

Lactose and Fructose Intolerance in Turkish Children with Chronic Abdominal Pain

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Objective: To investigate the prevalence of lactose and fructose intolerance in children with chronic abdominal pain.

Methods: Hydrogen breath tests were done to detect lactose and fructose malabsorption in 86 children with chronic abdominal pain (44 irritable bowel syndrome, 24 functional abdominal pain and 17 functional abdominal pain syndrome as per Rome III criteria) presenting to a Pediatric Gastroenterology department.

Results: 14 (16.3%) of patients were diagnosed with lactose intolerance and 11 (12.8%) with fructose intolerance.

Conclusions: Lactose and fructose intolerance in children can lead to chronic abdominal pain and symptoms improve with dietary modifications.

Keywords: *Diagnosis, Etiology, Functional gastrointestinal disorders.*

Chronic abdominal pain is a symptom that can affect patients physically, psychologically and socially. It affects 13-38% of school-age children [1]. Studies in recent years, particularly in adults, have reported that lactose and fructose intolerance can cause chronic abdominal pain [2-6]. However, the data are insufficient in childhood [3,5,7].

This study was planned to investigate the prevalence of lactose and fructose intolerance in children with chronic abdominal pain.

METHODS

Children between the ages of 4 and 18 years, presenting with chronic abdominal pain were included in the study. Chronic abdominal pain was defined as three or more episodes of pain or discomfort capable of affecting daily activity lasting for at least 3 months [8]. Organic causes were excluded. Patients with excessive bacterial growth identified using the Hydrogen breath test (HBT), and those with a history of antibiotic, proton pump inhibitor, laxative or probiotic use were also excluded. The study was approved by the Ondokuz Mayıs University Medical Research and Ethical Committee.

The HBT was performed using a gas analyzer (Bedfont Gastro+Gastrolyzer, ME13QX, Great Britain) with 1 ppm sensitivity. Patients were given a carbohydrate-poor diet before the HBT. Following the measurement of patients' first basal hydrogen value in

breath after 8-h fasting, measurements continued for 3 h every 30 minutes with patients drinking test substances. Lactulose HBT was first performed to identify patients with excessive bacterial growth. Lactose was given in a 2 g/kg dose (maximum 25 g), and fructose was given at a dose of 1 g/kg (maximum 50 g) in 25% concentration. Tests with an increase in hydrogen levels of 20 ppm over basal levels were regarded as positive [3,9,10].

Appropriate dietary adjustments were made in children diagnosed with lactose or fructose malabsorption. A symptom score ranging from 0 and 3 (0: none, 1: mild, 2: present, 3: severe) for abdominal pain, bloating, flatulence, headache, vomiting and diarrhea was recorded [5]. In addition, frequency of abdominal pain per week and days of school missed per month, and frequency of difficulty in sleeping were recorded.

SPSS 15 was used for statistical analysis. Categorical data were analyzed using the Pearson and Fisher chi-square test. Analysis of variance (ANOVA) was used for group comparisons of normally distributed values, and the Kruskal Wallis test for non-normally distributed parameters. Student *t* test was used to compare differences of normally distributed means between two groups and the Mann-Whitney U test for comparing means between non-normally distributed data. The Wilcoxon test was employed in pre- and post-diet (intragroup) analysis. Significance was set at $P < 0.05$ for all results.

RESULTS

Eighty-six patients, (52 girls), were enrolled in the study. When patients were assessed using Rome III criteria, 44 (51.2%) were diagnosed with irritable bowel syndrome (IBS). Functional abdominal pain was present in 24 (27.9%) patients and functional abdominal pain syndrome in 17 (19.8%). One patient was diagnosed with functional dyspepsia.

Carbohydrate intolerance was observed in 27 patients; 14 (16.3%) had lactose intolerance, 11 (12.8%) had fructose intolerance and 2 (2.3%) patients had combined lactose and fructose intolerance (**Table I**).

Carbohydrate intolerance was observed in 12 (27.2%) patients with IBS, 10 (41.6%) patients with functional abdominal pain and 5 patients (29.4%) with functional abdominal pain syndrome (**Fig. 1**). Patients' demographic data and HBT results are shown in **Table II**. No significant difference was determined between IBS,

functional abdominal pain and functional abdominal pain syndrome in terms of age, gender and prevalence of lactose and fructose intolerance ($P=0.71$; $P=0.749$; $P=0.40$ and $P=0.80$, respectively).

One patient with lactose intolerance dropped out from the study, and two failed to comply with their diets. Symptoms resolved entirely in 8 of the 11 patients (72.7%) at the end of the 2nd month, and decreased in the other three. A significant decrease was observed in the severity of abdominal pain, nausea, bloating and days of school missed ($P=0.003$, $P=0.002$, $P=0.015$, $P=0.024$ and $P=0.046$, respectively) (**Web Fig. 1**).

One patient with fructose intolerance dropped out from the study and four failed to comply with their diets. Symptoms did not resolve in one of the six patients monitored, decreased in three and resolved completely in two. A significant decrease was observed after diet in abdominal pain in patients with fructose intolerance ($P=0.04$) (**Web Fig. 2**).

TABLE I CHARACTERISTICS OF CHILDREN WITH POSITIVE OR NEGATIVE LACTOSE AND FRUCTOSE BREATH TESTS (N=86)

	L(+), (n=14)	F(+), (n=11)	LF(-), (n=59)	P value
Age (y), mean (SD)	11.9 (3.6)	9.8 (3.6)	10.8 (3.5)	0.36
Female gender, n (%)	11 (78.6)	6 (54.5)	34 (57.6)	0.32
BMI (kg/m ²), mean (SD)	21 (2.2)	19.7 (2.1)	20.6 (2.2)	0.38
History of allergy, n(%)	5 (35.7)	2 (18.2)	14 (23.7)	0.55

L(+) Lactose hydrogen breath tests were positive, F(+) Fructose hydrogen breath tests were positive, LF(-) Lactose and fructose hydrogen breath tests were negative. Two children had positive breath tests for both lactose and fructose.

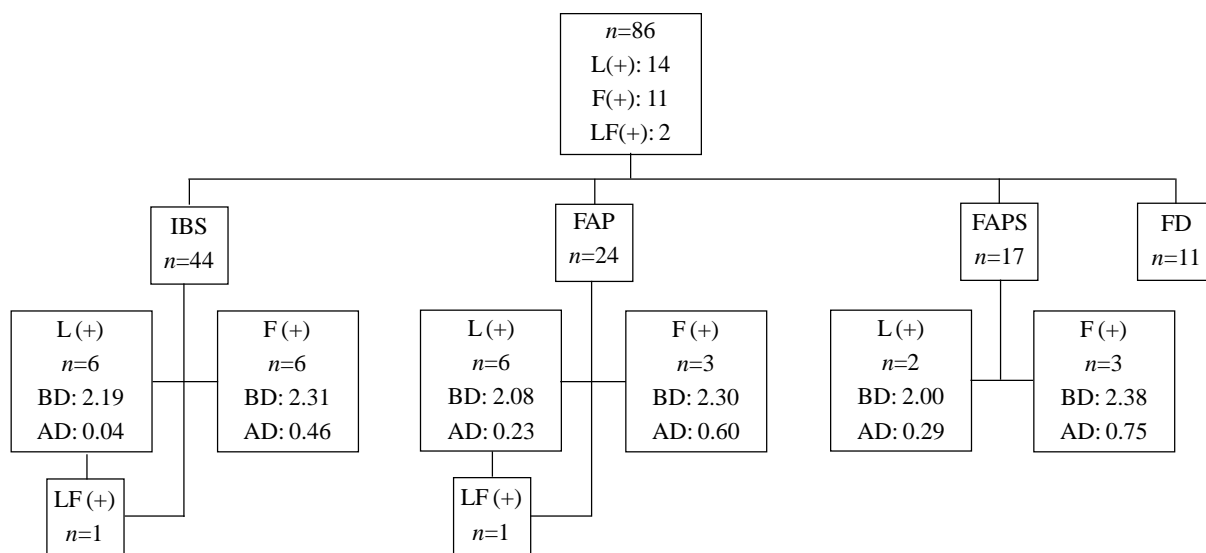


FIG. 1 IBS: Irritable bowel syndrome, FAP: Functional abdominal pain, FAPS: Functional abdominal pain syndrome, FD: Functional Dyspepsia L(+) Lactose hydrogen breath tests were positive, F(+) Fructose hydrogen breath tests were positive, LF(+) Lactose and fructose hydrogen breath tests were positive, BD: Abdominal pain score of before diet, AD: Abdominal pain score of after diet

WHAT THIS STUDY ADDS?

- Lactose and fructose intolerance can cause chronic abdominal pain in children.

TABLE II DEMOGRAPHIC DATA OF PATIENTS AND HBT RESULTS

Variable, n(%)	IBS (n=44)	FAP (n=24)	FAPS (n=17)
*Age, y	10.6 (3.7)	10.9 (3.4)	11.8 (3.2)
Females	30	13	9
L(+)	6 (13.6)	6 (25)	2 (11.7)
F(+)	5 (11.4)	3 (12.5)	3 (17.7)
LF(+)	1 (2.2)	1 (4.1)	0

IBS: Irritable bowel syndrome, FAP: Functional abdominal pain, FAPS: Functional abdominal pain syndrome, L(+): Positive Lactose hydrogen breath tests, F(+): Positive Fructose hydrogen breath tests, LF(+): both hydrogen breath tests positive; LF(-) Both hydrogen breath tests negative; *Values in mean (SD); All comparisons $P > 0.05$.

DISCUSSION

In this study, the prevalence of lactose and fructose intolerance in children with chronic abdominal pain was observed to be 16.3% and 12.8%, respectively. Symptoms resolved entirely in 10 HBT-positive patients in response to the modified diet. Two of these were from the fructose group and 8 from the lactose group.

Earlier studies aimed at determining the prevalence of lactose intolerance in children with chronic abdominal pain have reported estimates of 20-30% [3,11,12]. Excessive bacterial growth in the gut is known to lead to false positive outcomes at HBT. Nucera, *et al.* [13] reported a level of lactose malabsorption of 83% before treatment of excessive bacterial growth at HBT in patients with IBS, and a level of 48% after treatment. The fructose malabsorption level was 75% before treatment, falling to 25% after treatment. It has therefore been suggested that breath tests are more reliable for identifying lactose and fructose malabsorption, and should be performed after excluding excessive bacterial growth [13].

Lactose malabsorption can cause abdominal fullness, bloating, nausea, abdominal pain, flatulence, and diarrhea, which are similar to the symptoms of IBS. However, it is unclear if these digestive disorders contribute to or cause the symptoms of IBS. Some previous studies have concluded that there is no evidence that lactose-free diets benefit children with IBS [7]. While the mechanism involved in the lack of symptoms with carbohydrate intolerance is uncertain, the common view is that individual differences are significant in the presence of

symptoms. In the same way, responses to diet therefore also exhibit individual differences. Research studies show that a proper diagnosis and effective dietary intervention significantly reduces the severity and frequency of gastrointestinal symptoms in IBS [14,15]. In our study, symptoms improved markedly with lactose free diet.

Limitations to this study include absence of healthy controls. Additionally, our patients on modified diets were not regularly followed-up by clinical examination.

In conclusion, lactose and fructose intolerance may be common in children with chronic abdominal pain. Large-scale controlled studies are needed to confirm our findings.

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