Anti-rotavirus IgG Seropositivity among Healthy Population and Patients with Acute Diarrhea in Baquba-Diyala Province

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Abstract:

Background: Rotavirus infection is the leading single cause of severe diarrhea among infants and young children. More than 500,000 children under 5 years of age die from rotavirus infection each year, and almost 2 million more become severely ill.

Objectives: To determine the rate of anti-rotavirus IgG antibody among healthy population and patients with diarrhea in Baquba-Diyala province.

Materials & Methods: The present study was extended from the first of July 2008 to the first of September/ 2009 in Baquba City. A total of 300 fecal specimens were collected from patients suffering from acute diarrhea. The patients include 136 (45.3%) females with mean age (7.8 ± 4.7) years, and 164 males with mean age (5.3± 3.4) years. Biorad-Rota kit is a highly sensitive agglutination test was used for detection of rotavirus in fecal specimens. Anti-rotavirus IgG antibody was detected by ELISA technique. All data were statistically analyzed

Results: The results revealed that the anti-rotavirus IgG antibody positivity rate among patients was 49.3% compared to 37.1% among the healthy population. Additionally, 25.7% of patients who were positive for rotavirus infection as detected by agglutination test in the stool were also positive for anti-rotavirus IgG antibody. On the other hand, 17(22.4%) of patients with rotavirus diarrhea were negative for anti-rotavirus IgG antibody. The effects of age, gender, residence, type of water supply, and type of feeding on the frequency of anti-rotavirus IgG antibody in both patients and healthy groups were statistically insignificant.

Conclusion: Nearly two third of healthy population in Baquba city are liable for rotavirus infection as they lack anti-rotavirus IgG antibody.

Keywords: Rotavirus, acute diarrhea, Anti-rotavirus IgG.

Introduction:

Rotavirus is ubiquitous infection that is the leading cause of severe diarrhea worldwide. Severe infections are most commonly observed in the first 2 years of life, and most infections are mild or asymptomatic [1]. Rotavirus-induced diarrhea is associated with substantial morbidity and mortality rates and socioeconomic costs with adverse outcomes particularly prevalent in developing countries [2,3]. The frequency of rotavirus as a cause of sporadic cases of acute gastroenteritis ranges between 17.3% and 37.4% [4]. Adults are also affected, especially those in families with an infected child; the disease also occur in close communities [5].

Epidemiological studies have demonstrated that children who acquired natural rotavirus infections develop immunity to subsequent infections, with the protective effect increasing with each natural infection, and usually associated with low severity of subsequent rotavirus infection [6,7]. Infants in the first few months of life usually had higher maternal IgG titers, but when they are infected with rotavirus, they develop low IgM titers in acute phase sera and poor seroconversion 3 weeks later, suggesting that maternal antibodies inhibits viral replication and antibody responses [8]. However, all patients 6 months or more of age had IgM in the acute-phase sera, suggesting that IgM is a good marker of acute rotavirus infection [9].

Anti-rotavirus IgG is the best overall marker of an infection, as the serocovalescent-phase sera of 81% of patient had rising titers of IgG, indicating that serum IgG is the most reliable marker of seroconversion and is a consistent proxy for protection against severe disease [10].

Materials & Methods:

This study was conducted in Baquba city /Diyala province for the period extending from the first of july 2008 to the first of September 2009. Diyala Governorate is located in the middle of Iraq about 65 kilometers to the north-east of Baghdad , Baquba city

is the center of Diyala, situated around Diyala river which is the source of water for this city. The area of Baquba is an agricultural area, it is 580 kilometers and it's population 557178 urban population, in addition to 48000 rural population, children under one year of age 22287 and 94719 are children under 5years of age.

There are two main hospitals in Baquba (Baquba general teaching hospital and Al-Battool Maternity and Pediatric teaching hospital), with two reference consultation clinics in these hospitals, regarding the Primary Health Care (PHC) system Baquba consists of one PHC District, that include six main Primary health care centers, Al-Tackya, Al-Tahrier, Al-Saray, Al-Katon, Shifta and buhriz. Other centers are distributed through rural regions of the district [11].

A total of 300 fecal specimens were collected from patients suffering from acute diarrhea who were referred from the Primary health care centers to the reference consultation clinics in the main hospitals. The patients include 136 (45.3%) females with mean age (7.8± 4.7) years, and 164 males with mean age (5.3± 3.4) years. BioRad-Rota kit is a highly sensitive Agglutination test was used for detection of rotavirus in fecal specimens. Anti-rotavirus IgG antibody was detected by ELISA technique [7]. All data were statistically analyzed.

Results:

The results showed that 74 (49.3%) of the patients with acute diarrhea were positive for anti-rotavirus IgG antibody with a 95% confidence interval range (41.3- 57.3). Whereas, 13 (37.1%) of the healthy controls were positive for anti-rotavirus IgG antibody with a 95% confidence interval range (21-53.2). The difference between the two groups was statistically insignificant (P= 0.19), **table (1).**

Regarding the association between the rotavirus diarrhea (rotavirus in the stool specimens) and the serum anti-rotavirus IgG positivity rate, the results revealed that 19(25.7%) of patients who had rotavirus diarrhea were positive for anti-rotavirus IgG antibody, and 55(74.3%) of patients who had non-rotavirus diarrhea were positive for anti-rotavirus IgG. On the other hand, 17(22.4%) of patients with rotavirus diarrhea were negative for anti-rotavirus IgG antibody, Table (2).

Table (1): anti-rotavirus IgG positivity rate among study groups.

95% confidence interval	Anti-rotavirus IgG		Study group
	No. negative (%)	No. positive (%)	
(41.3-57.3)	76 (50.7)	74 (49.3)	Patient group
(21-53.2)	22 (62.9)	13 (37.1)	Healthy control

P (Chi-square) = 0.19 [NS]

Table (2): Frequency of serum anti-rotavirus IgG in relation to detectable virus in the stool specimens.

Total No. (%)	Rotavirus in stool specimens		Serum anti-rotavirus IgG
	No. positive (%)	No. negative (%)	
76 (100)	17 (22.4)	59 (77.6)	Negative
74 (100)	19 (25.7)	55 (74.3)	Positive

P (Chi-square) = 0.635 [NS**]**

Table (3) showed that the effects of certain variables such as, type of water supply, type of feeding (for those < 2 years), residence, gender, and age on the anti-rotavirus positivity rate in the patient group were statistically insignificant. Similarly, in the healthy individuals, the effects of above variable on the frequency of anti-rotavirus IgG antibody were also statistically insignificant, table (4).

Table (3): Effect of certain variables on the frequency of anti-rotavirus IgG in patient group.

Variables	Anti-rotavirus IgG		Total No.	P(Chi-square)
	Negative (%)	Positive (%)		
Water supply				0.72 [NS]
Municipal water	45 (48.9)	47 (51.1)	92	
River water	25 (55.6)	20 (44.4)	45	
Tank water	6 (46.2)	7 (53.8)	13	
Type of feeding				0.71 [NS]
Breast feeding	24 (53.3)	21 (46.7)	45	
Bottle feeding	17 (44.7)	21 (55.3)	38	
Mixed feeding	8 (53.3)	7 (46.7)	15	
Residence				0.63 [NS]
Urban	34 (48.6)	36(51.4)	70	
Rural	42 (52.5)	38 (47.5)	80	
Gender				0.31[NS]
Female	35 (55.6)	28 (44.4)	63	
Male	41 (47.1)	46 (52.9)	87	
Age (Years)				0.98 [NS]
< 1(infants)	17 (47.2)	19 (52.8)	36	
< 2 (toddler)	19 (51.4)	18 (48.6)	37	
<5 (preschool)	20 (50)	20 (50)	40	
<10 Children)	5 (45.5)	6 (54.5)	11	
10-17 (teenagers)	7 (58.3)	5 (41.7)	12	
18 + (adults)	8 (57.1)	6 (42.9)	14	

Table (4): Effect of certain variables on the frequency of anti-rotavirus IgG in healthy individuals.

Variables	Anti-rotavirus IgG		Total No.	P(Chi-square)
	Negative (%)	Positive (%)		
Residence				0.07 [NS]
Urban	10 (50)	10(50)	20	
Rural	12(80)	3 (20)	15	
Gender				0.24[NS]
Female	13 (72.2)	5 (27.8)	18	
Male	9 (52.9)	8 (47.1)	17	
Age (Years)				0.86 [NS]
< 1(infants)	4 (80)	1 (20)	5	
< 2 (toddler)	1 (50)	1 (50)	2	
<5 (preschool)	6 (75)	2 (25)	8	
<10 Children)	4 (50)	4(50)	8	
10-17 (teenagers)	4 (57.1)	3 (42.9)	7	
18 + (adults)	3 (60)	2 (40)	5	

Discussion:

Rotavirus infection is the leading cause of severe diarrhea worldwide, accounting for 8% of all diarrheal diseases and 20%-50% of acute diarrhea that required hospitalization [12]. Moreover, it causes about 150 million episodes of acute gastroenteritis among children < 5 years, 2 million of them were hospitalized and about half million deaths annually [13].

Several studies have demonstrated that natural infection whether it is symptomatic or even asymptomatic confers protection against subsequent infection and this protection increases with each new infection and reduces the severity of diarrhea [6,7,14]. Additionally, it has been affirmed that the anti-rotavirus IgA and IgG are the most reliable marker of protection against rotavirus infection and amelioration of the severity of disease [7,8,10].

In the present study, 49.3% of the patients with acute diarrhea were positive for anti-rotavirus IgG. Studies regarding the seropositivity rate of anti-rotavirus IgG among infants and children have yielded variable results ranging from 46% to 81% [8,9,14,15]. The lower seroprevalence of anti-rotavirus IgG obtained in this study may be related to the age range of the patients included which is extended from < 1 year to > 18 years. Furthermore, it has been reported that children from low socio-economic class and malnutrition may have delayed seroconversion to anti-rotavirus IgG [16]. On the other hand, as the anti-rotavirus IgG is the most reliable marker of protection against infection and disease [7,8,10], our results found that 62.9% of the healthy individuals are vulnerable for infection by rotavirus as they lack the specific IgG.

Another important result in this study is that 74.3% of patients who were positive for rotavirus IgG had no detectable virus in their stool. These patients may be either infants or children in whom the excretion of the virus in the stool was beyond the detectable level or adults in whom the virus is infrequently detectable in their stool [2]. On the contrary, 22.4% of the patients were negative for rotavirus IgG, but have detectable virus in the stool. Those patients are either having recent onset of the disease and they did not develop IgG antibody yet, or may suffering malnutrition that delay the development of protective antibodies [6,16].

Although, it is insignificant, the slightly lower positivity rate of anti-rotavirus IgG among patients (52.5%) as well as healthy population (80%) reside in rural areas may be related to the fact that most of those subjects are belong to low socio-economic class in whom the levels of IgG is low because of malnutrition [16,17]. On the other hand, the persistent of anti-rotavirus IgG in adult patients (42.9%) may point out to the subclinical infections that are mostly contracted from infected children in the family [5,18].

The lower positivity rate of anti-rotavirus IgG among female (72.2%) compared to male (52.9%) healthy individuals may be related to the fact that males spend more time outdoor [18]. Additionally, the lower positivity rates of anti-rotavirus IgG among infants and children of healthy population mimic those people under high risk for rotavirus infection and disease [1,4,6].

Nearly two third of healthy population in Baquba City are liable for rotavirus infection as they lack anti-rotavirus IgG antibody.

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