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RESEARCH ARTICLE

CLINICAL AND LABORATORY FINDINGS RAISE THE INDEXES OF SUSPICION OF INFECTION WITH ROTAVIRUS AMONG CHILDREN WITH ACUTE GASTROENTERITIS

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ABSTRACT

A prospective study was conducted over 2 years on 4600 children aged between 2 weeks to 5 years with acute gastroenteritis who were attending the pediatric clinics of Al-Zahraa and Al-Karama Teaching Hospitals in Kut - Iraq for the period between 1st of July 2017 to 30th of June 2018 to identify the role of rotavirus in children with acute gastroenteritis. The aim of this study is to focus a light on the clinical and laboratory findings of rotavirus infection among young children presented with acute gastroenteritis to offer informations for the health authorities to standardize a proper guidelines for prevention, control and management of this serious disease. Fecal specimens were collected properly and tested for the presence of human rotavirus antigen by Latex Agglutination (LA) test. The rotavirus antigen was detected in 55% of fecal specimens from children with acute gastroenteritis. Human rotavirus antigen was detected more in stool of infants between 6 – 24 months of age, more during winter months, more in low socio-economic group and rural patients; and lowest among breast-fed infants. There was no sex predilection to get the infection with the virus. Children with acute gastroenteritis due to rotavirus infection may have certain clinical and laboratory findings that raise the indexes of suspicion for a clinical diagnosis of the condition.

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INTRODUCTION

Diarrhea is estimated to cause 1.5 million deaths and 21% of all under fives mortality worldwide (WHO, 2008). Rotavirus (RV) is the most common cause of severe diarrhea among infants and young children (Dennehy, 2000). By the age of five, nearly every child in the world has been infected with rotavirus at least once (Velázquez *et al.,* 1996). However, with each infection, immunity develops, and subsequent infections are less severe (Linhares *et al.,* 1988). It is the leading single cause of severe diarrhea among infants and children, being responsible for about 20% of cases, and accounts for 50% of the cases requiring hospitalization (Simpson *et al.,* 2007). Boys are twice as likely to be admitted to hospital as girls (Rheingans *et al.,* 1990). RV is transmitted by the fecal-oral route, via contact with contaminated hands, surfaces and objects (Butz *et al.,* 1993) and probably by the respiratory route (WHO *et al.,* 2008). RV gastroenteritis (GE) is a mild to severe disease characterized by vomiting, watery diarrhea, and low-grade fever. Once a child is infected by the virus, there is an incubation period of about two days before symptoms appear (Hochwald and Kivela, 1999). Symptoms often start with vomiting followed by four to eight days of profuse diarrhea.

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Dehydration is more common in rotavirus infection than in most of those caused by bacterial pathogens, and is the most common cause of death related to RV infection (Maldonado and Yolken, 1990). Milk intolerance due to lactase deficiency is a particular symptom of RV infection, which can persist for weeks (Ouwehand and Vesterlund, 2003). Specific diagnosis of infection with RV-A is made by finding the virus in the child's stool by enzyme immunoassay (Smith *et al.,* 1993).

Aim of the study: To demonstrate the clinical and laboratory features of children with RVGE.

PATIENTS AND METHODS

A prospective study was conducted over 2 years on 4600 children aged between 2 weeks to 5 years with acute GE who were attending the pediatric clinics of Al-Zahraa and Al-Karama Teaching Hospitals in Kut - Iraq for the period between 1st of July 2017 to 30th of June 2018 to identify the role of RV in children with acute GE. "Diarrhea" was defined as "passage of three or more loose or liquid stools in any 24-hour period (for breastfed infants, this also required a statement by the mother that the stools had become more frequent or less formed than usual for the infant)". Fecal specimens were collected properly and tested for the presence of human RV antigen by Latex Agglutination test (Rota-kit Biomerieux – France).

Medical history, was recorded and physical examination was carried out for each patient. The following informations were recorded: age, sex, residence, date of admission, type of feeding, socioeconomic status and clinical presentation. Chi-square test was carried out to determine the relative importance of various variables, P value < 0.05 was considered as statistically significant and < 0.01 as highly significant.

RESULTS AND DISCUSSION

Out of 4600 children (2588 = 56.26% males and 2012 = 43.74%) females presented with acute GE, 2530 (55%) [1412 = 55.81% males and 1118 = 44.19% females] were positive for RV (Table.1).

There was no sex preference to get the infection with the virus. RV GE affects mainly infants between 6 – 12 months (47.04%) and children between 13 – 24 months (26.05%). The high prevalence of RV positive cases (55%) among children with acute GE in our study proves that rotavirus is a major aetiological agents for acute diarrheal diseases in young children and a leading cause for morbidity and hospitalization with the consequent burden on health and the community. These findings were consistent with the findings in Brazil (Teixeira *et al.,* 1998) where group A- RV detected in stools of up to 69% of children with diarrhea seen at emergency rooms, depending on the season. In Basrah, Iraq (Abbas AND Mea'ad, 2000), The percentage of RV infection among children with acute watery diarrhea was 43.3%.

Table .1 Age and sex distribution of the studied population

Variable	Patients with +ve R.V. GE		Patients with -ve R.V. GE		Total		p- value
	No. 2530	% 55	No.2070	% 45	No. 4600	% 100	
Age (months)							
< 6	179	7.07	233	11.26	412	8.96	< 0.01
6 – 12	1190	47.04	370	17.87	1560	33.91	
13 – 24	659	26.05	346	16.71	1005	21.85	
25 – 36	165	6.52	510	24.64	675	14.67	
37 – 48	160	6.32	392	18.94	552	12	
49 – 60	177	7	219	10.58	396	8.61	
Sex							
Male	1412	55.81	1176	56.81	2588	56.26	> 0.4
Female	1118	44.19	894	43.19	2012	43.74	

Table 2. Clinical features of the studied population

Feature	R .V. + patients		R .V. -ve patients		Total		p-value
	No.2530	% 55	No.2070	% 45	No.4600	%100	
Initial symptom							
Vomiting	1514	59.84	596	28.79	2110	45.87	< 0.05
Diarrhea	1016	40.16	1474	71.21	2490	54.13	
Fever							
None	411	16.24	189	9.13	600	13.04	< 0.01
≤ 39 °C	1817	71.82	771	37.25	2588	56.26	
> 39 °C	302	11.94	1110	53.62	1412	30.7	
Dehydration							
None	783	30.95	1084	52.37	1867	40.59	< 0.01
Some	833	32.92	702	33.91	1535	33.37	
Severe	914	36.13	284	13.72	1198	26.04	
Respiratory symptoms							
None	803	31.74	1307	63.14	2110	45.87	< 0.01
Nasal discharge	298	11.78	163	7.87	461	10.02	
Cough	411	16.25	77	3.72	488	10.61	
Wheeze	477	18.85	96	4.64	573	12.46	
Two or more respiratory symptoms	541	21.38	427	20.63	968	21.04	

Table 3. Laboratory findings of the studied population

Feature	R .V. +ve patients		R .V. – ve patients		Total		p-value
	No.2530	% 55	No.2070	% 45	No. 4600	% 100	
Stool character							
Watery	1534	60.63	1066	51.5	2600	56.52	< 0.01
Loose	996	39.37	1004	48.5	2000	43.48	
Stool colour							
Yellow	933	36.88	665	32.13	1598	34.74	< 0.01
Green	853	33.71	308	14.88	1161	25.24	
White	700	27.67	261	12.61	961	20.89	
Brown	30	1.19	579	27.97	609	13.24	
Blood stained	14	0.55	257	12.41	271	5.89	
Stool PH							
< 5	1637	64.7	289	13.96	1926	41.87	< 0.01
5 – 7	721	28.5	1193	57.63	1914	41.61	
> 7	172	6.8	588	28.41	760	16.52	
Stool microscopy							
No findings	922	36.44	78	3.77	1000	21.74	< 0.01
Pus cells (WBCs)	715	28.26	773	37.34	1488	32.35	
Mucus	741	29.29	778	37.59	1519	33.02	
Blood (RBCs)	152	6.01	441	21.3	593	12.89	

Regarding the clinical presentation (Table.2); 59.84% of patients with RV GE presented with vomiting as the initial symptom, 16.24% were afebrile and 71.82% had a low grade fever (≤ 39 °C), some dehydration and severe dehydration was evident in 32.92% and 36.13% respectively; while 71.21% of patients with non RV GE presented with diarrhea as the initial symptom, only 9.13% were afebrile and 53.62% had a high grade fever (> 39°c), and 52.37% were well hydrated and only 13.72% were severely dehydrated. The prevalence of one or more associated respiratory symptoms (nasal discharge, cough, and wheeze) in patients with RV GE was 68.26% compared to 63.14% of patients with non- RV GE whom never had any respiratory symptom. RV diarrhea cases accounted for 50% of hospitalized acute GE cases, 50% of emergency department visits and 27% of outpatient visits (Payne *et al.,* 2008). In our study, some dehydration and severe dehydration was evident in 32.92% and 36.13% respectively. RV diarrhea children were significantly more likely to have dehydration and hospitalization than non – RV diarrhea children (Thomas *et al.,* 2006). This indicates that RV diarrhea is a heavy burden in children health care, incurring great economic cost. Stephered *et al.* (1995) reported that vomiting was the initial symptom in 50-55% of children with RV gastroenteritis. Brabhan *et al.* (1992) had shown that RV GE is accompanied by abnormal gastric motor function, and this abnormality may be the cause of vomiting. Tallet *et al.* (1997) found that 85% of children with RV GE were febrile and 42% of them had a temperature above 39°c; while Ruuska and Vesikari (1990) recorded that most of children with RV GE were febrile, but only 14% had fever more than 39°c. Maki (1981) observed mild to moderate dehydration in 42.9% of children with RV GE and no patient with severe dehydration. The prevalence of one or more associated respiratory symptoms (nasal discharge, cough, and wheeze) in patients with RV GE was in contrast to a study in Basrah (2000), where only 29.3% of children with RV diarrhea had respiratory symptoms.

In USA, RV accounted for 16.5% of hospitalizations for diarrhea among children < 5 years of age (Umesh *et al.,* 1998). While our data on disease burden demonstrate the importance of RV as a cause of diarrhea among hospitalized children, several observations suggest that they may underestimate the problem. Pediatricians in many hospitals have been discouraged from ordering diagnostic tests for RV that increase the cost of medical care but do not significantly alter treatment decisions. Consequently, much RV infection may go undiagnosed and be coded as nonspecific diarrhea. We assume that a report of RV on the hospital discharge record is based on establishing a laboratory diagnosis, an assumption that needs to be confirmed. Regarding the laboratory investigations (Table.3); 60.63% children with RV GE had watery stool and 39.37% had loose stool; 36.88% had yellow stool, 33.71% had green stool, and only 0.5% had bloody stool; 64.7% had stool PH < 5 and only 6.8% had stool PH > 7; 36.44% demonstrated no findings on stool microscopy, 28.26% with pus, 29.29% with mucus, and only 6.01% with red blood cells. Children with non- RV GE presented with watery stool in 51.5% and loose stool in 48.5% of cases respectively; 32.13% had yellow stool, 27.97% had brown stool, and 12.41% had bloody stool; 57.63% showed a stool PH (5 – 7) and 28.41% had a stool PH > 7; 37.34% demonstrated pus cells on stool microscopy, 37.59% with mucus, 21.3% with blood, and only 3.77% demonstrated no findings. The finding of more acidic stools in patients with RV GE could be due to lactose malabsorption which undergoes fermentation by intestinal bacteria in the colon. Walker Smith (Walker-Smith, 1998) reported that the stool of patients with RV GE characteristically had no inflammatory cells, and the finding of such cells might be due to mixed infection with invasive bacterial pathogen associated with RV GE.

Conclusions and recommendations

- The clinical features and laboratory findings of stools from children with rotavirus gastroenteritis are non specific but highly suggestive and should raise the indexes of suspicion of infection with this virus.
- Doctors, especially juniors and residents; should have a high index of suspicion of RV infection in any young child presented with acute GE especially infants on artificial formula with initial onset as vomiting and rapidly develop dehydration and not to forget the association with respiratory symptoms.

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