

Frequency of Inflammatory Diarrhoea (Faecal Leukocyte Count ≥ 5 /MI or Faecal Cal-protetctin Positive) in young patients presenting with Acute Gastroenteritis

SYED ANEES AHMED GARDEZI¹, NAJMUSAQIB KHAN NIAZI¹, SYED HAIDER TIRMIZI¹, IFFAT RAFIQUE¹, RABIA SADIQ¹, MUNEEB UR REHMAN¹, TALHA LAIQUE²

¹Department of Medicine, Combined Military Hospital, Kharian- Pakistan

²Department of Pharmacology, Allama Iqbal Medical College, Lahore-Pakistan

Correspondence to Dr. Talha Laique, Email: talhalaique51@gmail.com Tel:+92-331-0346682

ABSTRACT

One of the common dilemma and the most important cause of child death below the age of 5 years in developing countries is acute gastroenteritis.

Aim: To check the frequency of inflammatory diarrhoea (faecal leukocyte count ≥ 5 /ml or faecal calprotectin positive) in young patients presenting with acute gastroenteritis in hospital.

Study design: Descriptive cross sectional study.

Methodology: Patients (n=366) within the age range of 1 day to 6 years presenting to the OPD with the complaints of symptoms associated with acute gastroenteritis (diarrhoea with or without abdominal pain, vomiting and nausea) were included into the study. Patients demographic data were collected. Stool samples from the patients were obtained in sterile bottles and sent for Stool RE and CS examination. All this information was recorded on Performa. Data was analyzed using SPSS version 26. Results were presented as frequency and percentage. Age was presented as mean \pm SD.

Results: Out of total 366 patients 178 (48.6%) were male and 188(51.4%) were female. Mean age of the patients presenting to the OPD/MRC was 826 days (2.2 years) \pm 618 days, with a range 13 days to 2187 days (5.9 years). Frequency of inflammatory diarrhoea was 193(52.7%) among patients presenting with acute gastroenteritis as compared to non inflammatory diarrhoea.

Conclusion: It was concluded that frequency of inflammatory diarrhoea in young patients presenting with acute gastroenteritis is alarmingly high in our region. Various programs for the identification and eradication of causative factors and organisms should be carried out along with education of masses about this fatal condition.

Keywords: Acute Gastroenteritis, Diarrhoea, Infectious Diarrhoea, Inflammatory Diarrhoea and Non-Inflammatory Diarrhoea,

INTRODUCTION

One of the common dilemma and the most important cause of child death below the age of 5 years in developing countries is acute gastroenteritis¹. It is categorized as the inflammatory condition which affects the stomach and intestines (small and large). It is the leading cause of visits to general health practitioners and admissions in the emergency department. The infant mortality rate due to Rota virus associated gastroenteritis is 67.6 per 100,000 children in Pakistan². There are more than 700 million cases of gastroenteritis reported every year. Worldwide mortality rate of 3.5-5 million has been associated with acute gastroenteritis³.

Diarrhoea, vomiting, nausea, fever, abdominal cramps and generalized weakness are among the common symptoms in children presenting with acute gastroenteritis. American academy of paediatrics defines acute gastroenteritis as a rapid onset diarrheal disease with accompanying symptoms such as nausea, vomiting etc⁴. Acute diarrhoea is defined as passage of 3 or more than three loose stools for a duration of 3 or more days as outlined by World Health Organization. If the diarrhoea lasts for more than 14 days it is than termed as persistent diarrhoea, which is a complex and potentially hazardous condition⁵.

Diarrhoea could be inflammatory or non inflammatory⁶. The former is characterised by frequent, stools which are small in volume and blood stained. On stool examination leukocytes and leukocyte proteins such as calprotectin and lactoferrin can be seen⁷. Infectious causes can be classified broadly into viral, bacterial and parasitic depending on the organism. Most common causative organisms are Escherichia coli, vibrio cholera, salmonella, shigella, rota virus, giardia lamblia, norovirus etc^{8,9}. Rota virus is the leading cause of acute gastroenteritis in Pakistan.

The objective of the study was to check the frequency of inflammatory diarrhoea (faecal leukocyte count ≥ 5 /ml or faecal cal-protetctin positive) in young patients presenting with acute gastroenteritis in hospital.

Received on 17-10-2021

Accepted on 27-05-2022

METHODOLOGY

Present study was a cross-sectional study. After Ethical Review Committee permission an informed consent was taken from the patients or guardians prior to enrolling the patients into the study. Patients demographic data were collected. Stool samples from the patients were obtained in sterile bottles and sent for Stool RE and CS examination. Macroscopic and microscopic examinations examination of stool samples were carried out for colour, consistency, presence of occult blood, fecal leukocyte count and presence of calprotectin. Culture and sensitivity tests were performed for identification of causative organisms. Patients showing ≥ 5 /ml leukocyte in their stool samples are labeled as having inflammatory diarrhoea. Children within the age range of 1 day to 6 years presenting to the OPD with the complaints of symptoms associated with acute gastroenteritis (diarrhoea with or without abdominal pain, vomiting and nausea) were included into the study. Patients with chronic diarrhoea, short gut syndrome, malabsorption diarrhoea along with other comorbid conditions (cardiac/ renal/ hepatic) were excluded from the study. All this information was recorded on proforma.

Statistical Analysis: Data was analyzed using SPSS version 26.0. Mean and SD was calculated for variables such as Age. Percentage and Frequency was calculated for variables (categorical) such as gender and type of diarrhoea, kind of causative organism and constitutional symptoms (nausea, vomiting, abdominal pain). Data Normality was assessed using Shapiro wilk test, which showed a parametric distribution of data. Association of type of diarrhoea with age was assessed using independent samples T test. Comparison of various symptoms among causative organism causing inflammatory diarrhoea was assessed using chi square test. p value of ≤ 0.05 was considered to be significant.

RESULTS

Out of total 366 patients 178(48.6%) were male and 188(51.4%) were female. Mean age of the patients presenting to the OPD/MRC was 826 days (2.2 years) \pm 618 days, with a range 13 days to 2187 days (5.9 years). Frequency of inflammatory diarrhoea was 193(52.7%) among patients presenting with acute

gastroenteritis as compared to non inflammatory diarrhoea 173(47.3%). Among the inflammatory diarrhea following organisms were found in the culture and sensitivity testing as shown in fig-1. Along with diarrhea 102(52.8%) children presented with abdominal pain. Nausea was present in 102 patients (52.8%). However, very

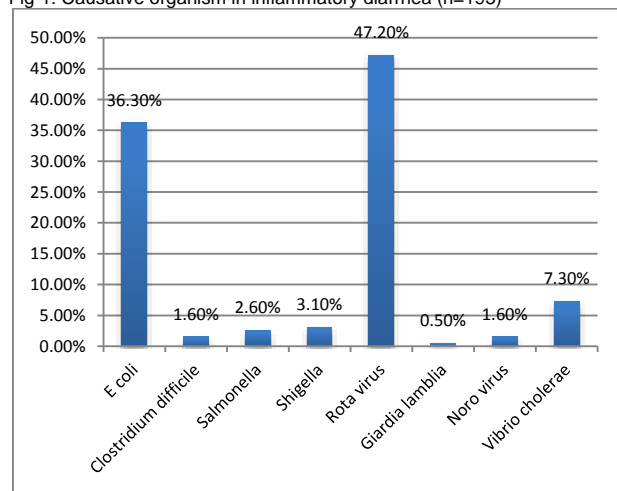
few children 51(26.4%) presented with vomiting. When these symptoms were compared among various organisms a statistically significant difference was observed in vomiting ($p=0.008$) as shown in table-1.

Table 1: Comparison of symptoms among various causative organisms in children with inflammatory diarrhoea

Symptoms		E.coli	Clostridium difficile	Salmonella	Shigella	Rota virus	Giardia lamblia	Norovirus	Vibrio cholera	p-value
Abdominal pain	Yes	33	1	2	5	5	0	1	9	0.4
	No	37	2	3	1	1	1	2	5	
Nausea	Yes	38	2	1	3	50	0	2	6	0.7
	No	32	1	4	3	41	1	1	8	
Vomitting	Yes	9	2	0	1	33	0	0	6	0.008*
	No	61	1	5	5	58	1	3	8	

*Statistically significant

Fig-1: Causative organism in inflammatory diarrhoea (n=193)



DISCUSSION

Mortality due to diarrhoea is due to the underlying dehydration and electrolyte imbalance. This can lead to detrimental effects on child's growth and development. Organisms causing inflammatory diarrhoea are transmitted through feco-oral route especially through the contaminated water supplies. Due to this there is dire need for the sanitation of water supplies, education of mothers about proper sanitisation and improving the facility of primary health care units.

Understanding the cause and etiology of acute inflammatory diarrhoea is an important step in the eradication of this disease. These organisms which have the ability to produce cytotoxins either attach to the intestinal mucosa or invade it, leading to the activation of cytokines and releases mediators of inflammation. This inflammation then spreads rapidly and effects the functions of intestinal mucosa leading to diarrhoea and other constitutional symptoms. In our study the most common organism seen in the stool CS examination was Rota virus (47.2%) followed by E coli (36.3%). Other organisms clostridium difficile (1.6%), giardia lamblia (0.5%), salmonella (2.6%), shigella (3.1%) vibrio cholera (7.3%) and norovirus (1.6%) contributed little in the etiology of acute inflammatory diarrhoea.

A study conducted by Haider et al to assess the risk factors and causative organisms in children under 5 years having acute diarrhea revealed that most frequent organism identified in the stool samples was Entamoeba histolytica followed by Rota virus¹⁰. Kim et al revealed that Staphylococcus aureus, some species of salmonella, E. coli and campylobacter were among the most important organisms involved in the pathogenesis of acute bacterial gastroenteritis in children in Korea¹¹. A study conducted in Pakistan revealed that out of 6679 children enrolled in the study 30.5% stool specimens were positive for Rotavirus. They further

concluded that about 1/3rd of the children hospitalized with acute gastroenteritis have been infected with Rotavirus¹².

Children less than 3 years of age, who are kept in day care institutes reports the highest incidence of acute inflammatory diarrhoea with Rota virus, giardia and shigella as the leading causative organisms¹³. Ahmetagic et al studied the etiology of acute infectious diarrhoea in 201 children and showed that 25.4% of patients had viral etiology with Rota virus predominating (23.9%). Salmonella was detected in 10% of the cases, E coli in 4.9% and shigella in 4.5% of the patients¹⁴. Similar to the results of our study Banyai et al in his study demonstrated that viruses are the predominant cause (70-90%) of diarrhoea in children, followed by bacteria (10-20%) such as shigella, salmonella etc¹⁵.

Population based survey in children living in Karachi, Pakistan revealed that rate of severe Rota virus related gastroenteritis was 2.3 per 1000 children who were under 5 years of age. In our study Norovirus was the causative agent in 1.6% of the cases of inflammatory diarrhoea. Amna et al found in her study conducted on children less than 5 years of age that 16.1% of the samples tested positive for Norovirus strains¹⁶. Romani et al in his study revealed that norovirus accounted for 9.8% of the cases of acute infectious diarrhoea in Irani population¹⁷.

Out of total 193 children having inflammatory diarrhoea 102(52.8%) presented with abdominal pain and nausea. Only 51(26.4%) presented with vomiting along with diarrhoea. Children whose stool samples were positive for E coli presented with abdominal pain and nausea. Rota virus infected individuals presented with nausea and vomiting. There was no statistical significant difference in the symptoms associated with various causative organisms in our study. Thus identification of specie from the presenting symptoms cannot be accurately determined. Treatment of infectious diarrhoea usually involves rehydration therapies and use of antibiotics and antiviral agents^{18,19}.

There is a dire need of establishment of surveillance system for hospitals and communities to eradicate the cause of acute gastroenteritis and inflammatory diarrhoea in the country. Establishment of various vaccine programs and introduction of Rota virus vaccine in the EPI schedule has been carried out to control and lessen the disease burden and mortality associated with it. Educating the parents especially mothers, regarding proper hand washing and sanitisation of feeding equipments is also an important factor in timely identification and earlier intervention in this highly debilitating condition.

Limitations: Our study had limitations like financial constraints, lack of resources, genetic workup and short duration of study.

CONCLUSION

It was concluded that frequency of inflammatory diarrhoea in young patients presenting with acute gastroenteritis is alarmingly high in our region. Various programs for the identification and eradication of causative factors and organisms should be carried out along with education of masses about this fatal condition.

Primary health care facilities to treat diarrhoea should be made available in the low income areas.

Authors' Contribution: SAAG&NKN: Conceptualized the study, analyzed the data, and formulated the initial draft, SHT&IR: Contributed to the proof reading, RS,MUR&TL: Collected data.

Conflict of Interest: None to declare

Financial Disclosure: None

REFERENCES

1. Rivadulla E, Romalde JL. A comprehensive review on human Aichi virus. *Viol. Sin.* 2020 27:1-6.
2. Umair M, Salman M, Alam MM, Rana MS, Zaidi SS, Bowen MD, Aamir UB, Abbasi BH. Rotavirus surveillance in Pakistan during 2015-2016 reveals high prevalence of G12P. *J Med Virol.* 2018. 90(7):1272-6.
3. Troeger C, Khalil IA, Rao PC, Cao S, Blacker BF, Ahmed T, Armah G, Bines JE, Brewer TG, Colombara DV, Kang G. Rotavirus vaccination and the global burden of rotavirus diarrhea among children younger than 5 years. *JAMA Pediatr.* 2018. 172(10):958-65
4. Florez ID, Niño-Serna LF, Beltrán-Arroyave CP. Acute infectious diarrhea and gastroenteritis in children. *Curr. Infect. Dis. Rep.* 2020 ;22(2):1-2.
5. Mihala G, Grimwood K, Morley C, Lambert SB, Ware RS. Effect of definitions of acute gastroenteritis episodes using symptom diaries in paediatric cohorts: a systematic review. *J Pediatr Gastroenterol Nutr.* 2020 70(3):e54-8
6. Mulladjanova KA, Khodjimotov GM. Algorithm of Diagnosis, Pathogenetic Treatment and Prevention of Acute Diarrhea in Early Children. *Ann Rom. Soc. Cell Biol.* 2021. 25(1):6355-63.
7. Hamilton KW, Cifu AS. Diagnosis and management of infectious diarrhea. *JAMA.* 2019. 321(9):891-2
8. Wang LJ, Zhou Y, Qi L, Liang JR, Sun H, Xu BL, Wang J, Wang X, Jing HQ. Etiological study of diarrhea in children under 5 years old in Dongcheng district of Beijing. *Chin. J. Prev. Med.* 2018. 52(9):936-40
9. Johargy A, Ghazi H, Mumenah A. Frequency of viral, bacterial and parasitic enteropathogens among young children with acute diarrhoea in Saudi Arabia. *J Pak Med Assoc.* 2010. 60(6):456-9.
10. Tuky HS, Semender BA. Assessing risk factors and causative organisms of acute diarrhea in children under 5 years in Al-Hindiya, Karbala, Iraq. *Med J Babylon.* 2019. 16(4):357.
11. Kim SY, Kim HJ, Shin EH, Eun BW, Ahn YM, Song MO. Etiology and clinical features of acute bacterial gastroenteritis in children managed at a secondary hospital. *Pediatr Infect Vaccine.* 2017 24(2):95-101.
12. Kazi AM, Warraich GJ, Qureshi S, Qureshi H, Khan MM, Zaidi AK, members of the Pakistan Rotavirus Study Group. Sentinel hospital-based surveillance for assessment of burden of rotavirus gastroenteritis in children in Pakistan. *PloS one.* 2014. 9(10):e108221
13. Pickering LK, Bartlett AV, Woodward WE. Acute infectious diarrhea among children in day care: epidemiology and control. *Clin Infect Dis.* 1986. 8(4):539-47
14. Ahmetagic S, Jusufovic E, Petrovic J, Stojic V, Delibegovic Z. Acute infectious diarrhea in children. *Med Arh.* 2003. 57(2):87-92.
15. Bányai K, Estes MK, Martella V, Parashar UD. Viral gastroenteritis. *Lancet.* 2018. 392(10142):175-86
16. Alam A, Qureshi SA, Vinjé J, Zaidi A. Genetic characterization of norovirus strains in hospitalized children from Pakistan. *J Med Virol.* 2016 88(2):216-23.
17. Romani S, Mohebibi SR, Hosseini SM, Azimzadeh P, Vahedi M, Derakhshan F, Zali MR. Prevalence of norovirus infection in children and adults with acute gastroenteritis, Tehran, Iran, 2008–2009. *Food Environ Virol.* 2012. 4(1):1-5.
18. Binder HJ. Development and pathophysiology of oral rehydration therapy for the treatment for diarrhea. *Digest Dis Sci.* 2020. 65(2):349-54
19. Sadiq A, Bostan N, Yinda KC, Naseem S, Sattar S. Rotavirus: Genetics, pathogenesis and vaccine advances. *Rev Med Virol.* 2018. 28(6):e2003.