Aetiologies of Acute Gastroenteritis in Hospitalized Children

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Abstract
Introduction: *Diarrheal disease and acute gastroenteritis is one of the important cause of morbidity and mortality among young children in developing countries. Most of the clinical burden of acute gastroenteritis (AGE) occurs in children. In India 10–13 children under 5 years of age die every 1 h due to diarrhoea Dehydration is the major cause of diarrhoeal deaths and 90% of them can be prevented with use of oral rehydration solution.*
Material and Methods: *One to two stool samples which were free from urine contamination were collected from each admitted patients during the admission, or within 24 h of hospital admission. Stool samples were processed within one hour after being sent to the laboratory. Direct observation under light microscopy for white blood cells, red blood cells, ova and parasites, bacteria and motility was done. Stool cultures were performed as per the diagnosis and requirement. Each case was followed from admission to discharge and data including age, sex, residency area, family size, nutrition, breast feeding and the vaccination history was taken. Patients were categorized in to five groups 1. Entamoeba histolytica infections 2. Bacterial infections 3. Rotavirus infections 4. Mixed infections and 5. Unidentified group.*
Results: *A total of 169 cases of diarrheal diseases were included in the study admitted during study period. Out of 169 cases 84 were male and 85 were female. 44% of the infections were identified as either parasitic, bacterial, viral or mixed variety while in 56% no specific infectious cause was detected. The most common clinical presentation was diarrhoea in all the groups highest in rotaviral group (100%) while lowest in Entamoeba histolytica group (50%). CRP (C reactive proteins) levels were raised in mixed infection group (mean CRP 58.22).*
Conclusion: *Acute gastroenteritis is an important cause of morbidity in children under 5 years of age. Preventive measures, including vaccination strategies, sanitation and clean water supply are necessary to reduce acute gastroenteritis -related morbidity.*
Keywords: *CRP, AGE, UNICEF.*

Introduction

Diarrheal disease and acute gastroenteritis is one of the important causes of morbidity and mortality among young children in developing countries.

Total burden accounts for 1700 million cases of diarrhoea and 5,000,000 deaths among children annually[1]. Most of the clinical burden of acute gastroenteritis (AGE) occurs in children, with one

in eight deaths in this age group attributable to diarrheal diseases, mainly in developing countries[2]. In India 10–13 children under 5 years of age die every 1 h due to diarrhoea [3]. Rotavirus is the most common viral etiological agent for acute gastroenteritis[4]. Most of the acute gastroenteritis (AGE) occurs in children, with one in eight deaths in this age group attributable to diarrheal diseases. Efficacy of nearly 80% is seen with rotavirus vaccine against severe rotavirus diarrhoea in children under 5 years[5].

Socioeconomic inequalities may lead to disparities in accessing health care, basic water and sanitation infrastructure. Maternal education also has impact the health status of children[6]. Dehydration is the major cause of diarrhoeal deaths and 90% of them can be prevented with use of oral rehydration solution [7, 8]. The World Health Organization and the United Nations Children's Fund (UNICEF) recommended giving low-osmolarity ORS to prevent and treat dehydration in diarrheal patients and also to give zinc supplements for 10–14 days to all children suffering from diarrhoea [8]. Increased consumption of prophylactic antibiotic agents causes selective pressure which allows the resistant organism to survive and propagation of antimicrobial resistance[9]. Our objective was to find the cause of diarrhoea in admitted patients under 5 years age group

Material and Methods

This prospective surveillance study was performed between November 2017 and May 2018 at Raipur Institute of Medical Sciences in Paediatrics Dept in collaboration with Dept. of Microbiology. One to two stool samples which were free from urine contamination, were collected from each admitted patients during the admission, or within 24 h of hospital admission preferably before the administration of antibiotics, these samples were immediately transferred to the microbiology laboratory or stored at 2–8 °C until being transported to the laboratory. Stool samples were processed within one hour after being sent to the laboratory. Direct observation under light microscopy for white blood cells, red blood cells, ova and parasites, bacteria and motility was done. Stool cultures were performed as per the diagnosis and requirement. For viral detection, qualitative immuno-chromatographic assay method was used having Sensitivity >99% and Specificity >98%. Each case was followed from admission to discharge and data including age, sex, residency area, family size, nutrition, breast feeding and the vaccination history was taken. The presence of fever, vomiting, associated co-infections, urine output, and the presence of blood or mucus in stool, the results of stool analysis, microscopy for ova and parasites, the quick identification tests for rota virus and motility was done. The study was approved by the ethical and scientific committee. All results were entered in Excel sheet of Windows 10 Microsoft Excel software and analysis was done by using SPSS Statistics.

Table shows distribution of Patients category: Patients were categorized in to five groups
1. Entamoeba histolytic infections, 2. Bacterial infections, 3. Rotavirus infections, 4. Mixed infections, 5. Unidentified group

Group	Entamoeba Histolytic (%)		Bacterial Infections (%)		Rotavirus Infections (%)		Mixed Infections (%)		Unidentified Group (%)		Total (%)	
Male	5	2.96	5	2.96	8	4.73	21	12.43	45	26.63	84	49.70
Female	3	1.78	6	3.55	9	5.33	18	10.65	49	28.99	85	50.30
Total	8	4.73	11	6.51	17	10.06	39	23.08	94	55.62	169	100

Results

A total of 169 cases of diarrheal diseases were included in the study admitted during study period. Out of 169 cases 84 were male and 85 were female. 44% of the infections were identified as either parasitic, bacterial, viral or mixed variety while in 56% no specific infectious cause was detected. In 8 (4.73%) patients Entamoeba histolytica cyst were identified by microscopy of which 5 (2.96%) were male and 3 (1.78%) were female. Bacterial infections were diagnosed in 11 (6.51%) patients with male (2.96%) and female 6 (3.55%). Of the total 11 patients 3 were diagnosed as Cholera, 4 as Shigella infections and 3 as Salmonella infections. Rotaviral infections was found in 17 (10.06%) cases of which 8 (4.73%) were male and 9 (5.33%) were female. Mixed infections were observed in 39 (23.08%) children of which 21 (12.43%) were male and 18 (10.65%) were female. Group in which no observable cause identified was 94 (55.62%) of which 45 (26.63%) and 49 (28.99%) were male and female respectively.

Table 2 : Clinical Characteristics among the Studied Groups(n= 169)

Clinical Characteristics	Entamoeba Histolytica (N= 8%)		Bacterial Infections (N= 11%)		Rotavirus Infections (N= 17 %)		Mixed Infections (N= 39 %)		Unidentified Group (N= 94 %)	
Diarrhoea	4	50	10	90.9	17	100.0	35	89.74	88	93.6
Vomiting	1	12.5	2	18.2	6	35.3	7	17.95	21	22.3
Fever	2	25	10	90.9	15	88.2	32	82.05	76	80.9
Mean CRP	50.21		15.78		13.11		58.22		26.21	
Mean Age	3 Years		2year 7 Months		1year 6 Months		3 Years 5 Months		2year 11 Months	

Clinical Characteristics	N=169	%
Diarrhoea	154	91.12
vomiting	37	21.89
fever	135	79.88

The most common clinical presentation was diarrhoea in all the groups highest in rotaviral group (100%) while lowest in Entamoeba histolytica group (50%). Vomiting was observed in rotaviral group (35.3%) and lowest in Entamoeba histolytica group (12.5%). Fever was more in unidentified group (93.6%) followed by bacterial infection group (90.9%). CRP (C reactive proteins) levels were raised in mixed infection group (mean CRP 58.22) followed by Entamoeba histolytica group (mean CRP 50.21) and lowest in rotaviral group (mean CRP 13.11)

Discussion

Poor sanitary condition and health service status led to the high morbidity and mortality of childhood diarrhoea. Diarrhoea can be caused by agents such as bacteria, parasites and virus. Bacteria such as Campylobacter jejuni, Escherichia coli, Salmonella species, Shigella species, Vibrio cholera, and Yersinia enterocolitica, and Aeromonas species, enteroparasites such as Giardia lamblia, Cryptosporidium species and Entamoeba histolytica, and viruses such as adenovirus, Norwalk virus, and rotavirus are the major etiologcal cause of diarrhoea[10]. Knowledge of the etiological agents responsible for diarrheal illnesses is essential for implementation of appropriate public and hospital health measures to control these diseases[11]. In our study enteropathogens were identified in about 44% cases which was less than the study by Youssef et al[11] our low isolation may be due to the conventional approach and molecular methods must have added the enteropathogens in our study. E. histolytica is usually transmitted via fecal oral route with contaminated food and water, so young infants are less likely to develop intestinal

amebiasis[12]. In our study the percentage of *E. histolytica* reported was 4.73% which was less than the study by *Naous A* et al[13]. The reason may be due to improved sanitation and use of clean drinking water. In our study bacterial isolates were identified in 11 (6.51%) patients this low isolation may be due to conventional identification methods applied in the laboratory. Of the total 11 patients 3 were diagnosed as cholera, 4 as Shigella infections and 3 as Salmonella infections. In a study by Natarajan M et al[14] observed that DEC is a potential diarrhoeal agent compared to other enteric bacterial pathogens in both children and adults. In other study by Gebreegziabher G et al the overall prevalence of *Salmonella* species was 7.3% and 6.9% *Shigella* species were isolated from children with diarrhoea[15]. Rotaviral infections found in our study was 23.08% it was 19 % in a study by Ghssein G et al[16]. Many studies have reported rotavirus is a leading cause of paediatric AGE, accounting for 27-51% of all diarrheal cases in children less than 5 years of age [17]. Rotavirus mainly spread through contact with infected persons, contaminated environmental surfaces or via ingestion of contaminated food and water. 23.08% of the children in our study showed mixed infection mostly were parasitic and bacterial while unidentified group was 55.62% which was quite higher than the study by Ghssein G et al[16]. Who reported it as 42.4%. As there were limitations in the identification of enteropathogens our unidentified group was high. Diarrhoea, vomiting and fever was observed in 91.12%, 21.89% and 79.88 % respectively. Findings observed by Ghssein G et al[16]. Fever in 76.8%, vomiting in 71.2% and diarrhoea in 93.4%.We reported that in amoebiasis and unidentified pathogens group, there was an elevated CRP in comparison to viral groups which means that in the unidentified pathogens group is highly suggestive of an invasive infection.

Conclusion

Acute gastroenteritis remains an important cause of morbidity in children under 5 years of age. Mixed infections remains the leading cause followed by rotavirus. Preventive measures, including vaccination strategies, sanitation and clean water supply are necessary to reduce acute gastroenteritis -related morbidity.

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