

Original Research Article

Body mass index in celiac disease and effect of a gluten-free diet on body mass index

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ABSTRACT

Background: Various researchers have shown association of celiac disease with body mass index. We studied body mass index levels in patient with celiac disease and effect of gluten free diet on it. To compare body mass index levels in celiac disease patients with general population and to study effect of gluten free diet on BMI levels in them.

Methods: 50 children with biopsy confirmed celiac disease (either newly diagnosed or having poor dietary compliance for gluten free diet) and 50 healthy children were enrolled at our centre. Their initial and after 6 months of strict gluten free diet, BMIs were measured and compared with the previous levels.

Results: BMIs in patients with celiac disease was significantly lower (17.18) than the healthy children 21.20 ($p < 0.001$). Boys with celiac disease had (17.28) and girls with celiac disease had (17.10) lower body mass index when compared to their healthy peers. The difference between both sexes was insignificant. After 6 months of strict gluten free diet, celiac patients showed 19.30 (12.36%) increase in their BMI levels. Boys had 19.41 (12.32%) and girls had 19.23 (12.45%) increase in their BMIs. These levels were significantly higher than those measured at the start of therapy and comparable to their healthy peers.

Conclusions: The study concluded that, low BMI is significantly associated with celiac disease. Gluten free diet significantly increases BMI levels. According to the study, largest improvement in BMI was more pronounced in patients who were underweight initially. Whereas overweight patients losses their weight after strict GFD. Low cholesterol levels were significantly associated with low BMI.

Keywords: BMI, Bikaner, Celiac disease, Gluten free diet, Serum cholesterol

INTRODUCTION

Celiac disease (CD), also known as gluten-sensitive enteropathy or celiac sprue, is defined as a permanent intolerance to ingested gluten (the storage protein components of wheat, barley and rye). The intolerance to gluten results in immune-mediated damage to the mucosa of the small intestine characteristically inducing villous atrophy and crypt hyperplasia that resolve with the removal of gluten from the diet.¹ There is little

information about body mass index (BMI) and effect of GFD in patients with celiac disease. We therefore conducted this study in fifty celiac disease patients to disclose the association of BMI and celiac disease, and to determine the impact of GFD on BMI. Mariani et al first reported high prevalence of overweight and obesity in CD adolescents on a gluten-free diet (GFD).² The risk of overweight and obesity at diagnosis of CD varies largely with the nutritional status of the underlying population, as suggested by some very recent pediatric papers.³⁻⁶ While

Cheng et al showed a positive effect of a GFD by demonstrating weight gain in previously underweight patients and weight loss in those previously overweight.⁷ In this study, we evaluated the BMI in celiac patients at the time of diagnosis and after 6 months of follow up, after taking strict gluten free diet.

METHODS

This study was carried in a tertiary care hospital of north western Rajasthan. A total of 50 children of either gender, below 16 years of age, diagnosed with celiac disease (newly diagnosed or having poor compliance for gluten free diet) were enrolled in this study. Celiac disease was diagnosed with the help of serum IgA-tTG levels and duodenal biopsy. Children with any other chronic metabolic (eg. diabetes, hyper/hypothyroidism, liver disease etc.) Or severe medical illness was excluded from cases. Another 50 apparently healthy children of either gender and below 18 years were identified as control group. Information regarding their age, sex, mode of presentation (for cases), duration of symptoms and anthropometry was collected. A case of celiac disease was considered newly diagnosed if interrogated within a month of diagnosis. Dietary compliance was assessed by questioning in detail about their dietary history. BMI was measured for both cases and controls. BMI defined as body weight (kg)/height (m²) was recorded at the time of celiac diagnosis and after strict gluten free diet. BMI was further categorized into 4 groups according to World Health Organization criteria: BMI <18.5 as underweight, 18.5 to 24.9 as normal, 25 to 29.9 as overweight and 30 as obese. All celiac disease patients were counseled for strict gluten free diet (GFD) and maintenance of the same was assured by timely follow up. After 6 months of strict gluten free diet, BMI levels were repeated for cases. All collected data was tabulated and statically analyzed by using SPSS software.

RESULTS

In this study, Out of 50 celiac patients, there were 30 males and 20 females in the study group. Control group had 28 males and 22 females. Before GFD, 35 (70%) celiac patients were underweight and after 6 months of strict GFD, their BMI levels were dramatically improved. Although, before GFD 3(6%) patients were overweight, but their BMI levels were decreased after strict GFD. BMIs in patients with celiac disease was significantly (p value <0.001) lower (17.18) than the healthy children (21.20). Boys with celiac disease had (17.28) and girls with celiac disease had (17.10) body mass index when compared to their healthy peers (21.20). The difference between both sexes was insignificant. After 6 months of strict gluten free diet, celiac patients showed 19.30 (12.36%) increase in their BMI levels. Boys had 19.41 (12.32%) and girls had 19.23 (12.45%) increase in their BMIs. These levels were significantly higher than those measured at the start of therapy and comparable to their healthy peers. The difference in mean BMI at diagnosis

and after 6 months of GFD was highly significant statistically (p value = <0.001). When celiac patients were follow after 6 months of strict GFD, the percentage increases in mean cholesterol level corresponded to percentage increases in mean BMI value in celiac patients. At time of diagnosis both serum cholesterol level and BMI levels were low in celiac patients. After 6 months of strict GFD both s. cholesterol and BMI levels were increased.

Table 1: distribution of celiac patients according to their BMI levels (before and after 6 months of GFD).

BMI	Total no. of male (n = 30)		Total no. of female (n = 20)	
	Before GFD	After GFD	Before GFD	After GFD
<18.5	20 (66.6%)	14 (46.6%)	15 (75.0%)	11 (55.0%)
18.5-24.9	08 (26.6%)	16 (53.3%)	04 (20.0%)	09 (45.0%)
25-29.9	02 (6.66%)	00	01 (05.0%)	00
>30	00	00	00	00

Table 2: BMI changes in different celiac groups (before and after 6 months of GFD).

BMI	Underweight <18.5	Normal 18.5-24.9	Overweight 25-29.9
Pre GFD BMI	16.0±0.9	21.6±1.3	26.3±1.0
Post GFD BMI	19.2±1.6	21.9±1.2	24.8±1.1

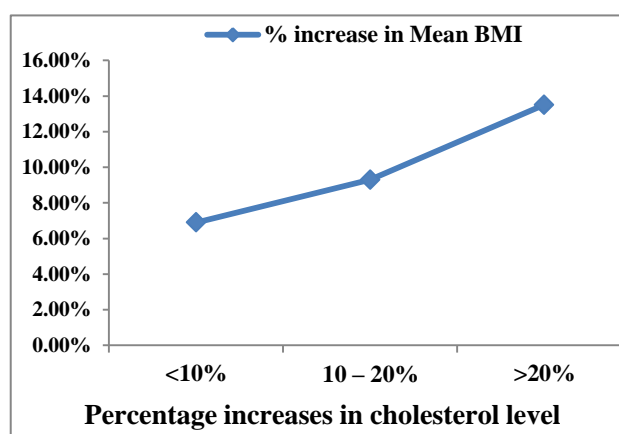


Figure 1: Association of degree of percentage increase in s. cholesterol level with percentage rise in body mass index after 6 months strict GFD.

DISCUSSION

Dietary management is the only gold standard therapy for celiac disease. Dietary counseling is very important, because patients need to be able to make food choices among the gluten-free foods. We must advise patients

about a high quality GFD in which naturally gluten-free foods and use of alternate, non-gluten containing grains. According to our study 70% of celiac patients met the underweight criteria, 24% patients had normal weight, and however, for those who were either underweight or overweight, treatment with a GFD resulted in a beneficial change in the BMI. This provides another reason to diagnose and treat those with celiac disease. Nutritional rehabilitation leads to growth acceleration in most CD patients.⁸⁻¹⁰ GFD heals in fact the intestinal mucosa and corrects malabsorption, with a more rapid recovery of fat mass.^{11,12} Results of our study was similar with a study by Cheng et al, which also showed a positive effect of a GFD by demonstrating weight gain in previously underweight patients and weight loss in those previously overweight.⁷ Another study by Patwari et al found that children with an early diagnosis of CD had a greater increase of height than children diagnosed later.¹³ In some recent studies, the presence of anti-pituitary antibodies has been reported in newly diagnosed CD children and this may contribute to growth impairment.¹⁴

CONCLUSION

Low BMI is significantly associated with celiac disease. Gluten free diet significantly increases BMI levels. According to our study, largest improvement in BMI was more pronounced in patients who were underweight initially. Whereas overweight patients losses their weight. These facts are proofs of the beneficial effect of GFD in the great part of CD children. The high frequency of underweight at diagnosis suggests the need for careful and personalized nutrition management.

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