

## **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 600,000 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 and methods:** The present study was extended from 1/July/2007 to 1/September/ 2008 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 (4.8 ± 1.7) years, and 164 males with mean age (3.3 ± 1.4) 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 in 100 patients and 30 healthy control sera.

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, 20.7% 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, 14(22,8%) 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 14,3% and 37,8% [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 [8]

weeks later, suggesting that maternal antibodies inhibits viral replication and antibody responses [1]. However, all patients 7 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 seroconvalescent-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 and methods:

The present study was extended from 1<sup>st</sup> July/2007 to 1<sup>st</sup> September/ 2008 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 (4,8 ± 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. Sera from 180 subjects (100 patients and 80 apparently healthy individuals) were submitted for the detection of anti-rotavirus IgG antibody by enzyme linked immunosorbant assay technique. All data were statistically analyzed.

#### Results:

The results showed that 44 (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= 0,91), table (1).

**Table (١): anti-rotavirus IgG positivity rate among study groups.**

Study group	Anti-rotavirus IgG		٩٥% confidence interval
	No. positive (%)	No. negative (%)	
<b>Patient group</b>	٧٤ (٤٩,٣)	٧٦ (٥٠,٧)	(٤١,٣-٥٧,٣)
<b>Healthy control</b>	١٣ (٣٧,١)	٢٢ (٦٢,٩)	(٢١-٥٣,٢)

P (Chi-square) = ٠,٩١ [NS]

Regarding the association between the rotavirus diarrhea (rotavirus in the stool specimens) and the serum anti-rotavirus IgG positivity rate, the results revealed that ١٩(٢٥,٧%) of patients who had rotavirus diarrhea were positive for anti-rotavirus IgG antibody, and ٥٥(٧٤,٣%) of patients who had non-rotavirus diarrhea were positive for anti-rotavirus IgG. On the other hand, ١٧(٢٢,٤%) of patients with rotavirus diarrhea were negative for anti-rotavirus IgG antibody, Table (٢).

**Table (٢): Frequency of serum anti-rotavirus IgG in relation to detectable virus in the stool specimens.**

Serum anti-rotavirus IgG	Rotavirus in stool specimens		Total No. (%)
	No. negative (%)	No. positive (%)	
<b>Negative</b>	٥٩ (٧٧,٦)	١٧ (٢٢,٤)	٧٦ (١٠٠)
<b>Positive</b>	٥٥ (٧٤,٣)	١٩ (٢٥,٧)	٧٤ (١٠٠)

P (Chi-square) = ٠,٦٤ [NS]

Table (٣) showed that the effects of certain variables such as, type of water supply, type of feeding (for those < ٢ years), residence, gender, and age on the anti-rotavirus positivity rate in the patient group were statistically insignificant.

**Table (۳): Effect of certain variables on the frequency of anti-rotavirus IgG in patient group.**

Variables	Total No.	Anti-rotavirus IgG		P(Chi-square)
		Positive (%)	Negative (%)	
<b>Water supply</b>	۹۲	۴۷ (۵۱,۱)	۴۵ (۴۸,۹)	۰,۷۲ [NS]
<b>Municipal water</b>	۴۵	۲۰ (۴۴,۴)	۲۵ (۵۵,۶)	
<b>River water</b>	۱۳	۷ (۵۳,۸)	۶ (۴۶,۲)	
<b>Tank water</b>				
<b>Type of feeding</b>	۴۵	۲۱ (۴۶,۷)	۲۴ (۵۳,۳)	۰,۷۱ [NS]
<b>Breast feeding</b>	۳۸	۲۱ (۵۵,۳)	۱۷ (۴۴,۷)	
<b>Bottle feeding</b>	۱۵	۷ (۴۶,۷)	۸ (۵۳,۳)	
<b>Mixed feeding</b>				
<b>Residence</b>				۰,۶۳ [NS]
<b>Urban</b>	۷۰	۳۶ (۵۱,۴)	۳۴ (۴۸,۶)	
<b>Rural</b>	۸۰	۳۸ (۴۷,۵)	۴۲ (۵۲,۵)	
<b>Gender</b>				۰,۳۱ [NS]
<b>Female</b>	۶۳	۲۸ (۴۴,۴)	۳۵ (۵۵,۶)	
<b>Male</b>	۸۷	۴۶ (۵۲,۹)	۴۱ (۴۷,۱)	
<b>Age (Years)</b>				۰,۹۸ [NS]
<b>&lt; ۱ (infants)</b>	۳۶	۱۹ (۵۲,۸)	۱۷ (۴۷,۲)	
<b>&lt; ۲ (toddler)</b>	۳۷	۱۸ (۴۸,۶)	۱۹ (۵۱,۴)	
<b>&lt; ۵ (preschool)</b>	۴۰	۲۰ (۵۰)	۲۰ (۵۰)	
<b>&lt; ۱۰ Children)</b>	۱۱	۶ (۵۴,۵)	۵ (۴۵,۵)	
<b>۱۰-۱۷ (teenagers)</b>	۱۲	۵ (۴۱,۷)	۷ (۵۸,۳)	
<b>۱۸ + (adults)</b>	۱۴	۶ (۴۲,۹)	۸ (۵۷,۱)	

Similarly, in the healthy individuals, the effects of above variable on the frequency of anti-rotavirus IgG antibody were also statistically insignificant, table (٤).

**Table (٤): Effect of certain variables on the frequency of anti-rotavirus IgG in healthy individuals.**

Variables	Total No.	Anti-rotavirus IgG		P(Chi-square)
		Positive (%)	Negative (%)	
Residence				
Urban	٢٠	١٠ (٥٠)	١٠ (٥٠)	٠,٠٧ [NS]
Rural	١٥	٣ (٢٠)	١٢ (٨٠)	
Gender				
Female	١٨	٥ (٢٧,٨)	١٣ (٧٢,٢)	٠,٢٤ [NS]
Male	١٧	٨ (٤٧,١)	٩ (٥٢,٩)	
Age (Years)				
< ١ (infants)	٥	١ (٢٠)	٤ (٨٠)	٠,٨٦ [NS]
< ٢ (toddler)	٢	١ (٥٠)	١ (٥٠)	
< ٥ (preschool)	٨	٢ (٢٥)	٦ (٧٥)	
< ١٠ (Children)	٧	٣ (٤٢,٩)	٤ (٥٧,١)	
١٠-١٧ (teenagers)	٥	٢ (٤٠)	٣ (٦٠)	
١٨+ (adults)				

### Discussion:

Rotavirus infection is the leading cause of severe diarrhea worldwide, accounting for ٨% of all diarrheal diseases and ٢٠%-٥٠% of acute diarrhea that required hospitalization [١١]. Moreover, it causes about ١٥٠ million episodes of acute

gastroenteritis among children < 5 years, 7 million of them were hospitalized and about half million deaths annually [1]. 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 [2,3]. 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 [4].

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 16% to 81% [5,6]. 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 > 10 years. Furthermore it has been reported that children from low socio-economic level and malnutrition may have delayed seroconversion to anti-rotavirus IgG [7]. On the other hand, as the anti-rotavirus IgG is the most reliable marker of protection against infection and disease [4], our results found that 72.9% of the healthy individuals are vulnerable for infection by rotavirus as they lack the specific IgG.

Another fascinating result in this study is that 54.3% 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 [8]. On the contrary, 22.4% of the patients were negative for rotavirus IgG, but have detectable virus in the stool. Those patients are either have

recent onset of the disease and they didn't develop IgG antibody yet, or may suffering malnutrition that delay the development of protective antibodies<sup>[7,10]</sup>. Although, it is insignificant, the slightly higher negativity rate of anti-rotavirus IgG among patients (52,0%) as well as healthy population (8,%) 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<sup>[10,16]</sup>. On the other hand, the persistent of anti-rotavirus IgG in adult patients (22,9%) may point out to the subclinical infections that are mostly contracted from infected children in the family<sup>[10,17]</sup>.

The higher negativity rate of anti-rotavirus IgG among female (42,2%) comared to male (52,9%) healthy individuals may be related to the fact that males have more risk for rotavirus infection as they spend more time outdoor<sup>[17]</sup>. Additionally, the high negativity rates of anti-rotavirus IgG among infants and children of healthy population, undoubtedly mke those people under high risk for rotavirus infection and disease<sup>[1,2,7]</sup>.

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## الإيجابية المصلية للضدات النوعية IgG للفيروس العجلي لدى الأشخاص الأصحاء ومرضى الإسهال الحاد في مدينة بعقوبة - محافظة ديالى

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**تمهيد:** الإصابة بالفيروس العجلي هي السبب الرئيسي للإسهال الشديد لدى الرضع والاطفال. أكثر من ٥٠٠٠٠٠٠ طفل ممن هم دون سن الخامسة من العمر يموتون بسبب الإصابة بالفيروس العجلي سنويا، ومليونين آخرين يصابون بالإسهال الشديد بسببه.

**أهداف الدراسة:** لتحديد معدل انتشار الضدات النوعية IgG للفيروس العجلي بين الأشخاص الأصحاء و بين المرضى الذين يعانون من إسهال شديد في مدينة بعقوبة - محافظة ديالى، وكذلك دراسة تأثير بعض العوامل الديموغرافية على انتشار تلك الضدات.

**المواد وطرائق العمل:** امتدت الدراسة الحالية من الأول من تموز ٢٠٠٧ إلى الأول من أيلول ٢٠٠٨ في مدينة بعقوبة. إجمالاً جمعت ٣٠٠ نموذج من البراز من المرضى الذين يعانون من إسهال حاد. شملت مجموعة المرضى ١٣٦ (٤٥،٣%) إناثاً وبمعدل عمر (٧،٨ ± ٤،٧) سنة، و ١٦٤ من الذكور بمعدل عمر (٣،٤ ± ٥،٣) سنة. استخدمت عدة التلازن عالية الحساسية من شركة (BioRad) للكشف عن الفيروس في نماذج البراز. الكشف عن الضدات النوعية IgG للفيروس العجلي في الأمصال لدى ١٥٠ مريضاً بالإضافة إلى ٣٥ شخصاً من الأصحاء ظاهرياً اجري بتقنية الاليزا. جميع النتائج تم تحليلها احصائياً. النتائج: أظهرت النتائج إن ايجابية الضدات النوعية IgG للفيروس العجلي بين المرضى كانت ٤٩،٣% مقارنة ٣٧،١% بين الأشخاص الأصحاء. فضلاً عن ذلك فإن ٢٥،٧% من المرضى ممن هم ايجابيون لوجود الفيروس في نماذج البراز كانوا ايجابيون أيضاً للضدات النوعية IgG للفيروس في المصل. ومن جانب آخر، ١٧ (٢٢،٤%) من المرضى الذين يعانون من الإسهال نتيجة الإصابة

بالفيروس العجلي لا يملكون الضدات النوعية IgG للفيروس في امصالهم . كما أظهرت النتائج بأنه لم يكن هنالك تأثير معنويًا لكل من العمر، الجنس، السكن، مصدر مياه الشرب و نوعية التغذية (لمن هم دون السنتين من العمر) على توزيع الضدات النوعية للفيروس في كل من مجموعة المرضى والأشخاص الاصحاء .  
**الاستنتاج:** ما يقارب من ثلثي الأشخاص الأصحاء في المجتمع في مدينة بعقوبة هم معرضون للإصابة بالفيروس العجلي بسبب عدم امتلاكهم للضدات النوعية للفيروس .