

Frequency of Functional Gastrointestinal Disorders in Children with Recurrent Abdominal Pain

Pryanka Devi^{1*}, Arit Parkash¹, Bilquis Naeem¹, Shahzadi Dilawar Hussain¹, Aneel Kumar² and Nadeem Ahmed Memon¹

¹Department of Paediatrics, National Institute of Child Health (NICH), Karachi, Pakistan

²Department of Psychiatry, Jinnah Medical & Dental College (JMDC), Karachi, Pakistan

ABSTRACT

Background: Functional gastrointestinal disorders (FGIDs) are common disorders characterized by chronic or recurrent gastrointestinal (GI) symptoms, not related to structural or biochemical abnormalities

Objective: To determine the frequency of FGIDs in children with complaints of recurrent abdominal pain.

Methods: This cross-sectional study was done at the outpatient department of pediatrics, National Institute of Child Health, Karachi, Pakistan from October 2022 to March 2023. Children of either gender aged 1-12 years with complaints of recurrent abdominal pain were analyzed. Socio-demographic characteristics along with presenting complaints and types of FGIDs were noted.

Results: In a total of 188 children, the mean age was 7.22 ± 1.96 years while 107 (56.9%) children were boys. The mean duration of symptoms was 2.7 ± 1.8 months. The most frequent presenting complaints were pain during bowel movement, nausea, and epigastric pain reported by 88 (46.8%), 75 (39.9%), and 64 (34.0%) children respectively. Frequency distribution of functional GI disorders revealed that functional abdominal pain was the commonest noted in 72 (38.3%) children while irritable bowel syndrome (IBS) and functional dyspepsia were found among 38 (20.2%) and 37 (19.7%) children respectively. Stratification of functional GI disorders showed a statistically significant relationship ($p < 0.001$) concerning presenting complaints.

Conclusion: Among children with FGIDs, the most frequent presenting complaints were pain during bowel movement, nausea, and epigastric pain. Functional abdominal pain, IBS, and functional dyspepsia were the most frequent types of FGIDs.

Keywords: Bowel movement, epigastric pain, gastrointestinal disorders, irritable bowel syndrome, nausea.

INTRODUCTION

Functional gastrointestinal disorders (FGIDs) are common disorders described as chronic or recurrent gastrointestinal (GI) symptoms that are not associated with structural or biochemical disorders [1]. The etiology of FGIDs is not fully understood but it could be linked with subtle alterations in the normal development or maladaptation to normal behavioral responses to internal as well as external stimuli [1, 2]. The frequency of FGIDs remains variable in different parts of the world [3]. International data shows that between 27–41% of infants and toddlers are documented to meet the criteria for at least one FGID [4-7]. Many of FGIDs are treated with ineffective therapeutic options which adds to the already existing financial issues among developing countries [8].

Around 50% of the global pediatric population lives in Asia and this region is passing through a rapid economic and cultural transition [9-11]. Some researchers have shown that the burden of FGIDs is significant among children, [12, 13] but still, the data on this important issue is scarce from Pakistan. It is well known that assessment of the burden, presentation, and determinants of the disease

is very important for an improved understanding of the unexplained pathophysiology behind FGIDs and may assist in better management approaches. This study was planned to determine the frequency of functional gastrointestinal disorders in children with complaints of recurrent abdominal pain.

METHODOLOGY

This cross-sectional study was conducted at the outpatient department of pediatrics, National Institute of Child Health, Karachi, Pakistan from October 2022 to March 2023. Approval from “Institutional Review Board (IRB)” was taken. Informed and written consents were obtained from parents/guardians. Open-Epi sample size calculator was used to estimate a sample size of 188 taking confidence interval 95%, margin of error 3% and reported prevalence of functional dyspepsia in children as 4.6% [14]. Inclusion criteria were children of either gender aged 1-12 years with complaints of recurrent abdominal pain. Children were excluded who have known cases of malignancy, had congenital problems, or those were mentally retarded.

Detailed medical history was obtained and socio-demographic characteristics as well as clinical findings were noted. Monthly family income status was termed as low if monthly family income was below PKR 35,000, middle if PKR between PKR 35,000 to 65000, or high if PKR above 65,000. Routine ultrasound was performed

*Corresponding author: Pryanka Devi, Department of Paediatrics, National Institute of Child Health (NICH), Karachi, Pakistan, Email: priyankatalreja786@gmail.com

Received: April 10, 2023; Revised: July 07, 2023; Accepted: July 18, 2023

DOI: <https://doi.org/10.37184/lnjpc.2707-3521.6.7>

on all the patients. All the study information was noted on a specifically designed proforma.

Types of Functional Gastrointestinal Disorders

Functional Dyspepsia: It was labeled as per ROME-III Criteria [15] as the presence of 1 or more of the following at least four days per month (for at least two months): i) postprandial fullness; ii) early satiation; iii) epigastric pain or burning (not related to defecation), and no evidence of structural disease that is likely to explain the symptoms.

Irritable Bowel Syndrome (IBS): It was described as the existence of abdominal pain at least four days/month linked with one or more of the following: i) symptoms associated with defecation; ii) a change in frequency of stool; iii) a change in the form of stool.

Abdominal Migraine: It was defined as the presence of the following occurring at least two times a week: i) paroxysmal episodes of intense, acute peri umbilical, midline, or diffuse abdominal pain lasting one hour or above; ii) episodes are separated by weeks to months; iii) the pain is incapacitating and interferes with normal activities.

Functional Abdominal Pain: It was defined as: i) episodic or continuous abdominal pain that does not occur solely during physiologic events such as eating or menses for at least 4 times per month; ii) insufficient criteria for IBS, functional dyspepsia, or abdominal migraine.

Constipation: Must include 2 or more of the following occurring at least once per week for a minimum of 1 month with insufficient criteria for a diagnosis of irritable bowel syndrome: i) Two or fewer defecations in the toilet per week in a child of a developmental age of at least 4 years; ii) at least 1 episode of fecal incontinence per week; iii) history of retentive posturing or excessive volitional stool retention; iv) history of painful or hard bowel movements; v) presence of a large fecal mass in the rectum; vi) history of large diameter stools that can obstruct the toilet.

Data analysis was performed using “Statistical Package for Social Sciences (SPSS)” version 26.0. Mean and standard deviation were calculated for quantitative variables while frequency and percentages were calculated for quantitative data. Normality assumption was tested employing the Shapiro-Wilk test. Median and interquartile ranges (IQR) were shown for non-normal data. Inferential statistics were explored using chi-square and “analysis of variance (ANOVA)” taking $p < 0.05$ as statistically significant.

RESULTS

In a total of 188 children, the mean age was 7.22 ± 1.96 years (median=7, IQR=6-8.5), ranging between 3.5 to 12 years. There were 107 (56.9%) boys and 81 (43.1%) girls, representing a boy-to-girl ratio of 1.3:1. The mean body weight and height were 22.58 ± 5.15 kg (median=22,

Table 1: Characteristics of children with recurrent abdominal pain (n=188).

Characteristics	Groups	Number (%)
Age (years)	≤5	32 (17.0)
	6-10	146 (77.7)
	11-12	10 (5.3)
Gender	Boys	107 (56.9)
	Girls	81 (43.1)
Maternal education	Illiterate	92 (48.9)
	Literate	96 (51.1)
Father’s education	Illiterate	91 (48.4)
	Literate	97 (51.6)
Monthly family income	Low	169 (89.9)
	Middle	19 (10.1)
Maternal employment	Yes	103 (54.8)
	No	85 (45.2)
Residence	Rural	76 (40.4)
	Urban	112 (59.6)
Birth Order	≤2	103 (54.8)
	>2	85 (45.2)
Number of Siblings	≤3	66 (35.1)
	>3	122 (64.9)

IQR=19-26) and 1.18 ± 0.14 meters (median=1.2, IQR=1.1-1.3). Details about the characteristics of children with FGIDs are shown in Table 1.

The mean duration of symptoms was 2.7 ± 1.8 months (median=2.5, IQR=2-3). The most frequent presenting complaints were pain during bowel movement, nausea, and epigastric pain reported by 88 (46.8%), 75 (39.9%), and 64 (34.0%) children respectively. The details about the presenting complaints are shown in Fig. (1).

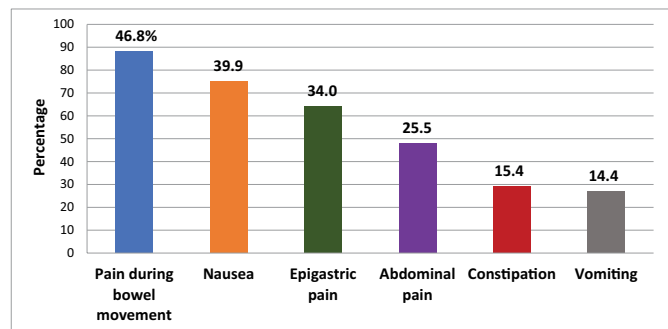


Fig. (1): Presenting complaints of children with recurrent abdominal pain (n=188).

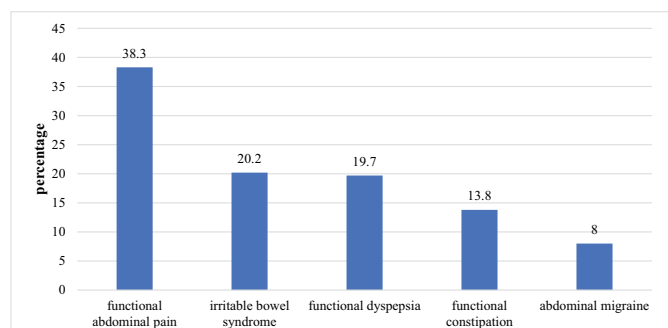


Fig. (2): Frequency of functional gastrointestinal disorders in children with recurrent abdominal pain (n=188).

Table 2: Stratification of functional gastrointestinal disorders concerning study variables (n=188).

Study Variables	Groups	Functional Abdominal Pain Count (%)	Irritable Bowel Syndrome Count (%)	Functional Dyspepsia Count (%)	Functional Constipation Count (%)	Abdominal Migraine Count (%)	p-value
Age (years)	≤5	12 (16.7)	6 (15.8)	5 (13.5)	7 (26.9)	2 (13.3)	0.364
	6-10	55 (76.4)	29 (76.3)	32 (86.5)	19 (73.1)	11 (73.3)	
	11-12	5 (6.9)	3 (7.9)	0(0)	0(0)	2 (13.3)	
Gender	Boys	48 (66.7)	18 (47.4)	21 (56.8)	14 (53.8)	6 (40.0)	0.195
	Girls	24 (33.3)	20 (52.6)	16 (43.2)	12 (46.2)	9 (60.0)	
Maternal education (illiterate)	-	33 (45.8)	16 (42.1)	19 (51.4)	14 (53.8)	10 (66.7)	0.523
Father's educational status as illiterate	-	36 (50.0)	21 (55.3)	19 (51.4)	9 (34.6)	6 (40.0)	0.506
Monthly family income	Low	67 (93.1)	32 (84.2)	33 (89.2)	22 (84.6)	15 (100)	0.325
	Middle	5 (6.9)	6 (15.8)	4 (10.8)	4 (15.4)	0(0)	
Maternal employment (employed)	-	37 (51.4)	24 (63.2)	23 (62.2)	14 (53.8)	5 (33.3)	0.285
Residence	Rural	25 (34.7)	10 (26.3)	17 (45.9)	14 (53.8)	10 (66.7)	0.029
	Urban	47 (65.3)	28 (73.7)	20 (54.1)	12 (44.2)	5 (33.3)	
Birth Order	≤2	42 (58.3)	25 (65.8)	22 (59.5)	8 (34.6)	5 (33.3)	0.087
	>2	30 (41.7)	13 (34.2)	15 (40.5)	18 (65.4)	10 (66.7)	
Number of Siblings	≤3	32 (44.4)	20 (52.6)	6 (16.2)	5 (19.2)	3 (20.0)	0.001
	>3	40 (55.6)	18 (47.4)	31 (83.8)	21 (80.8)	12 (80.0)	

Evaluation of children with recurrent abdominal pain revealed that functional abdominal pain was the commonest presenting complaint noted in 72 (38.3%) children while IBS and functional dyspepsia were found among 38 (20.2%) and 37 (19.7%) children respectively (**Fig. 2**).

Area of residence (p=0.029) and number of siblings (p=0.001) were found to have significant association with functional GI disorders while all other study variables had insignificant association (p>0.05). A comparison of various study variables concerning the distribution of frequency of functional GI disorders is shown in Table 2.

Stratification of functional GI disorders showed a statistically significant relationship (p<0.001) for presenting complaints and the details are shown in Table 3. Duration of symptoms was significantly higher (2.86±0.81 months) among patients with functional abdominal pain (p=0.042).

DISCUSSION

The FGIDs are important because they influence the child's and their family's quality of life, which results in higher usage of medical services in the paediatric age range and are extremely prevalent [16]. In this study,

the mean age of children with FGIDs was 7.22±1.96 years. A study done by Alonso-Bermejo *et al.* analyzing children below 16 years of age with FGIDs noted that the mean age was 8.4±4.2 years which is quite close to what we found in this study. A recent study done by Ibrahim *et al.* in a multicentric study [14] revealed that the mean age among school-going children having FGIDs was 8.05±3.03 years which is again very close to what was noted.

The most frequent presenting complaints were pain during bowel movement, nausea, and epigastric pain reported by 46.8%, 39.9%, and 34.0% of children respectively. Frequency distribution of functional GI disorders revealed that functional abdominal pain was the commonest noted in 38.3% while IBS and functional dyspepsia were found among 20.2% and 19.7% of children respectively. A recent local study done by Malik *et al.* [17] analyzing FGIDs among children revealed that functional abdominal pain (38.7%) was the commonest FGID which is quite similar to what we found (38.5%). They further noted that function nausea (16.6%) and epigastric pain (10.6%) were the most frequent presenting complaints [17]. A study from Spain noted that IBS, followed by functional constipation

Table 3: Stratification of functional gastrointestinal disorders concerning presenting complaints (n=188).

Presenting Complaints	Functional Abdominal Pain Count (%)	Irritable Bowel Syndrome Count (%)	Functional Dyspepsia Count (%)	Functional Constipation Count (%)	Abdominal Migraine Count (%)	p-value
Pain during bowel movement	46 (63.9)	34 (89.5)	0 (0)	0 (0)	8 (53.3)	<0.001
Nausea	19 (26.4)	6 (15.8)	37 (100)	0 (0)	13 (86.7)	<0.001
Epigastric pain	10 (13.9)	6 (15.8)	31 (83.3)	9 (34.6)	8 (53.3)	<0.001
Abdominal pain	18 (25.0)	23 (60.5)	2 (5.4)	0 (0)	5 (33.3)	<0.001
Constipation	2 (2.8)	1 (2.6)	0 (0)	26 (100)	0 (0)	<0.001
Vomiting	2 (2.8)	2 (5.3)	10 (27.0)	0 (0)	13 (86.7)	<0.001
Duration of symptoms# (months)	2.86±0.81	3.26±3.58	2.18±0.64	2.66±0.80	2.03±0.52	0.042

#: Numerical variable is expressed as mean ± standard deviation

and functional dyspepsia were the commonest FGIDs among children [18]. Lewis and colleagues found that functional constipation (13%) and abdominal migraine (9.2%) were the most frequent FGIDs among children [19]. These findings are somewhat different than what we found which shows that there is a difference in FGIDs pattern between ours and developed countries [14, 18]. Abdominal migraine was diagnosed among 8% of children. This is different from what has been reported in the literature which highlights the proportion of abdominal migraine among FGIDs to be between 0.2-4.1% [20]. A study from Saudi Arabia analyzing 152 children with FGIDs revealed that constipation (50.9%) and abdominal pain were the commonest entities [21]. The findings of this study seem helpful in the assessment of the various types of FGIDs in the studied community as we provided the burden of the existing problem that can assist health planners and stakeholders. Literature reports that FGIDs vary greatly between different geographies that need further exploration [21].

This was a single-center study conducted on a relatively small sample size. We were unable to correlate dietary patterns and their possible association with different kinds of FGIDs. There might have been some reporting bias among parents/caregivers of the study participants [22].

CONCLUSION

Among children with FGIDs, the most frequent presenting complaints were pain during bowel movement, nausea, and epigastric pain. Functional abdominal pain, IBS, and functional dyspepsia were the most frequent types of FGIDs. A distinct relationship of FGIDs with presenting complaints was found.

ETHICAL APPROVAL

Ethical approval was obtained from the IERB of the National Institute of Child Health (NICH), Karachi, Pakistan as IERB No: IERB-50/2021, dated: 26-01-2022. All procedures performed in studies involving human participants were following the ethical standards of the institutional and/or national research committee and with the Helsinki Declaration.

CONSENT FOR PUBLICATION

Written informed consent was taken from the parents/guardians of all the participants.

AVAILABILITY OF DATA

The authors confirm that data supporting the results of this study are available upon request to the corresponding author.

FUNDING

Declared none.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ACKNOWLEDGEMENTS

Declared none.

AUTHORS' CONTRIBUTION

All the authors contributed equally to the publication of this article.

REFERENCES

1. Benninga MA, Nurko S, Faure C, Hyman PE, Roberts ISJ, Schechter NL. Childhood functional gastrointestinal disorders: Neonate/Toddler. *Gastroenterology* 2016; S0016-5085(16)00182-7 DOI: <https://doi.org/10.1053/j.gastro.2016.02.016>
2. Wojtyniak K, Szajewska H. Systematic review: probiotics for functional constipation in children. *Eur J Pediatr* 2017; 176(9): 1155-62. DOI: <https://doi.org/10.1007/s00431-017-2972-2>
3. Zeevenhooven J, Koppen IJN, Benninga MA. The new Rome IV criteria for functional gastrointestinal disorders in infants and toddlers. *Pediatr Gastroenterol Hepatol Nutr* 2017; 20(1): 1-13. DOI: <https://doi.org/10.5223/pghn.2017.20.1.1>
4. Ferreira-Maia AP, Matijasevich A, Wang YP. Epidemiology of functional gastrointestinal disorders in infants and toddlers: a systematic review. *World J Gastroenterol* 2016; 22(28): 6547-58. DOI: <https://doi.org/10.3748/wjg.v22.i28.6547>
5. Vandenplas Y, Abkari A, Bellaiche M, Benninga M, Chouraqui JP, Çokura F, *et al.* Prevalence and health outcomes of functional gastrointestinal symptoms in infants from birth to 12 months of age. *J Pediatr Gastroenterol Nutr* 2015; 61(5): 531-7. DOI: <https://doi.org/10.1097/mpg.0000000000000949>
6. van Tilburg MAL, Hyman PE, Walker L, Rouster A, Palsson OS, Kim SM, *et al.* Prevalence of functional gastrointestinal disorders in infants and toddlers. *J Pediatr* 2015; 166(3): 684-9. DOI: <https://doi.org/10.1016/j.jpeds.2014.11.039>
7. Chogle A, Velasco-benitez CA, Koppen IJ, Moreno JE, Hernández CRR, Saps M. A population-based study on the epidemiology of functional gastrointestinal disorders in young children. *J Pediatr* 2016; 179: 139-43.e1. DOI: <https://doi.org/10.1016/j.jpeds.2016.08.095>
8. Bellaiche M, Ategbro S, Krumholz F, Ludwig T, Miqdady M, Abkari A, *et al.* A large-scale study to describe the prevalence, characteristics and management of functional gastrointestinal disorders in African infants. *Acta Paediatr* 2020; 109(11): 2366-73. DOI: <https://doi.org/10.1111/apa.15248>
9. The World Bank. World Development Indicators: Population Dynamics [Internet]. [cited 2021 Sep 10]. Available from: <http://wdi.worldbank.org/table/2.1>
10. Fang X, Francisconi CF, Fukudo S, Gerson MJ, Kang JY, Schmulson MJ, *et al.* Multicultural aspects in functional gastrointestinal disorders (FGIDs). *Gastroenterology* 2016; S0016-5085(16)00179-7. DOI: <https://doi.org/10.1053/j.gastro.2016.02.013>
11. Yeoh SW, Leung C. Cross-cultural aspects of functional gastrointestinal disorders. *Functional Gastrointestinal Disorders* 2017:40-8.
12. Saps M, Velasco-Benitez CA, Langshaw AH, Ramírez-Hernández CR. Prevalence of functional gastrointestinal disorders in children and adolescents: comparison between Rome III and Rome IV criteria. *J Pediatr* 2018; 199: 212-6. DOI: <https://doi.org/10.1016/j.jpeds.2018.03.037>
13. Velasco-Benitez CA, Gómez-Oliveros LF, Rubio-Molina LM, Tovar-Cuevas JR, Saps M. Diagnostic accuracy of the Rome IV criteria for the diagnosis of functional gastrointestinal disorders in children. *J Pediatr Gastroenterol Nutr* 2021; 72(4): 538-41. DOI: <http://dx.doi.org/10.1097/mpg.0000000000003030>
14. Ibrahim AT, Hamdy AM, Elhodhod MA. Prevalence of functional gastrointestinal disorders among school-aged children and adolescents, a multicenter study. *QJM: Int J Med* 2020; 113(Supp-1): hcaa063-029. DOI: <http://dx.doi.org/10.1093/qjmed/hcaa063.029>

15. Edwards T, Friesen C, Schurman JV. Classification of pediatric functional gastrointestinal disorders related to abdominal pain using Rome III vs. Rome IV criteria. *BMC Gastroenterol* 2018; 18: 41. DOI: <https://doi.org/10.1186/s12876-018-0769-z>
16. Baaleman DF, Di Lorenzo C, Benninga MA, Saps M. The effects of the Rome IV criteria on pediatric gastrointestinal practice. *Curr Gastroenterol Rep* 2020; 22(5): 21. DOI: <https://doi.org/10.1007/s11894-020-00760-8>
17. Malik ZI, Umer MF, Ali KN, Kawish AB, Arshed M, Zofeen S, *et al.* Functional gastrointestinal diseases and dietary practices among Pakistani children-A schools based cross-sectional study. *Diseases* 2022; 10(4): 103. DOI: <https://doi.org/10.3390/diseases10040103>
18. Alonso-Bermejo C, Barrio J, Fernández B, Garcia-Ochoa E, Santos A, Herreros M, *et al.* Functional gastrointestinal disorders frequency by Rome IV criteria. *An Pediatr (Engl Ed)* 2022; 96(5): 441-7. DOI: <https://doi.org/10.1016/j.anpede.2021.05.013>
19. Lewis ML, Palsson OS, Whitehead WE, van Tilburg MAL. Prevalence of functional gastrointestinal disorders in children and adolescents. *J Pediatr* 2016; 177: 39-43.e3. DOI: <https://doi.org/10.1016/j.jpeds.2016.04.008>
20. Azmy DJ, Qualia CM. Review of abdominal migraine in children. *J. Gastroenterol. Hepatol (NY)* 2020; 16(12): 632-9.
21. Alkhuzaei H, Almatrafi M A, Alqahtani W, Alotaibi R, Eid D, Matar E, *et al.* Patterns of functional gastrointestinal disorders among children in Makkah city: A single institutional experience. *Cureus* 2022; 14(12): e32224. DOI: <https://doi.org/10.7759/cureus.32224>
22. Játiva E, Velasco-Benítez CA, Koppen IJ, Játiva-Cabezas Z, Saps M. Prevalence of functional gastrointestinal disorders in schoolchildren in Ecuador. *J Pediatr Gastroenterol Nutr* 2016; 63(1): 25-8. DOI: <https://doi.org/10.1097/mpg.0000000000001108>