Prevalence and risk factors of functional gastrointestinal symptoms in first 6 months of life in Akhmim city, Sohag Governorate

By

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ABSTRACT

Background: Functional gastrointestinal disorders (FGIDs) can cause significant distress for infants as well as their parents, resulting in ongoing discomfort for both parties. This often leads to numerous visits to healthcare suppliers, changes in milk formulas frequently, and expensive non-drug treatments. Additionally, doctors may prescribe drugs without proven efficacy, that may lead to adverse reactions.

Objective: To determine the prevalence and risk factors of FGIDs in the first six months of life in Akhmim city using Rome IV criteria.

Patients and Methods:this is a Cross-sectional study that was applied on 1000 infants ages (0-6 months) in Akhmim central hospital, Akhmim city using Rome IV criteria to determine the prevalence and risk factors of (FGIDs) in the first six months of life during the period from February **2023 to July 2023.**

Results: Univariant regression analysis revealed that functional gastrointestinal disorders significantly correlated with age, urban, rural areas, weight at birth and mode of delivery with p-value <0.0001. Multivariant regression analysis also revealed that functional gastrointestinal disorders are significantly associated with age, urban, rural, birth weight and mode of delivery with p-value <0.0001.

Conclusion: FGIDs are frequent in infants and children. Regurgitation is the most frequent in infants and young age children. the prevalence of FGIDs are significantly related to Residence, birth weight, age and mode of delivery of the studied infants.

Keywords: Infant, Prevalence, Functional gastrointestinal symptoms, Infantile colic, Constipation.

INTRODUCTION

Functional gastrointestinal disorders (FGIDs) are marked by chronic and recurring gastrointestinal symptoms that are associated with digestive tract, where there are no organic or metabolic abnormalities can be identified through standard routine examinations *(Zanchi et al., 2021).*

FGIDs are mainly represented by functional dyspepsia (FD), irritable bowel syndrome (IBS) and functional constipation (FC). Abdominal pain, constipation, diarrhea, bloating, fullness, nausea, and vomiting are among the range of symptoms. The pathophysiology of (FGIDs) is still unobvious; *(Black et al., 2020).* These symptoms may occur in adults and children and can be diagnosed by using the Rome criteria (*Zeevenhooven et al., 2017).*

To accurate identify and diagnose the different FGIDs, the Rome IV criteria for newborns and toddlers are applied. According to these criteria, the doctor should not only diagnose, but it's also crucial for them to understand how gastrointestinal disorders in young children affect the family's functioning. *(Steutel et al., 2020).*

Functional gastrointestinal disorders (FGIDs) negatively affect the life quality for children and their parents. Specifically, Infants with FGIDs increase a mother's risk of postpartum depression, poor parental-infant bonding, and lead to inadequate attainment of milestones development in infants and young children *(Huang et al., 2021).* Additionally, these disorders place significant stress on families and the medical system, as they are a primary reason caregivers seek medical assistance *(Robin et al., 2018).*

The keystone for successful control of FGIDs count on the therapeutic partnership that needed to be established with parents through sufficient reassurance of parents. Although additional diagnostic procedures and medication prescriptions are frequently used to meet parental demands *(Salvatore et al., 2018).*

In conjunction with a decrease in newborn crying, a recent feasibility analysis including parents of infants with colic showed that reassurance services and support were related to significant decreases in parental annoyance, anxiety.

THE AIM OF THIS STUDY

To assess the functional gastrointestinal disorders (FGID) prevalence and risk factors in infants in the first six months of life in Akhmim city , Sohag Governorate using Rome IV criteria.

PATIENTS AND METHODS

Ethical considration:

1- A verbal informed consent was obtained from mothers before the study.

2- The approval of the local ethical committee was obtained before the study.

3- Confidentiality and personal privacy were maintained throughout all stages of the research.

4-No conflict of interest regarding to the study or publication.

5-No fund regarding the study or publication.

Sample size detremination: The sample size calculation was performed using EpI-Info 2002 software statistical package designed by World Health Organization (WHO) and by Centers for Disease Control and Prevention (CDC). The sample size was calculated based on the following considerations: 95% confidence level, the prevalence of infant regurgitation (0–6 months) was 33.9% according to a previous study (Lestari et al., 2023) ± 5% confidence limit. 35 cases were added overcome dropout. Therefore, we will recruit at least 380 cases.

Inclusion Criteria: Infant aged 0-6 months ,both sex, complain of one or more of the FGIDs e.g

-regurgitation

-constipation

-colic/crying

Exclusion Criteria: Organic disorders that identified by Physician. Physical and/or mental deficiency. Gastrointestinal surgery. Declined informed consent

Type of the study:A Cross-sectional study.

Study period and area: The study was carried out in a period of six months from February 2023 to July 2023 on 1000 infants their age between 0-6 months.

Data collection:

Methods:. Data collected using a verified questionnaire intended to diagnose functional gastrointestinal disorders (FGIDs) in infants and young children. (***Rajindrajith et al., 2018***). The questionnaire was translated into Arabic and evaluated with a limited sample of mothers of young children and infants to ensure clarity and applicability.

study procedure:

two sections make up the special FGID questionnaire that was created for the group of infants ages 0 to 6 months:

Section 1: asks for demographic details such as age, gender, birth order, delivery mode, gestational age, prenatal problems, anthropometry, growth pattern, feeding habits, and medical history.

Section 2: asks for gastrointestinal symptoms, including stool patterns based on the validated Amsterdam and Bristol stool charts, are included in Section two that covers the individuals' FGID history (***Koppen et al., 2016***), as well as crying behaviors and spitting in infants and young children. An interview was used to gather data for Sections one and two of the study, which was self-administered. Following questionnaire completion, individuals were diagnosed using the ROME IV criteria and categorized based on definitions for infantile colic, regurgitation, dyschezia, functional diarrhea, and functional constipation. (***Zeevenhooven et al., 2017***).

Statistical analysis:

Data were fed to the computer and analyzed using the Statistical Package for the Social Science (SPSS) software (version 20.0; SPSS Inc., Chicago, IL, USA). Number and percentage were used to described qualitative data. Quantitative data were described using mean, standard deviation, median. Significance was judged at the 5% level for the obtained results. Chi-square test was used to compare qualitative variables between groups. When one expected less than or equal to five, the **Fisher exact test** was used instead of the chi-square test. The **t-test** was used to compare quantitative variables in parametric data (SD<50% mean). **The odds ratio (OR), relative risk (RR) and risk difference (RD). To estimate the precision of the OR the 95% confidence interval (CI) is employed.**

RESULTS

Table (1): Demographic and clinical data among the studied cases:

Age,(months)	
Mean ± SD	3.05 ± 0.79
Median (Minimum - Maximum)	3 (2-5)
Sex	
Male	561 (56.1%)
Female	439 (43.9%)
Residence	
Urban	447 (44.7%)
Rural	553 (55.3%)
Birth order	
First	245 (24.5%)
Second	457 (45.7%)

Third	298 (29.8%)
Weight (gm)	
Mean ± SD	5044.16 ± 369.77
Median (Minimum - Maximum)	5025 (4359-5822)
Length (cm)	
Mean ± SD	58.66 ± 4.29
Median (Minimum - Maximum)	59 (50-68)
Feeding	
Breastfed	266 (26.6%)
Formula fed	734 (73.4%)

This table show Demographic and clinical data among the studied cases

Table (2): FGIDs symptom data among the studied cases

FGIDs symptom cluster :	Studed cases
Constipation	110 (11%)
Regurgitation	490 (49%)
Crying/colic	220 (22%)
Combined	180 (18%)
Total time which infants usually cry /day	**Studed cases**
< 10 min	780 (78%)
10–30 min	115 (11.5%)
30 min–1 h	30 (3%)
1–2 h	75 (7.5%)
2 or more h	0
Number of regurgitation/day	**Studed cases**
No	510 (51%)
1	250 (25%)
2–3	125 (12.5 %)
4–6	65 (6.5%)
7 or more	50 (5%)

This table shows FGIDs symptom data among studied cases

Table (3): abnormal defecation among studied cases

Number hard stool /(wk.)	cases
No	890 (89%)
1	28 (2.8%)
2–3	39 (3.9%)
4–6	15 (1.5%)
7 or more	28 (2.8%)
Strain during passing stool/(wk)	
No	842 (84.2%)
1	80 (8%)
2–3	55 (5.5%)
4–6	12 (1.2%)
7 or more	11 (1.1%)

This table shows that 2.8% had 1 time Pass a hard stool, 3.9% had 2–3 times, 1.5% had 4–6 times. 2.8% had 7 or more times ,8% had 1 time faced difficulty at passing a bowel movement, 5.5% had 2-3 times faced difficulty at passing a bowel movement, 1.2% had 4-6 times while 1.1% had 7 or more times.

.**Table (4):** Correlations between Functional gastrointestinal symptoms and risk factors

Correlations		
Risk factors	Functional gastrointestinal symptoms	
Age	-.495-**	
	less than **0.0001**	
Residence	**Urban area**	.498**
		less than **0.0001**
	Rural area	.560**
		less than **0.0001**
Birth weight	.720**	
	less than **0.0001**	
Mode of delivery	.515**	
	less than **0.0001**	

This table shows that there were strong significant correlations between Functional gastrointestinal symptoms and age, urban, rural, Birth weight and Mode of delivery.

Table (5): Univariate Correlations between Functional gastrointestinal symptoms and risk factors

Variable	Correlation
Age	0.348
Urban area	0.471
Rural area	0.412
Birth weight	0.357
Mode of delivery	0.462

There is significant correlations between functional gastrointestinal symptoms, & age, urban, rural,residence, Birth weight and mode of delivery when univariate correlation regression is applied.

Table (6): Multivariate Correlations between Functional gastrointestinal symptoms and risk factors

Risk factors		Correlation
Age		**71.305**
Residence	**Urban area**	**20.495**
	Rural area	**25.595**
Birth weight		**72.35**
Mode of delivery		**21.49**

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There is strong significant correlations between Functional gastrointestinal symptoms and age, urban, rural, Birth weight and Mode of delivery when Multivariate correlation regression is used.

DISCUSSION

Diagnostic Rome criteria have been established through a combination of evidence-based research and expert consensus *(Zeevenhooven et al., 2017).* Prevalent symptoms in infants with FGIDs include regurgitation, infantile colic, and functional constipation *(Salvatore et al., 2018).* All symptoms, except constipation, which often persists, will usually get better as infant grows and develops. *(Benninga et al., 2016).* This cross-sectional study, which evaluated the prevalence and risk factors of FGIDs during the first six months of life on 1000 infants in the Akhmim city, was carried out using the Rome IV criteria. The infants ranged from 0 to 6 months.

In the present work, the percentage of different functional disorders included regurgitation (49%), crying and colic (22%), combined functional gastrointestinal disorders (18%), and constipation (11%). The same was reported by Steutel et al. study which was performed on 2751 children from 0 to 48 months old to figure out the prevalence of FGIDs in young children and revealed that between the ages of 0-12 months and 13-48 months, the prevalence of FGID was 24.7% and 11.3%, respectively and the most common symptoms were functional constipation (9.6%) in toddlers and infant's regurgitation (13.8%) *(Steutel et al., 2020).*

Similarly, Huang et al. conducted a previous study on 2604 infants and young children and revealed that the commonest functional gastrointestinal disorders including infant regurgitation (33.9%), followed by infant colic (14.9%), infant dyschasia (3.6%), functional diarrhea (2.2%) and functional constipation (1.5%) *(Huang et al., 2021).*

Our study revealed that majority of children diagnosed to have FGIDs had history of formula fed (73.4%). Similarly; another study was reported by Steutel et al. who also revealed a multivariate regression analysis that younger age and formula feeding were common association with functional gastrointestinal disorders with p-value 0.03 and 0.045 respectively *(Steutel et al., 2020).* Regurgitation pathophysiology involves esophageal small volume, a lower esophageal

sphincter immaturity, excessive breastfeeding and the position of infant *(Benninga et al., 2016)*. Breastfed infants can regulate their milk intake more effectively, leading to more frequent but smaller feedings, that is considered a reduced reflux factor *(Yourkavitch et al., 2016).* Furthermore, breast-fed babies experience faster gastric emptying and lower esophageal pH, which promotes peristalsis and shortens the duration of reflux *(Heacock et al., 1992).*

The present study demonstrated that the majority of the included children had crying with duration <10 minutes (78%), while (11.5%) had history of crying for duration 10-30 minutes, (3%) had history of crying for 30 minutes to 1 hours and from 1 to 2 hours (7.5%). Continues crying with no apparent reason, may classified as infant colic *(Sarasu et al., 2018).* Lestari et al. study reported statistically significant association between infant crying and gastrointestinal diseases history among parents *(Lestari et al., 2023).*

Our study revealed that only (3.9%) had a history of 2-3 times of hard stool, while only (8%) had history of 1 time of passing hard stool. Similarly, Lestari et al. reported (5.8%) of the included infants had history of passing hard stool while (12.1%) had history of difficulty of passing bowel movement *(Lestari et al., 2023).* Bager et al. previously explained the prevalence of functional constipation may be related to caesarian

section which has been linked to several infant conditions, including inflammatory bowel disease and gastroenteritis *(Bager et al., 2012).* It also stops the exposure to microbes from mothers᾽ altering the normal colonization of the infant gut *(Azad et al., 2013).*From other side, vaginally delivered infants are exposed to vaginal and intestinal microbiota from their mother's, which have a vital role in the development of functional constipation *(Ohkusa et al., 2019).* Our study revealed that majority of the included cases (51%) had no history of infant regurgitation, while only (49%) had history of infant regurgitation.

The current study documented statistically significant negative correlation between functional gastrointestinal symptoms and age of the included children with p-value <0.0001.

The current study documented statistically significant positive correlation between functional gastrointestinal symptoms and urban residence of the included children with p-value <0.0001.

The current study documented statistically significant positive correlation between functional gastrointestinal symptoms and rural residence of the included children with p-value <0.0001. Similarly, Huang et al. reported that there was a 44% higher risk of developing infant regurgitation for infants staying in rural areas. (OR=1.44, 95% CI=1.08-1.93, p-value=0.014) *(Huang et al., 2021).*

The current study documented statistically significant positive correlation between functional gastrointestinal symptoms and infant weight of the included children with p-value <0. 0001.The current study documented statistically significant positive correlation between functional gastrointestinal symptoms and mode of delivery of the included children with p-value <0.0001. In another study conducted by Huang et al. demonstrated that vaginal delivery has significant association with the reduction of functional constipation risk *(Huang et al., 2021)..* Univariant regression analysis revealed that functional gastrointestinal disorders significantly associated with age, urban, rural areas, birth weight and mode of delivery with p-value <0.0001. FGIDs have different identified risk factors including environmental, parental, neonatal factors, Besides the wide range of FGIDs, numerous connections had recognized with the following diseases Breastfed infants were less likely to experience regurgitation, with factors such as ethnicity, sex, birth weight and prematurity consider non-significant to FGIDs (*Chew et al., 2021*).

Multivariant regression analysis also revealed that functional gastrointestinal disorders significantly associated with age, urban, rural, birth weight and mode of delivery with p-value <0.0001. Similarly,

another study by Steutel et al. was performed on 2751 children including (1698 infants ages 0-12 M and 1053 children ages 13-48 M) and revealed using multivariant analysis there was statistically significant association between FGIDs and other risk factors as younger age (p-value=0.03), formula feeding (p-value=0.045), parents subjected to domestic violence (p-value=0.035) *(Steutel et al., 2020).*

CONCLUSION

Functional gastrointestinal disorders are frequent issue in infants and young children, Regurgitation is the most common in infants and young age children, commonly regurgitation, colic and constipation among infants who are mostly formula fed. some risk factors are strongly correlated with development of gastrointestinal disorders including young age, residence either urban or rural areas, lower birth weight which may be related to gut maturity and mode of delivery. Knowing these possible risk factors can help to explain these functional gastrointestinal disorders and abnormal crying in these children. Recognizing the risk factors of functional gastrointestinal disorders will gain health care providers and parents to enhance the life quality of infants' and good management.

Recommendations

1- Further longitudinal studies in related geographical areas which can shear same habits are need for further estimation of functional gastrointestinal disorders in infancy.

2- Unrecompensed CS should be avoided and enhance vaginal delivery for better enhancement of the child microbiota development and further decrease FGIDs.

3- Enhance breast feeding for further decrease of FGIDs.

Limitations

1-it was single center study

2-limted age group

3-small sample size

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