

ROTAVIRUS DIARRHEA IN NEWBORN INFANTS*

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SUMMARY: Akıncı A, Teziç T, Gür İ, Çetin H, Hatun Ş. (Department of Pediatrics, Dr. Sami Ulus Children's Hospital, Ankara, Turkey). Rotavirus diarrhea in newborn infants. Turk J Pediatr 33: 153-157, 1991.

In this study, the frequency of rotavirus infection and also the relation of rotavirus pathogens to necrotizing enterocolitis were investigated in newborns with diarrhea. We observed that rotavirus is a very important agent as a cause of nosocomial infection and also that it has a role in the development of NEC. *Key words: rotavirus, diarrhea, necrotizing enterocolitis.*

Diarrhea is still one of the leading causes of infant mortality^{1, 2}. In developing countries, enterotoxigenic *E. coli* and rotavirus infections are the most prevalent pathogens known to cause diarrhea^{1, 3}. This study describes the clinical and laboratory findings and prognosis of diarrhea due to rotavirus infection in newborn infants. We also compared our findings with those reported in the literature.

Material and Methods

This study was performed on 70 newborn infants hospitalized for several reasons in the Neonatal Unit of Dr. Sami Ulus Children's Hospital between January - March 1990. Table I lists the reasons for admission to the neonatal unit. Patients passing normal stools at admission and then passing loose, watery and frequent stools 3 - 6 days after admission were considered to have diarrhea, and were categorized into three groups according to symptoms.

- 1— Mild diarrhea: Newborn infants with diarrhea but without complications or signs of dehydration.
- 2— Moderate diarrhea: Newborn infants with diarrhea accompanied by fever, vomiting and dehydration.
- 3— Severe diarrhea: Newborn infants with diarrhea accompanied by dehydration and such symptoms and signs as: lethargy, hypotonia, apneic spells, blood in the stool, X - ray findings of pneumatosis intestinalis, abdominal distension, prominence of bowel movements and indication of perforation.

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Stool, blood and urine cultures were taken from all patients. Hemograms and serum electrolytes, and BUN and creatinine levels were determined. The ELISA (Rotazyme) test was used to determine rotavirus in the stool samples. Stool samples of the personnel working in the newborn unit, water samples, and the oral rehydration solution (ORS) used in the unit were analyzed. The patients were hospitalized between 2 - 19 days. There was no significant difference found between the hospitalization period of rota (+) and rota (–) patients ($p > 0.05$) (Table II). Clinical data of the patients are given in Table II.

Results

Of the 17 rota (+) patients, three had mild, six had moderate and eight had severe diarrhea. Of the 53 rota (–) patients, 29 were described as being mildly ill, 10 moderately and 14 severely ill. The patients' laboratory findings are shown in Table III. The stool cultures of each of the two rota (+) infants with severe diarrhea, yielded *Shigella*, *E. coli* and *Klebsiella*, while the stool cultures of the 14 rota (–) infants with severe diarrhea yielded *Klebsiella* in two and both *Shigella* and *Klebsiella* in one. Pathogens were not detected in any of the remaining rota (–) infants with severe diarrhea.

The blood cultures obtained from the rota (–) infants grew the following: *Staphylococcus* (one patient), *E. coli* (two patients) and *Klebsiella* (two patients). No pathogens were isolated from the blood cultures of the rota (+) patients. Microscopic analysis of stools demonstrated leukocytes in six rota (+) patients and eleven rota (–) patients. Other laboratory findings are given in Table III.

Discussion

Rotavirus is one of the leading causes of diarrhea in newborn infants¹⁻⁵. There is a strong correlation between rotavirus infection and symptoms such as fever, vomiting and diarrhea in the first six months of life. Asymptomatic rotavirus infections have been also reported in newborns. Besides the asymptomatic cases, there are also severe cases such as those with manifestations as necrotizing enterocolitis (NEC)^{4, 6, 7}. In our 17 rota (+) patients, three had mild, six had moderate and eight had severe diarrhea. In four of the eight severe cases, NEC developed with pneumatosis intestinalis which was demonstrated on the X-ray studies. In one of these cases, there was a history of perinatal asphyxia and exchange transfusion, both of which are considered risk factors for the development of NEC. Three rota (+) patients with a history of prior exchange transfusion did not develop NEC (Table II). However, the other three patients who developed NEC were not at risk for this disease. *E. coli* and *Klebsiella* were isolated in the stool cultures of one of these four patients, while in the remaining patients no bacterial pathogen was cultured. Previous studies have shown that

TABLE I: The Cause of Admission to the Neonatal Unit

Admission Causes	Number
Hyperbilirubinemia	58
Respiratory distress	2
Convulsion	1
Diarrhea	2
Sepsis	1
Anoxia	1
Epidermolysis bullosa	1
Neonatal tetanus	1
Lower respiratory tract infection	1
Meconium aspiration	2
Total	70

TABLE II. The Clinical Data of the Patients

	Rotavirus (+) (n:17)			Rotavirus (-) (n:53)		
	Mild (n:3)	Moderate (n:6)	Severe (n:8)	Mild (n:29)	Moderate (n:10)	Severe (n:14)
Prematurity	—	—	—	1	3	3
Median birth weight (gr):						
1500-1999	—	—	—	1	3	3
2000-2499	—	—	—	8	4	3
2500-2999	1	2	3	12	1	6
3000-3499	1	3	5	5	—	2
3500-	1	1	—	3	2	—
Median duration of hospitalization (days)	2	5	19	3	5	17
Median length of diarrhea (days)	2	5	14	3	5	12
Breast-feeding	3	3	8	12	8	11
Median duration of breast-feeding (days)	2	3	3	4	3	3
Colostrum-feeding	3	3	8	12	8	11

the ELISA method can yield false (+) results in positive stool cultures, which has been explained by non-specific binding of rotavirus - antibody to bacteria⁸. In our study, the detection of rotavirus in two patients with positive stool cultures, could have possibly been due to the sensitivity of the ELISA method. In the severe rota (+) cases, leukocytosis and toxic granulation of polymorphonuclear leukocytes were strikingly higher than the rota (-) patients ($p < 0.05$; Table III). The leukocytes in the stool smear of rota (+) patients were also higher than the rota (-) patients. This can be explained by the enteroinvasive character of rotavirus^{9, 10}. In the patients with moderate and severe diarrhea, BUN and creatinine levels were higher than in the patients with mild diarrhea (Table III).

TABLE III: Laboratory Findings of the Patients

	Rotavirus (+) (n:17)			Rotavirus (-) (n:53)		
	Mild (n:3)	Moderate (n:6)	Severe (n:8)	Mild (n:29)	Moderate (n:10)	Severe (n:14)
Hb (gr/dl)	10.9±1.8	13.4±1.1	14.6±2.1	12.6±1.1	16.6±2.1	15.0±2.3
Hct	35.6±5.4	37.2±8.2	37.8±4.4	34.4±4.4	38.2±6.1	37.9±3.8
Leukocyte (mm3)	10.000±1.200	18.000±6.100	32.000±10.800 ($p < 0.05$)	9.500±3.900	21.500±5.750	19.000±1.500 ($p < 0.05$)
Toxic granulation	-	1	6 ($p < 0.05$)	-	2	3
Na (mEq/L)	142±10	138±8	135±7.5	138±11	140±10.8	138±11
Urea nitrogen (mg/dl)	18.6±7.6	20.5±6.5	23.8±8.5	10.4±4.7	13.2±7.9	28.6±10.1
Creatinine (mg/dl)	1.01±0.3	1.2±0.8	2.2±0.7	1.9±0.1	2.4±0.18	2.3±0.8
PNL (%) in faces (percentage per high-power field)	70±17	70±15	80±22	55±12	60±20	65±15

* Values are given as mean ±50.

Dehydration was regarded as having caused the elevation in BUN and creatinine levels. It is a well known phenomenon that breast milk protects the infant from rotavirus¹¹. Fourteen of our rota (+) patients were breast-fed approximately three days before they were admitted to the hospital. This paradox can be explained by the short duration of breast-feeding which is insufficient for the development of protective antibody against rotavirus. Our patients support recent reports about the severity of rotavirus infections during the newborn period. As a result of this study, we can say that the clinical course of rotavirus infections ranges from mild to severe gastroenteritis and also that it is the leading cause of NEC during the newborn period and infancy.

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