ORIGINAL ARTICLE

Functional gastrointestinal disorders in children: a single centre experience

Amela Selimović[1], Nina Mekić[2], Selma Terzić[1], Almira Ćosićkić[1], Evlijana Zulić[1], Majda Mehmedović[3]

[1]Clinic for Childhood Diseases, University Clinical Centre Tuzla, [2]Paediatric Department, Health and Educational Medical Centre Tuzla, [3]Clinic for Internal Medicine, University Clinical Centre Tuzla; Bosnia and Herzegovina

ABSTRACT

Functional gastrointestinal disorders in childhood (FGIDs) constitute a significant time-consuming clinical problem for healthcare practitioners, and they carry an important psychosocial burden for patients and their families. The aim of this study was to characterize etiology, clinical features, and interventions in a paediatric cohort of patients with FGIDs, who were referred to a tertiary care university-affiliated centre.

Methods A retrospective study of children aged 1-15 years old referred to the Clinic for Children's Diseases, University Clinical Center Tuzla, from January 2022 to December 2022, who fulfilled criteria for FGIDs (n=209), were divided in three groups: 0-3, 4-10 and 11-15 years old. Demographic characteristics, number of examinations, duration of symptoms, initial diagnosis, hospital evaluation and outcomes of each child were collected.

Results During the study period, 670 patients were referred to a gastroenterologist, out of whom 209 (31.2%) fulfilled the criteria for FGIDs, with median age of 8.0 years. Females were predominant in all groups (p=0.0369). Children aged 4 to 10 years were significantly more frequent (p<0.0001). A median duration of symptoms was one year. Functional constipation was the most common diagnosis, 99 (47.4%), followed by functional abdominal pain not otherwise specified, 67 (37.2%), and functional dyspepsia, 25 (12.0%). Fifty-two percent of patients did not require further follow-up by the gastroenterologist.

Conclusion Although FGDIs are frequent, they are not well accepted neither among patients nor physicians. Extensive diagnostic procedures are often unnecessary and the cessation of specialized care follow-up is possible in a significant number of cases.

Key words: abdominal pain, constipation, functional dyspepsia, irritable bowel syndrome, Rome IV

Corresponding author:
Amela Selimović
Clinic for Children's Diseases,
University Clinical Centre Tuzla
Prof. Ibre Pasica bb, 75000Tuzla,
Bosnia and Herzegovina
Phone: +387 35 303 715;
E-mail: amelaselimovic2711@gmail.com
ORCID ID: https://orcid.org/0000-0002-8709-4542

Original submission:
06 July 2023;
Revised submission:
02 October 2023;
Accepted:
19 October 2023
doi: 10.17392/1649-23

Med Glas (Zenica) 2024; 21(1):112-117

INTRODUCTION

Functional gastrointestinal disorders (FGIDs) are very common in children, since they represent 50% of pediatric gastroenterologists' consultations (1). FGIDs are defined as a combination of clinical patterns characterized by chronic or recurrent gastrointestinal symptoms not explained by biochemical or structural alterations (2). These disorders are currently diagnosed using the Rome IV criteria defined in 2016. The most substantial contribution of Rome IV was to present evidence and systematization of clinical criteria to support a "symptom-based diagnosis", which led to the end of an era in which the diagnosis of functional disorders had to be preceded by the exclusion of organic diseases (3,4); FGIDs can exist alongside with other medical conditions (5-7).

The causal mechanisms behind FGIDs are not fully understood. The dominant theory suggests that the cause is a dysregulation of the brain-gut communication axis (8). The interplay and feedback of a variety of genetic, physiological, psychological, and environmental factors are believed to affect the central nervous system and gastrointestinal motility (9,10). These disorders result in distressing symptoms such as stomach pain, gastrointestinal (GI) cramps, nausea and heartburn. Children with FGIDs present frequently to all levels of health care, they have lower quality of life which ultimately affects school attendance and negatively impacts parents' ability to work (11,12). The management of FGIDs is usually time-consuming and financially costly for families and health care teams, with many children continuing to present symptoms as adults (13).

Worldwide prevalence of FGIDs is as much as 40%, and more than two-thirds of patients have seen a doctor at least once during the year (14,15). There are no studies of the pattern of FGIDs based on ROMA IV criteria among children in Bosnia and Herzegovina. Despite the relatively benign nature of the symptoms in FGIDs, in many instances patients still undergo extensive testing, and are referred for further evaluation and follow up.

The aim of this study was to describe the demographics and interventions in paediatric patients with FGIDs who were referred to a gastroenterologist at a tertiary care centre Tuzla, Tuzla Canton, and most of all to increase knowledge of FGIDs as a common gastrointestinal problem in everyday paediatric practice.

PATIENTS AND METHODS

Study design and patients

A descriptive retrospective cohort study of children and adolescents with FGIDs referred to a gastroenterologist in the Clinic for Childhood Diseases in Tuzla from January 2022 to December 2022, aged 0-15 years (n=209). Data were collected from the clinical computerized records database (BIS). The Clinic for Childhood Diseases in Tuzla is a tertiary care university-affiliated centre in Tuzla Canton, the biggest Canton in the Federation of Bosnia and Herzegovina with the average of 510,353 inhabitants, and it is the only tertiary care centre in this region.

The Rome IV criteria were used to diagnose FGIDs (3). Patients with the following diagnoses were included: functional dyspepsia (FD), irritable bowel syndrome with/without diarrhoea, functional constipation, delayed defecation of a breastfed child, habitual/recurrent vomiting, aerophagia, functional abdominal pain not otherwise specified (FAP-NOS).

The study protocol was approved by the Ethic Committee of UKC Tuzla No.02-09/2-27/23

Methods

The following data were collected for each patient by examining medical documentation: gender, age, diagnosis of FGIDs, whether it was the first or control examination at the Department of Gastroenterology, the number of examinations during 2022, hospital evaluation, and associated other gastrointestinal diseases (chronic gastritis, gastroesophageal reflux disease - GERD, coeliac disease, moderate protein-energy malnutrition, lactose intolerance, Mb Hirschsprung, dolichosigma). For patients who were examined for the first time, data on a referral diagnosis, primary diagnostic approach (basic laboratory findings and ultrasound) and the duration of leading symptoms were also collected.

The patients were divided into 3 groups according to age: Group 1: infants and young children (0-3 years old); Group 2: older children (4-10 years old) and Group 3: adolescents (11-15 ye-

ars old). All collected data were entered into a unique table in which each participant was assigned an identification mark at the beginning of research to protect their personal identity.

Statistical analysis

A distribution of variables was determined by the Kolmogorov-Smirnov test. Variables with distorted distribution were shown with a median as a measure of the central value. Mann-Whitney *U* tests and one-way analysis of variance were used to compare continuous variables between the groups, and χ^2 test and comparison of proportions was used for categorical variables. The difference was considered significant with $p<0.05$.

RESULTS

During the study period, 670 patients were referred to a gastroenterologist at the Clinic for Childhood Diseases, University Clinical Centre Tuzla, of whom 209 (31.2%) fulfilled the criteria for FGIDs as per the Rome IV criteria definitions (Table 1).

Children aged from 4 to 10 years were significantly more frequent than other age groups, 104/209 (49.8%) ($p<0.0001$).

Among the FGIDs, functional constipation was the most common diagnosis, in 99 (out of 209; 47.4%). The majority of patients, 167 (out of 209; 79.9%), had one diagnosis, and 42 (20.1%) had two diagnoses of FGIDs at the same time. No patients had three or more diagnoses of FGIDs (Table 2).

Table 1. Overall demographic characteristics of 209 patients according to gender

Variable	**Female** (130; 62.2%)	**Male** (79; 37.8%)	<0.0001
	Median (interquartile range)		
Age (months)	7.6 (6,996-8.414)	8.9 (7.283-9.002)	0.4433
Weight (kg)	23.9 (20.000-28.896)	28.4 (23.158-33.342)	0.3842
Length (cm)	127 (116.104-132.000)	132 (119.632-142.342)	0.3277
Duration of symptoms (months)	12 (6.000-12.000)	12 (6.000-13.368)	0.8903
Number (%) of examinations in Department of Gastroenterology			
1	78 (60.0)	47 (59.5)	0.9431
2	39 (30.0)	21(26.6)	0.5992
3 and more	13 (10.0)	11(13.9)	0.3921

According to the age groups, functional constipation was the most common diagnosis in the group aged 0-3, 26 (out of 45; 57.8%) and in 4-10 years, 61 (out of 104; 58.7%); in the group aged 11-15 years the most frequent were FAP-NOS, 18 (out of 60; 30.0%) and FD, 17 (28.3%). In the group aged 4-10 years old, FAP-NOS was significantly more frequent in females ($p=0.0003$), while functional constipation occurred in more male patients ($p=0.0305$) (Table 2).

The most common referral diagnosis in all age groups was also functional constipation, with the referral diagnosis coincided with the final diagnosis in a significant number of patients, 76 (out of 99; 76.8%); other 23 (23.2%) patients were referred

Table 2. Functional gastrointestinal disorders of 209 patients according to age and gender

Functional gastrointestinal disorder	No (%) of patients in the group															
	Overall				0-3 years				4-10 years				11-15 years			
	Female	Male	Total	p	Female	Male	Total	p	Female	Male	Total	p	Female	Male	Total	p
	130 (62.2)	79 (37.8)	209	<0.0001	28 (62.2)	17 (37.8)	45 (21.5)	0.0084	57 (54.8)	47 (45.2)	104 (49.8)	0.3321	45 (75.0)	15 (25.0)	60 (28.7)	0.0006
Abdominal pain not otherwise specified	52 (40.0)	15 (18.9)	67 (32.1)	0.0016	-	-	-	-	36 (63.2)	13 (27.7)	49 (47.1)	0.0003	14 (31.3)	4 (26.7)	18 (30.0)	0.7495
Constipation	49 (37.7)	50 (63.3)	99 (47.4)	0.0003	14 (50.0)	12 (70.5)	26 (57.8)	0.1820	28 (33.0)	33 (49.1)	61 (58.7)	0.0305	8 (17.8)	4 (26.7)	12 (20.0)	0.4595
Dyspepsia	18 (13.8)	7 (8.9)	25 (12.0)	0.2908	-	-	-	-	5 (8.8)	3 (6.4)	8 (7.7)	0.646	14 (31.3)	3 (20.0)	17 (28.3)	0.4050
Encopresis	5 (3.8)	17 (21.5)	19 (9.1)	0.0001	1 (3.6)	1 (5.9)	2 (4.4)	0.7203	5 (10.6)	5 (8.8)	10 (9.6)	0.7578	3 (6.7)	4 (33.3)	7 (11.7)	0.0093
Irritable bowel syndrome with diarrhoea	3 (2.3)	1 (1.3)	4 (2.9)	0.6105	-	-	-	-	1 (17.5)	0	1 (0.9)	0.0027	1 (22.2)	3 (20.0)	3 (5.0)	0.8590
Irritable bowel syndrome with constipation	3 (2.3)	2 (2.5)	5 (6.9)	0.9268	-	-	-	-	-	-	-	-	3 (6.7)	2 (13.3)	5 (8.3)	0.4275
Cyclic vomiting syndrome	9 (6.9)	7 (8.9)	16 (7.7)	0.5890	2 (7.1)	1 (5.9)	3 (6.7)	0.8769	7 (12.3)	3 (6.4)	10 (9.7)	0.3125	2 (4.4)	1 (6.7)	3 (5.0)	0,7278
Infant colic	4 (3.1)	2 (2.5)	6 (2.9)	0.8017	4 (14.3)	2			-	-	-	-	-	-	-	-
Delayed defecation of a breastfed child	3 (2.3)	4 (5.1)	7 (3.3)	0.2771	3 (10.7)	4 (23.5)	7 (15.5)	0.2510	-	-	-	-	-	-	-	-
Aerophagia	1 (0.8)	2 (2.5)	3 (1.4)	0.3188	0	1 (5.9)	1 (2.2)	0.1936	-	-	-	-	1 (2.2)	1 (6.7)	2 (3.3)	0.4038

with recurrent abdominal pain, and basically had functional constipation previously not recognized.

Basic laboratory tests were performed at the primary level in about half of the patients, mostly in the group aged of 4-10 years old, while abdominal ultrasound was done in only 31 (out of 209; 14.8%) patients.

An associated disease was found in only 35 (16.7%) patients referred to a gastroenterologist, the most common of which was GERB, 10 (out of 31; 32.3%) and chronic gastritis, in 8 (25.8%) patients, followed by a moderate protein-energy deficit in six (26.1), celiac disease in five (16.1%) patients; three patients had dolichosigma, two had lactose intolerance, one patient had Mb Hirschsprung, and only 14 (6.7%) patients were hospitalized. A total of 108 (out of 209;51.6%) patients did not require further follow-up by a gastroenterologist.

DISCUSISION

FGIDs place an economic burden on healthcare systems, reduce quality of life and carry an important psychosocial burden for patients and their families (16). In our study, one third of all patients who were referred to the gastroenterologist met the ROMA IV criteria. Most patients were female (62.2%), with a median age of 7.6 years. At the time of initial evaluation in our centre, a median duration of symptoms was one year and most patients visited the gastroenterologist for the first time. Similar to our study, among 256 children referred to the paediatric gastroenterology clinic in Madrid, Bermejo CA et al. found FGIDs predominant in females 8.4 years old, with the same duration of symptoms (17). Female patients were predominant with similar median age in other studies too (18,19). In Saudi Arabia among 152 children with FGIDs, males were more common and younger comparing to our study; but in relation to gender, female children were also more frequent with the diagnosis of FAP-NOS, and a larger number of boys had functional constipation (20).

Paediatricians did not recognize the functional disorder as much as it was expected, and referred the patients to a paediatric gastroenterologist. FGIDs are still not accepted as harmless by paediatricians, especially family practitioners. Basic laboratory tests were performed at the primary level in about half of the patients, mostly in the group aged of 4-10 years old, but it is devastating that abdominal ultrasound was done in only 31 (14.8%) patients. Abdominal ultrasound is a non-invasive imaging method that is painless and in most patients with FGIDs, the findings are normal, which means a lot to worried parents.

Although FGIDs are considered a functional disorder rather than an organic disease, affected children and their families can still experience anxiety and concerns that can interfere with school, sports, and regular daily activities and lead to frequent attendances at paediatric emergency departments or paediatric gastroenterology clinics (21). We have found that functional constipation was the most common referral diagnosis in all age groups (47.4%). Functional constipation is considered a great disease burden in children who need early screening and detection, with a pooled global prevalence of 14.4% when diagnosed based on the Rome IV criteria. The prognosis is better in children with prompt and proper management (22).
In our study encopresis occurred in 19% of patients, probably because the constipation lasted for a short time before a consultation, but on the other hand, in our mentality, parents hardly report dirty laundry as a symptom because they feel ashamed. Functional dyspepsia (FD) was the third most common in the group aged 4-10 years old and the second most common in the 11-15 years old. The prevalence of FD, according to research on 4,400 children from 6 European countries, was 3.4% in children aged 4–9 and in 5.4% in adolescents aged 10–18 year (23).

It is important to provide a symptom-based diagnosis of FGIDs to the child and the family, because around 90% of children with FGIDs do not have an organic cause, and even though the diagnosis of functional etiology could be established in children without any alarm symptoms or “red flags”, still at least one-quarter of these children undergo diagnostic testing (24). According to our results, it was possible to establish the diagnosis of FGIDs in half of the patients at the first examination based on good medical history and using the ROMA IV criteria, and can be well managed at the primary care level, especially functional constipation.

Although FGIDs account for a majority of new patients, it seems that some training programs may not provide sufficient experience recogni-

zing and managing patients with common functional disorders. An associated disease was found in only 16.7% patients referred to our Centre, the most common of which were GERB (32.3%) and chronic gastritis (25.8%). But still as much as 42% of parents insisted on a follow-up examination. Pharmacotherapy is often sought by patients and families who hope to find a "pill" that will lead to rapid symptom relief. The parents had a hard time accepting that the child did not have a "serious" disease and insisted on additional diagnostic tests. The most important thing is for the doctor to be sure of the diagnosis of FGIDs, to leave no room for doubt, and especially not to require an excessive number of diagnostic tests, because this makes parents even more worried that the cause of their child's complaints could be a serious disease.

In conclusion, symptoms of FGIDs are usually chronic or recurrent, and cause significant morbidity, frequent hospital visits and broad diagnostic workup, thus having a negative impact on patients' quality of life. Depending on symptoms and "red flags", diagnostic workup must be rational. Based on our study, it appears that neither paediatricians nor family practitioners are educated enough about the diagnosis and management of FGIDs. The high prevalence of FGIDs suggests that we should make more effort in terms of education about FGIDs, including medical students, paediatricians, family practitioners and paediatric gastroenterologists.

FUNDING

No specific funding was received for this study.

TRANSPARENCY DECLARATION

Conflicts of interest: None to declare.

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