be taken into account when interpreting the results. The sleep need remains consistent at about 9.2h across all pubertal stages [70]. However, significant changes affecting staying up later at night and therefore sleeping in later in the morning than preadolescents could be revealed by several studies [36,71]. In sum, sleep disturbances and especially overtiredness might also be influenced by pubertal changes.

Another point of interest was the relationship between IBD symptoms, emotional problems, and sleep problems. Hence, correlations were found for IBD symptoms and nightmares as well as a tendency for significance between IBD symptoms and hypersomnia, only the main effect between IBD symptoms and nightmares was significant. For a closer examination, a mediation model was applied. However, the direct effect as well as the indirect effect of IBD symptoms on nightmares was not significant. Beyond, the association between IBD symptoms and nightmares was not mediated by anxiety in the current study. Our results indicate that anxiety does have an influence on the relationship between IBD symptoms and nightmares – however, not as a mediator. It rather seems that there might be other factors besides anxiety which influence the association between IBD and nightmares. Former studies concerning the relationship between nightmares and anxiety revealed that in healthy children and adolescents, nightmares were associated with increased anxiety symptoms [72–75]. In another study, chronically ill children reported more difficulty falling asleep as well as more nighttime awakenings, but nightmares were not mentioned [76]. However, after adjusting for emotional and behavioral problems, the enhanced sleep problems were reduced to a nonsignificant level compared to a healthy control group [76].

In our study, nightmares played a prominent role based on self-report as well as regarding mediation. As previous studies reported, the occurrence of nightmares has a negative impact on daily wellbeing in regard to cognitive, emotional, motivational, as well as physiological aspects [20,73,77]. Moreover, nightmares come along with inferior school performance and further sleep problems (*i.e.*, poor sleep quality, prolonged sleep latency) [12,78]. This leads to the conclusion that young IBD patients are not only challenged by their disease alone, in addition, they might be impaired by a higher frequency of nightmares which in turn might be caused by the disease itself [56]. Both conditions together (IBD and nightmares) could have an additional negative influence on adolescents' lives, making the need for further research in this context obvious to develop adequate intervention programs addressing these special impairments. Besides the role of nightmares, our results revealed that the emotional condition (*i.e.* anxiety) seems to be at least equally important in the young patients lives. This goes in hand with studies reporting that psychiatric problems such as depression and anxiety are more common in young IBD patients than in matched comparison groups with tension headache and diabetes as well as in healthy children [54,79]. Moreover emotional problems seem to affect the health-related quality of life in youth with IBD [54]. Especially, anxiety seems to have an influence on young IBD patients concerning disease handling (*i.e.*, concerning adherence) [80]. Moreover, IBD specific anxiety is supposed to be associated with a greater use of medical services and worsened psychological functioning [81]. Thus, it seems to be obvious to further investigate the role of emotional conditions, particularly anxiety, in young IBD sufferers.

5 Limitations and further directives

Like other studies, the present study has some limitations. Besides that this study was a pilot study, the sample size was small, due to the fact that it consisted of adolescents with a rare disorder [82]. Future studies could benefit from conducting multicenter studies to gather a higher number of participants. Furthermore, the age range of the sample is broad; thus it is questionable how valid the measurements are since the questionnaires used in this study are not validated for such a large age range. Moreover, the analyses of this study are exclusively based on questionnaires for all assessed variables, holding the possibility for bias. However, we included parental ratings as well. Further investigations should broadly examine sleep problems in young IBD sufferers with more specific questionnaires and objective measurements (*i.e.*, sleep diary, actigraphy) to evaluate sleep more adequately and detailed. Another point that should be addressed in future studies is the IBD symptom severity in the context of sleep troubles. Our findings indicate that nightmares and overtiredness play an important role in the context of IBD symptomatology in adolescents. Other studies found adolescents with severe IBD symptoms reporting lower perceived sleep quality, more sleep disturbances as well as more overtiredness than their peers without IBD, respectively, mild IBD symptoms [55, 83].

As disrupted sleep might be associated with IBD severity, sleep problems should be kept in mind when diagnosing and treating IBD in youths [84].

6 Conclusion

The present study revealed the importance of diagnosing sleep problems in adolescents suffering from IBD. Especially insomnia symptoms but also nightmares should be taken into account. Studies focusing on the comparison of parental and self-report in youths with chronic pain are rare and further investigation concerning this topic is needed.

Moreover, due to this study, it became clear that the role of anxiety in the context of IBD and sleep problems is not sufficiently answered yet. The results of the mediation analysis show that IBD is not significantly associated with nightmares after adjusting for anxiety. Further examination of anxiety and other emotional disturbances seems to be relevant to explain more of the variance in the sleep problems (especially nightmares) of young IBD patients.

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Conflict of interest

The authors declare that they have no competing interests.

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