

NOSOCOMIAL ROTAVIRUS DIARRHEA IN TWO MEDICAL WARDS OF A PEDIATRIC HOSPITAL IN CALCUTTA

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ABSTRACT

One hundred eighty nine children suffering from different medical problems were admitted in two wards of a pediatric hospital in Calcutta during the period between November 18, 1985 and February 10, 1986. Amongst them, 36 children developed nosocomial diarrhea and rotavirus was detected from 80.5 % of the cases. The nosocomial rotavirus diarrhea cases had lesser frequency of stools and only mild dehydration but the course of illness was longer in comparison to that of the hospitalized rotavirus diarrhea cases. There is a possibility of spread of infection via fomites, environmental surfaces and most likely mothers.

Key words: Rotavirus, Nosocomial diarrhea.

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Rotavirus has been recognized as the leading cause of infantile diarrhea both in developed and developing countries(1-5). It has also been incriminated as a frequent cause of nosocomial diarrhea among children in developed countries(6,7). However, most of the reports from India dealt with hospitalized rotavirus diarrhea cases(4,8). This paper describes the nosocomial rotavirus infection among children in two medical wards of a big pediatric hospital in Calcutta.

Patients and Methods

Wards: Nosocomial rotavirus diarrhea occurred in Dr. B.C. Roy Memorial Hospital for Children, Calcutta. This hospital has nine medical wards. In two wards, mothers are allowed to stay with their children (mothers' ward) and these wards are comparatively over crowded. In other seven wards, sick children are handled by trained nursing and paramedical staff. Along with the children having different medical problems, diarrheal children are also housed in all the wards. Children of both sexes upto the age of twelve years are admitted to this hospital.

Definitions: Nosocomial diarrheas were defined as cases who developed diarrhea at least 72 hours after hospitalization.

Patients: During the period between November 18, 1985 and February 10, 1986, nosocomial diarrhea occurred among 36 children who were admitted in the mothers' wards for different medical problems. Detailed clinical history was obtained and thorough physical examination was done and findings were recorded in standard proforma. All the children were followed up till discharge. Forty six diarrhea cases who acquired infection from the community and were admitted in the mothers'

wards during the same period (hospitalized diarrhea) were also included in this study. The WHO recommended guidelines were followed to treat these cases(9). Nutritional status was assessed by "Weight for age" according to Indian Academy of Pediatrics classification using Harvard standard weight(10).

Collection of Samples: Catheter specimens of fecal samples of 36 nosocomial diarrhea and another 46 hospitalized diarrhea cases were collected in sterile bottles. Freshly passed fecal samples were also collected from 25 mothers attending the nosocomial diarrhea cases and 43 medical cases (other than diarrhea or nosocomial diarrhea). Immediately after collection these samples were transported to the laboratory.

Microbiological Methods: The fecal samples were processed for isolation of bacterial enteropathogens and detection of parasites using standard techniques(11). An aliquot of sample was stored at -30°C for subsequent detection of rotavirus antigen by Enzyme Linked Immunosorbent Assay (ELISA) Technique(11). Rotavirus positive samples were confirmed by appropriate blocking tests.

Statistical Analysis: Most of the analysis was done by Chi-square and Fisher Exact test. However, different durations of illnesses during follow up were analysed by Student's t-test.

Results

One hundred eighty nine children suffering from different medical problems were admitted in the mother's wards during the period between November 18, 1985 and February 10, 1986. Amongst them, 36 children developed nosocomial diarrhea. Rotavirus was detected as sole enteropa-

thogen from 29 (80.5%) of these cases and enteropathogenic *E. coli* was isolated from 2 (5.5%) cases. However, out of 46 hospitalized diarrhea cases, 28 (60.9%) were positive for rotavirus. Enteropathogenic *E. coli*, *Campylobacter jejuni* and enterotoxigenic *E. coli* were also isolated from 10.9, 4.3 and 2.2% of the hospitalized diarrhea cases, respectively. Rotavirus were also detected from the feces of 1 (4.0%) attending mother and 2 (4.6%) of other medical cases who were asymptomatic.

Nosocomial rotavirus diarrhea was common among older children and the children aged between forty nine and sixty months had a statistically significantly greater incidence of nosocomial rotavirus infection (*Table I*). Nosocomial rotavirus diarrhea cases had more prolonged illness than hospitalized rotavirus diarrhea cases. Most of the nosocomial rotavirus diarrhea cases had less frequency of stools which resulted in milder dehydration in comparison to that of the hospitalized rotavirus diarrhea cases. In spite of close supervision, persistent vomiting in the nosocomial rotavirus diarrhea cases prevented effective oral rehydration initially which resulted in the development of mild and moderate dehydration in 82.8 and 17.2% cases, respectively. However, in the later part, vomiting subsided and it was possible to rehydrate the patients with oral rehydration therapy (*Table II*). Statistically significantly ($p = 0.0037$) more nosocomial rotavirus diarrhea cases had different grades of malnutrition (80 to <50 Harvard standard weight for age) as compared to that of the hospitalized rotavirus diarrhea cases (*Table III*).

Discussion

Rotavirus was the main causative agent of nosocomial diarrhea in the present

TABLE I—Rates of Detection of Rotavirus in Different Age Groups

Age groups (months)	No. of medical cases admitted	No. of medical cases developed nosocomial diarrhea	Nosocomial diarrhea cases positive for rotavirus No (%)	No. of diarrhea cases hospitalized	Hospitalized diarrhea cases positive for rotavirus No. (%)	p-value
<6	13	—	—	4	1 (25.0)	—
6-12	16	2	1 (50.0)*	13	12 (92.3)*	0.2571
13-24	21	3	1 (33.3)*	8	7 (87.5)	0.1515
25-36	33	5	3 (60)*	5	3 (60)*	0.7381
37-48	38	8	7 (87.5)*	6	2 (33.3)*	0.0629
49-60	31	10	10 (100.0)**	7	2 (28.6)**	0.0034
>60	37	8	7 (87.5)*	3	1 (33.3)*	0.1515

* Statistically not significant.

** Statistically highly significant.

! Statistical analysis was not considered as there was no case of nosocomial rotavirus diarrhea.

investigation because 80.5% of the fecal samples were positive for rotavirus by ELISA technique. This infection was restricted to patients admitted to only mothers' wards and was not transmitted to patients of other medical wards though the frequency of hospitalization of diarrhea cases was more or less the same in all the wards.

The present investigation showed that nosocomial rotavirus infection occurred in the season when the virus was also largely detected from other hospitalized diarrhea cases. These cases brought the virus in the wards and helped spread to the susceptibles via mothers(12) who were mostly illiterate and had little knowledge of personal hygiene but were primarily responsible for nursing the sick children. Fomites and environmental surfaces(13) may have also played important roles in the transmission of virus infection in those overcrowded mothers' wards. Possibly illiterate mothers contaminated their hands, food

and drinks from their immediate surroundings and transmitted the infection to their sick children. However, in spite of the viral contamination of the surroundings in other wards, sick children of other wards were not infected because they were handled by trained nursing and paramedical staff.

Closure of the infected wards was ideal to control the spread of infection. However, it was not practically possible due to heavy load of inpatients in all the wards. Disinfection of the immediate surroundings of the infected wards was carried out by commercially available disinfectants and antiseptics but the spread of infection continued till middle of February, 1986. This may be explained by the fact that rotavirus was relatively resistant to inactivation by the chemical disinfectants and antiseptics commonly used in the hospitals(14). Reduction or elimination of nosocomial rotavirus diarrhea will be increasingly important, especially in pediatric wards. Although mode of transmission of rotavirus is

TABLE II—Clinical Characteristics on Admission and Follow Up of the Children with Rotavirus Positive Nosocomial and Hospitalized Diarrhea

Parameter	Nosocomial diarrhea (n = 29)	Hospitalized diarrhea (n = 28)	p-value
<i>Frequency of stools</i>			
<10 times/day	21 (72.4)***	9 (32.1)***	0.005
≥10 times/day	8 (27.6)***	19 (67.9)***	0.005
<i>Stool character</i>			
Watery	25 (86.2)*	25 (89.3)*	0.5203
Mixed with blood	1 (3.4)*	1 (3.6)*	0.7456
Mixed with mucus	3 (10.3)*	2 (7.1)*	0.5171
<i>Vomiting</i>	25 (86.2)**	17 (60.7)**	0.0289
<i>Fever >39°C</i>	7 (24.1)**	16 (57.1)**	0.023
<i>Abdominal pain</i>	2 (6.9)*	3 (10.7)*	0.4829
<i>Respiratory symptom</i>	9 (31.0)*	7 (25.0)*	0.832
<i>Dehydration</i>			
Mild (4-5%)	24 (82.8)*	16 (57.1)*	0.0682
Moderate (6-9%)	5 (17.2)*	9 (32.1)*	0.3179
Severe (≥10%)	—	3 (10.7)*	0.112
<i>Follow Up</i>			
Mean duration of diarrhea in days (Mean ± SD)	5.8 ± 0.55***	3.5 ± 0.57***	0.000001
Mean duration of vomiting in days (Mean ± SD)	2.5 ± 0.57***	1.2 ± 0.61***	0.000001
Mean duration of fever in days (Mean ± SD)	2.4 ± 0.41***	1.0 ± 0.42***	0.000001

Figures are in numbers and percentages except where stated otherwise.

* Statistically not significant.

** Statistically significant.

*** Statistically highly significant.

defined incompletely, the present findings suggest that the incidence of nosocomial rotavirus diarrhea may be reduced by approaches that encourage adherence to standard infection control practices such as improvement of personal hygiene including hand washing and health education of

those involved in the care of the patients in the hospital.

Nosocomial rotavirus infection was common among older children which might be due to unrestricted movement of these children in the crowded and infected wards. Clinical course of illness was longer

TABLE III—Nutritional Status of the Children with Rotavirus Positive Nosocomial and Hospitalized Diarrhea

Nutritional status (% Harvard Standard weight for age)	Nosocomial diarrhea (n = 29)		Hospitalized diarrhea (n = 28)		p-value
	No.	%	No.	%	
Normal (>80%)	4	(13.8)**	15	(53.6)**	0.0016
I° malnutrition (71-80%)	12	(41.4)*	7	(25.0)*	0.3028
II° malnutrition (61-70%)	6	(20.7)*	3	(10.7)*	0.253
III° malnutrition (51.60%)	4	(13.8)*	2	(7.1)*	0.3521
IV° malnutrition (<50%)	3	(10.3)*	1	(3.6)*	0.3191
all grades of malnutrition (80-<50%)	25	(86.2)**	13	(46.2)**	0.0037

* Statistically not significant; ** Statistically significant.

amongst nosocomial rotavirus diarrhea cases. Malnutrition among these children may be one of the precipitating factor for prolonged diarrhea(15). Prolonged illness among these malnourished children may possibly be the result of depressed immunity(16) and delayed recovery of intestinal mucosal injury after acute infection(17). Malnutrition is not the only contributory factor for causation of severe diarrhea, infecting agents also play a major role. Rotavirus usually causes milder diarrhea in developed as well as in developing countries(2, 8). There was no death in the present investigation but nosocomial rotavirus diarrhea added greatly to cost of hospitalization and prolonged hospital stay by several days.

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