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Original Research Article

Overweight and obesity in children with newly diagnosed inflammatory bowel disease

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ABSTRACT

Purpose: Determination of overweight and obesity prevalence in children with inflammatory bowel disease (IBD) at the time of diagnosis.
Material and methods: This was a multicenter retrospective study. The study group consisted of children with new cases of IBD diagnosed in 2005–2013 according to the Porto criteria. Hospital admission records were reviewed for demographic and clinical characteristics. BMI-for-age and gender percentile charts were used to define overweight as ≥85th BMI percentile and obesity as ≥95th BMI percentile.
Results: 675 patients were evaluated: 368 with Crohn's disease (CD) and 307 with ulcerative colitis (UC). Of these, 54.8% were boys and 45.2% were girls. There were no statistically significant differences in age, weight, height and disease activity between the CD and UC patients. The UC patients had higher BMI values than the CD patients. The prevalence of overweight and obesity was higher in the UC than the CD patients (4.89% CI95 2.76–7.93 vs. 2.45% CI95 1.12–4.59 and 8.47% CI95 5.61–12.16 vs. 1.9% CI95 0.77–3.88, respectively); the differences were statistically significant (−2.44% CI95 −5.45 to 0.49 and −6.57% CI95 −10 to −3.1, respectively). The risk of overweight/obesity was 3.5 times higher for patients with UC (OR = 0.272, CI95 0.14–0.49, $p = 0.0004$).
Conclusions: The prevalence of overweight and obesity in newly diagnosed children with IBD was 8.4% and was higher in patients with UC than in patients with CD. The results of this study have shown that not only malnourished children may suffer from IBD but also children who are overweight or obese at the time of diagnosis.

1. Introduction

Over the last few years, the problem of excessive body weight in children and adolescents has become one of the most serious public health problems throughout the world [1]. For many years, the highest percentages of overweight and obese children have been observed in the United States [2] and Western Europe [3,4]. Recently, the problem has become noticeable in Middle Europe, including Poland [5,6]. Obese children are at risk for being overweight or obese adults [7]. Because obesity is associated with numerous comorbidities such as type 2 diabetes, cardiovascular disease, nonalcoholic fatty liver disease, cancer, and other immune-related disorders such as asthma and infection, it is especially worrying when it accompanies some other chronic disease state [8].

Traditionally, malnutrition was of concern as one of the major symptoms of inflammatory bowel disease (IBD), especially Crohn's disease (CD). Malnutrition is included in the gold standard for pediatric CD activity index assessment [9]. However, according to

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recent findings, the nutritional status of patients with IBD is changing, and more overweight and obese patients are observed in this group [10]. This may delay the correct diagnosis of IBD. Moreover, overweight adults with IBD have higher morbidity and disease activity, require surgery earlier than their underweight counterparts or have more frequent perianal complications [11]. Adult obese patients with CD and overweight patients with ulcerative colitis (UC) are more likely to have an IBD flare than patients of normal body weight [12]. Recently, excessive body weight has been associated with an earlier time to loss of response to infliximab [11].

1.1. Objective

Because overweight and obesity rates have been increasing in the general pediatric population in Poland, we hypothesized that they may affect children with IBD. Therefore, the aim of this study was to determine overweight and obesity rates among children with IBD at the time of diagnosis.

2. Material and methods

This multi-center retrospective study was conducted in five university-affiliated hospitals for children in Poland (cities of Warsaw, Poznan, Wroclaw, Katowice and Cracow). The hospital admission records between January 2005 and August 2013 for newly diagnosed pediatric (up to 18 years old) IBD patients were reviewed. For each enrolled subject, clinical and demographic characteristics including age, sex, place of residence, symptom duration, type of IBD and disease activity assessment were collected at the time of initial diagnosis. CD and UC were diagnosed based on clinical signs and symptoms as well as on endoscopic, histological and radiological parameters according to the Porto criteria [13]. The severity of CD and UC was evaluated using the *Pediatric Crohn's Disease Activity Index* (PCDAI) and the *Pediatric Ulcerative Colitis Activity Index* (PUCAI), respectively, which incorporate symptoms, physical examination findings and laboratory test results. A PCDAI score $\leq$10 for CD and a PUCAI score $<$10 for UC were defined as remission. Children with indeterminate colitis were excluded from the analysis. The socioeconomic status of IBD patients was subjectively assessed by doctors. Body mass index (BMI) was calculated as weight in kilograms divided by the square of height in meters (kg/m^2). BMI categories and corresponding percentiles were as follows: $\leq$5th percentile – underweight, 5th–84th percentile – normal weight, $\geq$85th percentile – overweight, $\geq$95th percentile – obesity. Percentiles were measured using the BMI-for-age and gender percentiles charts according to the World Health Organization [14].

2.1. Statistical analysis

The odds ratio and its 95% confidence interval were used as a measure of effect size. The confidence intervals for the differences of two independent binomial proportions were estimated with the Agresti–Caffo method. The confidence interval for difference between two dependent proportions was determined using the Wald procedure with the Agresti and Min modification. McNemar's test was used for two dependent proportions. The global test for the difference between two sets of k dependent proportions, i.e., $x_1 = (p_{11}, \ldots, p_{1k})^T$ and $x_2 = (p_{21}, \ldots, p_{2k})^T$, was $T = \|x_1 - x_2\|_2 / \mathrm{SE}_{\|x_1 - x_2\|_2}$, where the distribution of the T statistic was estimated with 9999 bootstrapped samples. The chi-square test for two proportions and the exact test, if necessary, were used for cross-classification tables. The median was used as a location parameter. The S_n statistic was computed as the measure of variability: $S_n = \mathrm{med}\,\{\mathrm{med}\,|x_i - x_j|\,;\ j = 1, \ldots, n\}$ [15]. Confidence intervals for the difference between two medians were estimated with the studentized bootstrap approach.

3. Results

In this study, 675 patients were evaluated, including 368 with CD and 307 with UC. The baseline characteristics of the study groups are shown in Table 1. There were no statistically significant differences in age, weight, height and disease activity between CD and UC patients. Both diseases were associated with lower BMI values, although UC patients had generally higher BMI values than CD patients, as shown in Fig. 1.

The prevalence of overweight and obesity was higher in UC than in CD patients (4.89% CI95 2.76–7.93 vs. 2.45% CI95 1.12–4.59 and 8.47% CI95 5.61–12.16 vs. 1.9% CI95 0.77–3.88, respectively); the differences were statistically significant ($-$2.44% CI95 $-$5.45 to 0.49 and $-$6.57% CI95 $-$10 to $-$3.1, respectively). Overall, the prevalence of overweight and obesity among CD patients was 4.3% and this rate was higher in UC patients (13.4%). The percentage of overweight and obesity in the IBD population was 8.4%. There were no correlations between BMI values and socioeconomic status or place of residence both in CD ($p = 0.9705$; $p = 2894$, respectively) and UC patients ($p = 0.2362$; $p = 0.5495$; respectively). Also there was no correlation between duration of symptoms and BMI values ($p = 0.2556$).

The risk of overweight or obesity was 3.5 times higher for UC patients (OR = 0.272, $p = 0.0004$). This risk decreased with an increase in disease activity index (OR = 0.5342, $p = 0.0012$) for both diseases. It was observed that CD patients with severe disease were at the lowest risk of being overweight/obese.

4. Discussion

The results of this study indicate that the prevalence of overweight and obesity in children with newly diagnosed IBD amounted 8.4% and was more than 3 times higher in UC patients.

To date, few studies have assessed overweight and obesity in IBD patients. Kugathasan et al. [10] in the only study performed in newly diagnosed IBD children, found that 10% of children with CD and 20–30% with UC were overweight or obese. In the largest multicenter study, which included 1598 children, the prevalence of overweight or obesity was 23.6% (20% for CD and 30.1% for UC) [16]. That study included both previously and newly diagnosed patients without sub-analyses of the groups. The prevalence of overweight or obesity in adult IBD patients was much higher than in children and ranged between 36% and 56% in different European studies [17–19]. Although the data are limited, it seems that the prevalence of overweight and obesity we observed is several times lower than that reported in previous studies [10,16]. This may be a result of geographical variation in the incidence of overweight and obesity in the general population. In the United States, 18.3% of adults [20] and 9.5% of children [10] with IBD were obese, compared to more than one-third of adults and almost 17% of youth in the general population in 2009–2010 [21]. In Scotland, Steed et al. found that 18% of the IBD population was obese (BMI $>$ 30 kg/m^2) in comparison to 23% of the general population [19]. Overall, 38% of IBD patients were overweight (BMI $>$ 25 kg/m^2), which was the same proportion as in the general population [19].

In the Polish national research project called "OLAF" (conducted from 2007 to 2010) 17,500 children aged 7–18 years were examined. The results of that project demonstrated that 18.6% of boys and 14.5% of girls were overweight or obese. Overall, the prevalence of children with excess body weight was 20% compared to 8.4% in our study [6]. Therefore, the incidence of overweight and obesity in IBD patients could be a mirror of the incidence of