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Original Research Article

Acute diarrhoea in paediatric age group - A clinico-microbiological study

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Abstract: Child health care has been given prime priority by national health care system organisations. However, acute diarrhoea is still a leading cause of childhood morbidity and mortality. One in four deaths in children under 5 years is due to acute diarrhoea. This study was aimed to assess the microbial profile of acute diarrhoea in paediatric age group patients. A total 380 acute diarrhoeal cases and two hundred non diarrhoeal control subjects were selected and stool sample was collected. All samples were undergone for microbial examination. Bacterial enteropathogens belonging to 6 species were isolated in 40.7% of diarrhoeal cases such as E.coli in 21.7%, Shigella in 7.9%, Klebsiella in 1.1%, Campylobacter in 5.8%, Salmonella in 1.6% and Pseudomonas in 1.1%, G. Lamblia and E.histolytica were found in 3.2% and 2.6% respectively. Mixed agents were found in 2.6% cases. Rotavirus is an important cause of acute diarrhoea, found in 18% of children below 5 years of age. With the reference of above results that E.coli is predominant enteropathogens leading to diarrhoea and Shigella is another major contributor to the diarrhoea. Improving the use of ORT, practice of hand wash, community health education, sanitation and water supply improvement and rapid implementation of anti-diarrhoeal vaccines may help to prevent the acute diarrhoea.
Keywords: Acute diarrhoea, E.coli, Shigella, Rotavirus

INTRODUCTION

Acute diarrhoeal diseases in children constitute a cardinal health problem in developing countries, where it is associated with high mortality and morbidity [1]. Studies from developing countries have shown that children under 5 years of age experience on an average 2-3 episodes of diarrhoea every year [2]. In several developing countries 40 percent of hospital admissions are accounted by acute diarrhoeal diseases, with a case fatality rate of 2.5 to 9.5 percent [3]. WHO child health epidemiology reference group estimates that 16% of deaths in African infants are less than five years by acute diarrhoea [4].

Most of acute diarrhoeas are infectious in origin. Among the causative agents that have been associated with paediatric diarrhoeal diseases in developing countries relatively few account for most diseases [5] such as rotaviruses, enterotoxigenic E. coli, Enteropathogenic E. coli, Shigella and Vibrio cholerae.

Aetiological studies of diarrhoeal disease are necessary to define the relative importance of various enteropathogens in a population and to direct therapeutic and preventive efforts for reduction of impact of these illnesses in a population [6]. However, for care of individual patient precise aetiological diagnosis is not essential. As oral rehydration therapy is the treatment of diarrhoeal disease of all ages and causes [7]. Enteric infection causing diarrhoea is generally selflimiting. However, diarrhoea caused by Shigella, V.cholera, Giardia and E. histolytica are effectively treated by antimicrobial drugs and only patients with these infections would clearly benefit from aetiological diagnosis and specific therapy [8]. The present study was aimed to evaluate the clinico microbiological profile of acute diarrhoea in paediatric age group patients.

MATERIAL AND METHODS

This study was carried out in the department of microbiology, Rajiv Gandhi Institute of Medical Sciences, Ongole. A total of 380 children in the age group of 1 to 5 years with acute diarrhoea were selected from paediatrics outpatient. Infants below 1 month age were excluded. Two hundred non-diarrhoeal age and sex matched controls were selected from admitted patients for minor illness like asthmatic bronchitis, epilepsy, etc. and from asymptomatic siblings of admitted patients, with no history of diarrhoea in last 15

days. A detailed history of patients was collected and obtained informed consent.

Culture

All the specimens were plated on Mac Conkey agar (MA), deoxycholate citrate agar (DCA) and thiosulphate citrate bile salt sucrose (TCBS) agar plates. The plates were incubated at 37^0C overnight. MA and DCA Plates were examined for lactose fermenting (LF) and non-lactose fermenting (NLF) colonies.

Detection rota virus

On receipt of sample in the laboratory the procedure of preparation of faecal extract and detection of rotavirus antigens in them by the ELISA technique was according to the manual provided with the kit of reagents.

RESULTS

Three hundred and eighty children suffering from acute diarrhoea and two hundred non-diarrhoeal children under the age of five years were studied. The male: female ratio in study group was 1.4: 1 and in control group it was 1.5: 1. In the study group 40% cases were below one year, 69% below two years and 31% cases were between 2 to 5 years of age. Controls distribution showed similar figure in respect of age and sex.

Positive E.coli strains as pure or predominant growth on culture. E.coli strains could not be screened for EPEC and ETEC.

Table-1: Microbiological findings of stool examination

Pathogens isolated	Study cases(N=380)		Control cases(N=200)	
	No.	Percentage (%)	No.	Percentage (%)
Rotavirus	68*	18.0	2*	1.0
*E. Coli	82**	21.7	22**	11.0
Shigella	30	7.9	-	-
Klebsiella	4	1.1	-	-
Campy lobacter jejuni	22***	5.8	8***	4.0
E. Histolytica	10	2.6	-	-
Pseudomonas	4	1.1	-	-
Vibrio-cholerae	-	-	-	-
Salmonella (non-typhoid)	6	1.6	-	-
G. lambilia	12	3.2	-	-
Mixed	8	2.1	2	1.0
Total	246	65.1	34	17.0

*P < 0.001, **p < 0.05, *** p > 0.05

Table-2: Frequency of isolation of various aetiological agents in relation to age.

Pathogens	Age groups (months)					
	≤ 6 (n=64)	7 – 12 (n=80)	13 – 24 (n=114)	25 - 36 (n=60)	37 - 60 (n=58)	Total (n=380)
Rotavirus	12 (17.5)	28 (35.0)	24 (21.0)	4(6.7)	-	68 (18.0)
E. Coli	16 (23.5)	20 (25.0)	26 (22.90	6 (10.0)	14 (25.0)	82 (21.7)
Shigella	2 (2.9)	4 (5.0)	10 (8.80	8 (13.3)	6 (10.7)	30 (7.9)
Salmonella	4 (5.9)	-	2 (1.7)	-	-	6 (1.6)
Campylobacter	2 (2.9)	6 (7.5)	10 (8.8)	2 (3.3)	2 (3.6)	22 (5.8)
Pseudomonas	2 (2.9)	-	-	2 (3.3)	-	4 (1.1)
Klebsiella	-	-	2 (1.8)	2 (3.3)	-	4 (1.1)
E. hystolytica	-	-	4 (3.5)	2 (3.3)	4 (7.1)	10 (2.7)
G.Lamblia	-	-	2 (1.8)	6 (10.0)	4 (7.1)	12 (3.2)
Mixed agents	4 (5.9)	-	-	2 (3.3)	2 (3.6)	8 (2.1)

Table-3: Feeding pattern in study and control cases.

Mode of feeding	Diarrhoea cases				Non - Diarrhoea cases			
	Age groups (months)				Age groups (months)			
	< 6	7 - 12	13 - 24	Total	< 6	7 - 12	13 - 24	Total
Exclusively breast fed	38* (55.9)	28 (35.0)	18 (15.8)	84** (32.1)	32* (84.2)	18 (39.1)	18 (20.0)	62** (43.1)
Bottle + breast fed	24 (35.3)	36 (45.0)	62 (54.4)	122 (46.6)	4 (10.5)	16	22 (36.7)	42 (29.2)
Exclusively bottle fed	6 (8.8)	12 (10.5)	12 (10.5)	30 (11.40	2 (5.3)	8 (17.4)	12 (20.0)	22 (15.3)
Cup and Spoon fed	-	4 (5.0)	22 (19.3)	26 (9.9)	-	4 (8.7)	14 (23.3)	18 (12.5)
Total	**68**	**80**	**114**	**262 (100.0)**	**38**	**46**	**60**	**144 (100.0)**

***P < 0.01, ****P > 0.05**

Table-4: Correlation between aetiological agents and feeding patterns

Organisms	Exclusively breast fed (n=84)		Bottle + breast fed (n=152)	
	Number	Percentage	Number	Percentage
Rotavirus	22	26.1*	34	22.3*
E. Coli	21	25*	43	28.2*
Shigella	5	5.9*	12	7.8*
Salmonella	2	2.3*	4	2.63*
Campylobacter	2	2.3*	12	7.89*
Klebsiella	-	-	2	1.3
Paeudomonas	-	-	3	1.9
Giardia	2	2.3	-	-
E. histolytica	2	2.3	2	1.3

***P > 0.05**

Almost identical organisms were detected in both the groups. Rotavirus was detected in 26.1% and 22.3% cases in breast fed and bottle fed children respectively. Prevalence of shigella was apparently higher in bottle fed children as compared to breast fed children; similarly campylobacter was detected more frequently in bottle fed cases. But these differences were not statistically significant. Klebsiella and Pseudomonas were present in one bottle fed and none breast fed cases.

DISCUSSION

Acute diarrhoea diseases are an acknowledged major health problem, severely effecting the children from developing countries, but important to all countries of the world. This disease is perhaps the biggest child killer in developing countries, still 3.5 million children mainly in developing countries die every year due to diarrhoeal diseases. In India alone about 1 million children die of diarrhoeal disease every year.

In the present study rotavirus was detected in 18% children suffering from acute diarrhoea using ELISA technique. The results obtained in the present study are in agreement with many studies conducted in India. Samantray *et al*. and Bhan *et al*. reported prevalence of rotavirus in an urban slum community in to be 21.2% and 20.3% respectively [9, 10]. Mohandas *et al*. in his study observed 19% acute diarrhoeas were due to rotavirus [11]. Bhat *et al*. and Sen *et al*. have reported similar incidence of rotavirus in hospitalized children (18.3%, 15.9% and 16.3% respectively) [6, 12]. Various authors have reported higher detection rates of rotavirus in patients with acute diarrhoea requiring hospitalization [9, 13]. This is because rotavirus disease has not greater potential to cause dehydration [14].

In the present study shigella was isolated from 15 patients out of 189 patients studied giving a prevalence of 7.9%. The isolation rate of shigella in the present study was consistent with the findings of Feldman *et al*., Sanyal *et al*., Agarwal *et al*., gupta *et al*. and lesser Bhat *et al*. (20.6%) and Santhana Krishnan (22%) [15-19, 9]. The difference in isolation rate varies according to epidemiological setting of study. In the present study isolation of salmonella was low. 1.6% which is consistent with many Indian studies by Bhan *et al*. (2.5%), Mohandas *et al*. (3%), and Sen *et al*. (0.9%), [10-12]. In the present study difference between isolation rates of C. jejuni from patients with diarrhoea and from controls is not significant. This is in agreement with most of the studies from India and Bangladesh. Studies by Blaser *et al*. from Bangladesh

(12% and 14% in patients and controls respectively) [20].

In the present study E.Coli was cultured and shows a predominant growth in 21.8%. Children with acute diarrhoea and in 11% non-diarrhoeal controls. Agarwal *et al*. reported 60.6% showed E. Coli growth among 21.2% were typable, Sarkar *et al*. 37% showed E. Coli growth among 58.8% were typable and Paul *et al*. isolated E. Coli in a pure culture in 30.6% cases and 22.6% controls [17, 21, 22]. Isolation of E.Coli as predominant growth culture was lower in comparison to previous studies due to intake of antibiotics by the patients.

Isolation rate of Entamoeba histolytica (3.2%) and Giardia lamblia (2.7%) remained low in present study. Lower isolation of G. Lamblia and E. Histolytica in present study is consistent with studies of Sen *et al*., Bhan *et al*. and Mohandas *et al*. reported 5% prevalence of G. lamblia in acute diarrhoea in young children [10, 11, 12]. In present study G. lamblia and E. histolytica were not isolated in infancy; isolation rate was relatively higher after two years of age.

CONCLUSION

Rotavirus is an important cause of acute diarrhoea in children particularly below 2 years of age. Rotavirus accounted for 18% diarrhoeas in children under 5 years of age in the present study. Bacterial enteropathogens accounted for 40.7% cases of diarrhoea. Commonest among them were E. coli (21.7%), Shigella (7.9%) and Campylobacter (5.8%). There was no significant difference in isolation rates of campylobacter from diarrhoeal and non - diarrhoeal children. Diarrhoea due to Vibrio cholerae is probably rare in this region as V. cholerae was not detected in any case in the present study. G. lamblia and E. histolytica were not common as a cause of acute diarrhoea in children.

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