

Rotavirus infection as a cause of watery diarrhea

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Summary:

Background: Rotavirus infection is the most common cause of watery viral diarrhea in children younger than 5 years of age; it is a major cause of childhood morbidity and mortality.

Objective: The aim of the study is to determine the clinical picture, age distribution of patients with rotavirus infection and their maternal educational background.

Patients & methods: A total of 202 patients suffering from diarrhea were included in this study, over 6 months period (from 1st of March 2011 to 30th of August 2011), in Children Welfare Teaching hospital. History and physical examination were carried out, anthropometrics measures were done and plotted on Centers for Disease Control & World Health Organization charts to determine the nutritional status. Stool was collected for General stool examination, stool PH, stool culture and stool for rotavirus antigen.

Results: The study showed that 41 children out of 202 were rotavirus positive (20.29%), and (192) (94.69%) of diarrhea occur below 2 years of age mainly between 6-12 months old (138) (68.32%), most of the mothers of the patients were illiterate (78) (38.6%), all of the patients were dehydrated and with the other clinical features (diarrhea, vomiting, fever). Most of the cases of rotavirus infection occurred with mixed feed children 23/41 (57%).

Conclusions: Rotavirus infection is an important cause of diarrhea especially in the last 6 months of the first year of life. Poor maternal education is risk factors in occurrence of diarrhea.

Keywords: watery diarrhea, rotavirus infection.

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Introduction:

The most common cause of acute diarrhea in young children in developed and developing countries are rotaviruses. In developing countries, it is estimated that 20-70% of hospitalizations and close to one million children below the age of five years die annually because of rotavirus infections (1). Rotavirus is a double stranded RNA virus in the family Reoviridae (2,3). Two structural viral proteins namely VP4, the protease cleaved protein (P protein) and VP7 the glycoprotein (G protein) are situated on the outer surface of the virus (2,4). Fourteen rotavirus G serotypes have been identified (2). However, the P serotypes are more difficult to determine and molecular methods are used to define genetically distinct P proteins by nucleotide sequencing (4).

Internationally; A review of epidemiological studies conducted in developing countries, found that rotavirus accounted for some 6% of all diarrhea episodes, a median of 28% of outpatient visits for diarrhea and 34% of hospitalizations for diarrhea in young children (5).

Most diarrheal episodes occur during the first 2 years of life, highest in (6-12 month). This pattern reflects the combined effect of declining of naturally acquired antibody, lack of active immunity, the introduction of food that may be contaminated with bacteria and infant start to crawl that

also increase contamination. (6)

District seasonal pattern of diarrhea occur in many geographical areas. In temperate climate, bacterial diarrhea occurs more frequently during warm season where as viral diarrhea (Rotavirus) occur during winter. (7)

Patients with rotavirus are infectious from 1 day before the onset of symptoms, to 8-10 days afterwards. The onset of the illness usually begins 3 days after exposure to the virus. Rotavirus usually starts with fever, gastric upset, and 1-3 days of vomiting, followed by 5-8 days of watery diarrhea which has an extremely foul odor. (8).

Rotavirus is extremely easy to catch and is transmitted mainly by the fecal-oral route. It can be passed before and after the onset of diarrhea. Respiratory transmission has not been proved, but rotaviruses can be detected in respiratory tract secretions. For diagnosis, the specimen of choice is the stool culture which has been collected during the first 3-5 days of illness. Diagnosis of the virus may be made by rapid antigen detection in stool specimens, electron microscopy, staining of enzyme immunoassays, or serology (8, 9). A vaccine to prevent rotavirus became available in 2006, is given by mouth to children in three separate doses at about 2, 4 and 6 months of age. Ninety eight percent of children who received the rotavirus vaccine were protected against severe rotavirus disease. The vaccine also caused a 96% decrease in hospitalizations and an 86% decrease in doctor visits due to rotavirus (10, 11).

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Patients & methods:

A cross sectional study was carried out in Children Welfare Teaching hospital in Baghdad for the period from 1st of March 2011 to 30th of August 2011, for children under 5 years who had acute diarrhea, 202 patients were collected from the outpatient, emergency department and inpatient. History and physical examination were carried out for all patients and the following information was recorded (age, sex, date of admission, type of feeding, clinical presentation (vomiting, fever, dehydration, tenesmus, stool character, pus, mucus, blood).

All patients were investigated for GSE, PH of stool, stool culture, stool for rotavirus by detecting of the rotavirus antigen in their stool by using rapid enzyme linked immunosorbent assay (ELISA) (slide rota kit -2). Sample about 1-2 gm of stool is mixed with 2 ml of the buffer (R4) in the test tube, the tube is placed on vortex type stirring machine to ensure well mixing of the sample & left in room temperature for 5-10 min, followed by centrifugation for 10 min, then the supernatant is used to perform test the result is indicated by appearance of an agglutination within 2 min, while the negative result is indicated by a homogenous suspension.

Statistical analysis: Statistical analysis was done using Fisher's exact and Chi-square test for comparison of proportion, P-value of less than 0.05 was considered as statistically significant.

Result :

A total of 202 children under 5 years of age were included in this study, of these 41 (20.3%) children were rotavirus positive that means very significant with chi sq. =70.5, df=1, p-value <0.0001. According to age of patient 192 (95.04%) of cases occur below 2 years of age mainly between 6-12 months old 138 (68.32%) and decrease after 2 years.

For rotavirus (+ve) cases, it was found that 35 (85.37%) were from 6-12 months old and small percent 1 (2.44%) below 6 months and 4 (9.75%), 1 (2.44%) in 2nd, 3rd years, with no patient in 4th and 5th years table-(1).

Regarding educational level of mother it was found that 78 (38.6%) were illiterate mothers, 62 (30.7%) attended primary school, 34 (16.8%) attended secondary school, and 28 (13.9%) their mother attend university, while for rotavirus we found that in 30 (73.1%) the mothers were illiterate, 10 (24.4%) the mothers attended primary school, and 1 (2.44%) attended secondary school. The association was statically significant with Chi-sq=19.25 df=3 p-value<0.001 table-(2).

The clinical features of rotavirus were studied and it was found that 13 (31.7%) of patients present with vomiting that

precede diarrhea, 10 (24.4%) present with fever and diarrhea only, 18 (43.9%) present with fever, vomiting and diarrhea, with 41 (100%) present with dehydration (mild, moderate, severe). Table-(3).

According to type of feeding, it was found that in general; 35 (17.3%) were breast fed, 110 (54.5%) were bottle fed and 57 (28.2%) were mixed fed, while for rotavirus was more 23 (56.09%) among mixed fed infants than bottle fed 10 (24.4%) and breast fed 8 (19.5%). With Chi-sq =63.12 df=2 p-value<0.0001. Table-(4).

Table -1:- Age distribution of acute diarrhea

Age in month	Rotavirus (-ve)	%	Rotavirus (+ve)	%	Total no.	%
0-6	31	19.3	1	2.44	32	15.48
>6-12	103	64.	35	85.37	138	68.32
>12-24	18	11.2	4	9.75	22	10.89
>24-36	6	3.7	1	2.44	7	3.47
>36-48	2	1.2	0	0	2	0.99
>48-60	1	0.6	0	0	1	0.49
Total	161	100%	41	100%	202	100%

Chi-sq.=11.48 df=5 p-value<0.0001

Table-2:-Mother education level

Mother education level	Rotavirus (-ve)	%	Rotavirus (+ve)	%	Total no.	%
Illiterate	48	29.8	30	73.1	78	38.6
Primary school	52	32.3	10	24.4	62	30.7
Secondary school	33	20.5	1	2.5	34	16.8
University	28	17.4	0	0	28	13.9
Total	161	100%	41	100%	202	100%

Chi-sq=19.25 df=3 p-value<0.001

Table-3:-Clinical presentation of cases with rotavirus infection

Clinical feature	No. of cases	%
Vomiting precedes diarrhea	13	31.7
Fever & diarrhea	10	24.4
Vomiting & Fever & diarrhea	18	43.9
Dehydration	41	100

Table-4-Type of feeding in the study group

Type of feeding	Rota virus (-ve) No.(%)	Rota virus (+ve) No.(%)	Total No. (%)	%
Breast	25(75.75%)	8(24.2%)	33(100%)	17.3
Bottle	102(91.07%)	10(8.93%)	112(100%)	54.5
mixed	34(61.40%)	23(38.60%)	57(100%)	28.2
Total	161(80.20%)	41(19.80%)	202(100%)	100

Chi-sq =63.12 df =2 p-value<0.0001

Discussion:

The current study included cases of acute diarrhea with rotavirus infection in children below 5 years of age; it was found that rotavirus infection occur in 20.3% of the watery diarrhea which is similar to studies done in developed countries as that done by Mark A in U.S.A(12), Maria cristina Italia(7) (23.9%,19% respectively) & developing country as studies done by Thomas F. in Egypt(13) (23 %), Martha Vargas in Tanzania(15) (23.56%), previous study in Iraq by Dr. Abbas M. This lower percentage may be due to that we performed the study at summer season where rotavirus infection is less than winter.

Most of the cases were under 2 years of age, with a maximum occurrence in infants 6-12 months old. Similar results have been found in studies done by Mark A in U.S.A. and Thomas F. in Egypt (12)(13). This may be explained by that,immunity derived from the mothers decrease in 2nd half of the 1st year together with introduction of contaminated food at this age will increase the susceptibility of children to acquire the diseases.

Regarding mother education, the result showed significant relationship between occurrence of diarrhea and level of education especially with rotavirus infection and illiterate mothers and this result was similar to previous study done in Iraq by Razaq R. Al.Bederi(17) and by Dorsey M.Bass(11) . As mother educational background influence knowledge ,and practice in health and hygiene and reflect on occurrence of disease in children.

Most of patients with rotavirus positive present with a triad of diarrhea ,fever, and vomiting(43.9%) and associated with dehydration(100%),but other presentation (31.7%) like vomiting which precede diarrhea so it is not differentiated from other causes of diarrhea as the study done by Abbas M(15)and by Dorsey M. Bass (11).

Another important risk factor which might increase risk of occurrence of diarrhea is type of feeding. There was a significant association between bottle feeding with

occurrence of diarrhea and association between rotavirus infection and mixed feeding.That is true for children below 2 years of age especially among those age range from6-12 months, and previous studies had demonstrate that continuing breast feeding for more than 6 months of age markedly decrease the incidence of acute diarrhea (18) (19). This may be explained by that most breastfed children were given increasing amounts of weaning foods after 6 months of age, and weaning has been shown to put children at increased risk of infection. In addition, the maternal antibody protection associated with breastfeeding begins to decrease at approximately 6 months of age.

Conclusion:

Rotavirus infection is an as important cause of diarrhea in this hospital . The critical age for diarrheal disease is 6-12 months. Maternal educational level plays a major role in occurrence of acute diarrhea.

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