Clinical Features of Infantile Diarrhea Associated with Single or Multiple Enteric Pathogens

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Abstract

Clinical features of infantile diarrhea were studied among 603 infants from birth to 12 months of age to determine the predominant clinical feature(s) seen in infantile diarrhea associated with a specific enteric pathogen. Among the major clinical features, fever was most often seen in diarrhea due to Yersinia spp. (61.5%) followed by that in rotavirus (26.1%). Vomiting was mostly associated with Vibno cholerae infection (90.9%) and sItigellosis (64.6%). Dehydration was predominant in Vibrio cholerae (90.9%) and Salmonella (84.9%) infections. Bloody diarrhea was mostly due to Shigella infection (74.3%): As regards diarrhea with multiple pathogens, vomiting and dehydration were most frequent with Campylobacter+Enteropathogenic Escherichia coli (EPEC) (88.9% and 77.8%, respectively), while fever was more common with rotavirus+Shigella+Escherichia coil and rotavirus+Giardia. Infection with invasive organisms lead to vomiting, 4-10 stools per day and dehydration significantly more often as compared to infections with non-invasive organisms. Similarly more stools of patients infected with invasive organisms showed presence of blood and more than 5 leukocytes/HPF as compared to those infected with non-invasive organisms (JPMA 45:266,1995).

Introduction

Diarrheal disease is a major public health problem in most developing countries, especially in children[1,2]. As regards diagnosis of different etiological agents of diarrhea, it can be established by using various standard laboratory techniques such as staining cultural characteristics, biochemical and serological tests[3,4],4 But these tests remain out of reach forpediatricians inpractice. At the same time most of the clinical laboratories are not well equipped in this respect. Thus, pediatricians often treat the children on the basis of symptoms alone. The purpose of present study was to correlate the clinical features of infantile diarrhea withvanous kinds of entempathogens (single or multiple).

Subjects and Methods

The study population comprised of 618 infants born between October, 1987 - February, 1993 in low socio-economic areas of Lahore, Pakistan. The infants were registered soon after birth through Maternal and Child Health Center of College of Community Medicine and Public Health Nursing School, Lahore. Out of the 618 infants, 15(2.4%) dropped out from the study due to change of residence before 12 months age. Thus 603 infants could be studied for one year. All the diarrhea episodes (1964) occuring in these infants were recorded. At the same time clinical features like fever, vomiting, dehydration, number of stools per day and nature of stools, were also noted. All these episodes were investigated by examination of stool specimens in the laboratory to identify the entenc pathogen (s). The specimens were collected at the infant's home. When the stool was available as such, it was put in a wide mouth clean dry container and a portion was transferred into a container of Anue's

transport medium[5]. If it was not available as such, it was aspirated with the help of a disposable feeding tube No.8 (Gammatron Company) and 5cc disposable syringe. A portion of this was put in the Arnie's transport medium while the rest was kept in the syringe and transported to the laboratory. Gross examination of the stool inclusive of consistency and presence of mucus/blood was performed. Microscopic examination showed leukocytes, RBC and presence of parasites by standard techniques[3,4]. Specimens present in the Arnie's transport medium were cultured on appropriate media for isolation of the enteric pathogens like E. coli, Salmonella spp., Shigella spp., Vibrio cholerae, Yersinia enterocolitica and Campylobacter spp. The pathogens were then identified by standard biochemical and serological tests as required[3,4,6,7]. All the diarrheal stool samples were also tested for rotavirus by ELISA technique with the .rotavims ELISA Kit manufactured by DAKOPATFS Company Denmark, strictly following the manufacturer's instructions.

Results

There were 1964 diarrheal episodes of which 1206 (61.4%) yielded single (Table I), 47 (2.4%) multipleenteric pathogens (Table II, III) while 711 (36.2%) samples gave a negative result.

Clinical features of diarrhea caused by single pathogens

Fever was commonly associated with the infantile diarrhea caused by Yersinia enterocolitica (61.5%) and rotavirus (26.1%). Vomiting was more frequent with V. Cholerae (81.8%) and Shigellosis (64.6%). Dehydration was mostly observed in Vibrio cholerae (90.9%) and salmonella (84.9%) infections while watery stools were more often seen in Vibro cholerae (90.9%) and rotavirus infection (43%) as compared to other enteric pathogens (Table I).

Table I. Clinical features of infantile diarrhea associated with various single enteric pathogens (n=1206).

Etiological Agents	No. of positive specimens	Fever	Vomi-ting	Dehyd-ration	Number of stool per day		Nature of stool		Presence of		No. of Leukocytes in the stools/high power field		
					<4	4-10	Watery	Loose	Blood	Mucus	<5	5-50	>50
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Bacteria													
Escherichia coli (EPEC)	399	41 (10.3)	152 (38.1)	208 (52.1)	95 (23.8)	304 (76.2)	83 (20.8)	316 (79.2)	12 (3.0)	152 (38.1)	171 (42.9)	0	0
Campylobacter spp.	149	13 (8.7)	87 (58.4)	118 (79.2)	11 (7.4)	138 (92.6)	58 (38.9)	91 (61.1)	34 (22.8)	47 (31.5)	26 (17.5)	19 (12.7)	0
Salmonella spp.	126	19 (15.1)	58 (46.0)	107 (84.9)	29 (23.0)	97 (77.0)	15 (11.9)	111 (88.1)	3 (2.4)	78 (61.9)	3 (2.4)	41 (32.5)	0
Shigella spp.	113	5 (4.4)	73 (64.6)	89 (78.8)	6 (5.3)	107 (94.7)	4 (3.5)	109 (96.5)	84 (74.3)	29 (25.7)	0	23 (20.4)	73 (64.6)
Yersinia enterocolitica	13	8 (61.5)	2 (15.4)	4 (30.8)	5 (38.5)	8 (61.5)	1 (7.7)	2 (15.4)	0	8 (61.5)	2 (15.4)	0	0
Vibrio cholerae	11	1 (9.1)	9 (81.8)	10 (90.9)	2 (18.2)	9 (81.8)	10 (90.9)	1 (9.1)	0	3 (27.3)	0	0	0
Virus													
Rotavirus	337	88 (26.1)	189 (56.1)	240 (71.2)	111 32.9)	226 (67.1)	145 (43.0)	192 (57.0)	0	108 (32.0)	102 (30.3)	0	0
Parasite													
Giardia lamblia	38	5 (13.2)	23 (60.5)	29 (76.3)	7 (18.4)	31 (81.6)	3 (7.9)	35 (92.1)	0	28 (65.1)	0	0	0
Ascaris spp.	11	0	0	0	10 (90.9)	1 (9.1)	0 (100.0)	11	0 (63.6)	7	0	0	0
Entameba histolytica	9	1 (11.1)	2 (22.2)	6 (66.7)	1 (11.1)	8 (88.9)	0	9 (100.0)	1 (11.1)	8 (88.9)	4 (44.4)	2 (22.2)	0

Bloody diarrhea (dysentery) was mostly associated with shigella (74.3%) and Campylobacter (22.8%) infection. As regards presence of leukocytes per high powerfield, more than 50 leukocytes/HPF were found in Shigellosis (64.6%), however, less number of leukocytes (5-50/HPF) were seen in diarrhe associated with Salmonella (32.5%), Entamoeba histolytica (22.2%). Shigella (20.4%) and campylobacter (12.7%) infections(Table I). Statistical analysis between organisms causing invasive and non-invasive infection revealed that infections with invasive organisms lead to vomiting ($P<0.05$), 4-10

stools per day (P<0.01) and dehydration-invasive organism. Similarly significantly higher number of stool samples in infections with invasive organisms showed presence of blood (p<0.001) and more than 5 leukocytes/HPF in the stools (P<0.001) as compared to non-invasive organisms.

Clinical features of diarrhea associated with multiple pathogens

Many cases of diarrhea harboured multiple pathogens. For example, out of 12 cases positive for Campylobacter, 9 also had EPEC and 3 Salmonella (Table II).

Table II. Clinical features of infantile diarrhea caused by Campylobacter with other pathogens (n=12).

Etiological Agents	No. of positive stool specimens	Fever	Vomiting	Dehydration	No. of Stool per day		Nature of stool		Presence of		No. of leukocytes in the stool/high power field		
					<4	4-10	Watery	Loose	Blood	Mucus	<5	5-50	>50
		No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)
Campylobacter with:													
Escherichia coli (EPEC)	9	0	8 (88.9)	7 (77.8)	0	9 (100.0)	3 (33.3)	6 (66.7)	1 (11.1)	8 (88.9)	9 (100.0)	0	0
Salmonella spp.	3	3 (100.0)	0	0	0 (100.0)	3 (33.3)	1 (66.7)	2	0 (100.0)	3 (100.0)	3	0	0

Similarly, 35 cases positive for rotavirus were also infected with Giardia (12' cases), Shigella (2 cases), EPEC (13 cases), Salmonella (4 cases) and Shigella+EPEC (4 cases) (Table III). The results showed that predominant clinical features in cases of CampyIobacter+EPEC were vomiting (88.9%), dehydration (77.8%) and 4-10 stools per day (100%). Fever was more common in diarrhea due to rotavirus+Shigella+EPEC (50%) and rotavirus+Giardia (4 1.7%) infection. Diarrhea! cases due to rotavirus+Giadia, rotavirus+Shigella and rotavirus + Shigella + EPEC mostly had vomiting and dehydration. The results also showed that in general, diarrhea due to rotávirus with any one of Giardia, EPEC, Salmonella or due to Shigella + EPEC was associated' with 4-10 stools per day and presence of mucus (Table III).

Table III. Clinical features of infantile diarrhea caused by rotavirus with the other pathogens (n=35)

Etiological Agents	No of positive stool specimens	Fever	Vomiting	Dehydration	No. of stool per day		Nature of stool		Presence of		No of leukocytes in the stools/high power field		
					<4	4-10	Watery	Loose	Blood	Mucus	<5	5-50	>50
		No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)
Rotavirus with Giardia lamblia	12	5 (41.7)	7 (58.3)	9 (75.0)	4 (33.3)	8 (66.7)	8 (66.7)	4 (33.3)	3 (25.0)	9 (75.0)	7 (58.3)	0	0
Shigella spp.	2	0	2 (100.0)	2 (100.0)	0	2 (100.0)	2 (100.0)	0	2 (100.0)	0	0	2 (100.0)	0
Escherichia coli (EPEC)	13	0	7 (53.8)	8 (61.5)	2 (15.4)	11 (84.6)	7 (53.8)	6 (46.2)	2 (15.4)	11 (84.6)	3 (23.0)	0	0
Salmonella spp.	4	1 (25.0)	2 (50.0)	2 (50.0)	0	4 (100.0)	0	4 (100.0)	0	4 (100.0)	3 (75.0)	1 (25.0)	0
Shigella and E. coli (EPEC)	4	2 (50.0)	3 (75.0)	4 (100.0)	0	4 (100.0)	4 (100.0)	0	1 (25.0)	3 (75.0)	1 (25.0)	3 (75.0)	0

Discussion

The common clinical features seen in a child with diarrhea are fever, vomiting and dehydration. At the same time infections with various enteric pathogens are accompanied by these signs and symptoms to a variable extent[8-10]. In the present study, an attempt has been made to find the predominant clinical feature(s) which may be seen in infantile diarrhea associated with a specific enteric pathogen. In this

study, fever was more commonly seen in the diarrhea caused by Yersima enterocolitica and rotavirus. However, fever was not a common feature in Shigella, Salmonella and EPEC associated diarrhea. These results are different from those of Levine[11] and others[8,9] who have considered fever as one of the important clinical feature in diarrhea associated with these pathogens. Vomiting has been reported to be a common feature in severe cases of diarrhea due to V. cholerae[10]. The present study also has similar findings. It was also observed that dehydration was more common in diarrhea associated with V. choleme and Salmonella species. Similar results have been reported by other workers[12]. Watery stools are significantly more common with rotavims infections[13]. In the present study, apart from V. cholerae, rotavirus and to some extent Campylobacter, this was not a common feature. In general, vomiting, watery diarrhea and dehydration were the predominant clinical features in V. cholerae infection. These findings are similar to other workers[10,14]. The results of the present study revealed that bloody diarrhea was mostly associated with Shigella and Campylobacter infections. Reports from other parts of the world also support this finding[13,15-18]. Similarly, children infected with Shigella spp., are more likely to have leukocytes in their diarrheal stools than patients infected with other pathogens[13,18,19]. The findings in the present study are in accordance with the observations of these authors as more than 50 leukocytes were found in cases of Shigellosis. Since management of diarrhea due to invasive and non-invasive organisms differs, therefore, it is also helpful to identify the clinical features of diarrhea due to invasive organisms and non- invasive organisms. As observed in the study, infections with invasive organisms lead to vomiting, diarrhoea (4-10 stools per day) and dehydrations significantly more often as compared to infections with non- invasive organisms. Similarly higher number of stool samples in the former showed presence of blood and more than 5 leukocytes/HPF in the stools as compared to the latter. In the present study, EPEC V. cholerae and rotavirus are considered as non-invasive[10,20,21] while Campylobacter, Salmonella, Shigella, Yersinia and E. histolytica have been considered as invasive organisms[8,9,20]. Clinical features of diarrhea in mixed pathogen infections (Campylobacter with either EPEC or Salmonella) varied. Campylobacter+EPEC had more vomiting and dehydration, whereas, diarrhoea, mucus and <5 leukocytesf HPF were more marked in Campylobacter+ Salmonella infections. Similarly variable results were seen in clinical features of diarrhea caused by rotavims with other pathogens. Although diarrhea associated with multiple pathogens was seen only in a small number of children in the present study, yet its investigations and treatment has an important role in treating and investigating infantile diarrhea.

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