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Prevalence of Rotavirus among Iraqi children with diarrhea in Diyala province

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ABSTRACT

Background: Rotavirus is the most common cause of acute gastroenteritis in children below five years. Objectives: The aim of this study to evaluate the prevalence of rotavirus among children with diarrhea, the efficacy of Immuno Chromatography Assay (ICA) and Enzyme-linked Immunosorbent assay (ELISA) and evaluate the relationship between the demographic agent and clinical presentation associated with rotavirus. Material and Methods: A cross-sectional study was conducted at AL-Batool Teaching Hospital in Baqubah, from the first of April 2019 to 31 of March 2020, on (300) children with diarrhea below five years of age. The patients included (n=161, 53.6%) males and (n=139, 46.3%) females. The patient's age, gender, living area, season, mode of feeding, source of water supply and sterilization, were collected through a questionnaire prepared for this study. The Rapid Test and ELISA are used for the detection of rotavirus in fecal specimens. Results: The rotavirus antigen was detected in (47.33%) stool specimens by the ELISA test and (59%) by ICA from (300) children with diarrhea and high infection in the age group between 13-24 months at the rate (49.40%). The highest infection rate in spring was (56.00%) and lower in summer (33.33%). The infection males more than females (42.24% vs. 39.57%). High significant infection among children living in rural areas (55.68%) compared to those living in urban areas (35.48%). According to the clinical features, the results showed the rate of rotavirus infection in children with fever was (54.90%), vomiting (42.03%), those suffering from severe dehydration (48.85) some dehydration 78 (46.15%), however, rotavirus infection was significant with fever only.

Keyword: Rotavirus, Diarrhea, ICA, ELISA

INTRODUCTION

Diarrheal diseases are a major cause of morbidity and mortality among young children in developing and developed countries. It is established that in Africa, Asia, and Latin America,

744 million to one billion cases of acute gastroenteritis and 2.4 to 3.3 million deaths occur annually among children of less than 5 years of age [1]. Rotavirus is the foremost cause of severe childhood diarrhea worldwide, [2]. Rotavirus transmission occurs through contact with contaminated faces. It can also be transmitted by eating food or water contaminated with this virus. As for the incubation period for this virus, it is approximately 48 hours. [3]. The disease caused by rotavirus infection ranges from mild to severe, as a child with this virus suffers from vomiting, watery diarrhea, and a mild fever that lasts for four years. For eight days, dehydration is more common among children infected with this virus than those infected with bacteria, and is responsible for a large number of deaths among children under the age of five, especially in developing countries [4]. Rotavirus can be detected in stool samples of children with diarrhea in various laboratory methods such as enzyme-linked immunosorbent assay, rapid stool antigen detection assay, electron microscopy, and molecular method [5]. No specific antiviral drugs are recommended for treating Rotavirus infection, but the availability of a vaccine for this virus can give good results in preventing infection and can also be prevented by washing hands well and improving sanitation. [6] [7].

MATERIAL AND METHODS

Collection of Samples

Three hundred stool specimens collected from infants and young children below 5 years of age suffering from diarrhea, attended AL-Batool Teaching Hospital, Central Baqubah from the first between the first of March, 2019 until the end of February, 2020.

Detect Rotavirus in human fecal specimens

The ICA and ELISA tests employed to detect rotavirus antigen in human fecal specimens, performed according to the manufacturer's specifications.

Data Extraction and Analysis

The data was collected by asking the parents of children via a simple questionnaire containing some questions about a child's age, gender, mode of feeding, duration of diarrhea and season and clinical presentation of children (fever, vomiting, and dehydration). In this study, we excluded children more than 5 years of age and having bloody diarrhea according to the World Health Organization [3]. All data is analyzed using computerized assisted SPSS (Statistical Package for Social Science), Pearson's chi-square (X2) used to find the association between variables. A P-value below or equal to 0.05 is considered significant.

RESULTS

Rotavirus detection

In this study, of the three hundred children suffering from diarrhea, the rotavirus antigen was found in (n= 142, 47.33%) stool specimens from children with diarrhea, during four seasons, (from April 2019 and February 2020) as shown in figure 1.

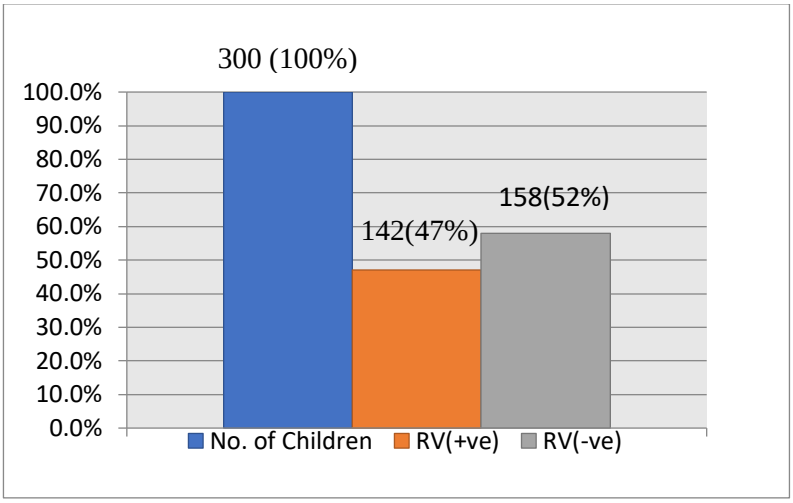

Figure 1: Infection rate of the rotavirus among children with diarrhea.

Table 1 explains a comparison in the detection of rotavirus antigen rate of the 300 stool samples tested by the two different techniques. The positivity rotavirus rates of ICA and ELISA were 177 (n=177, 59%) and 142 (n=142, 47.33%). There are significant (p ≤0.05) between the two techniques.

Table 1: Rotavirus detection rate by ICA and ELISA

Tests	No. positive (%)	No. negative (%)	P-value
ICA	177 (59)	123 (41)	0.05 [Sig.]
ELISA	142 (47.33)	158 (52.66)	

Sig: Significant, when (P-value ≤ 0.05)

Prevalence of Rotavirus according to demographic factors

The results of the present study showed that the overall infection rate by rotavirus among children with diarrhea was 142 (47. 33%).The age range was 1.5 months to 5 years, the rotavirus infection rate in (≥ 5) months was (n=17, 36.96%), 6–12 months (n=38, 55.88%), 13–24 months (n=41, 49.40%) ,25–36 months (n=22, 45.83%), 37–48 months (n=17, 47.22%) and 49–60 months (n=7, 36.48%). Although there was insignificant (P=0.639) between rotavirus infection and gender of children, the rotavirus infection rate of males was (n=68, 42.24%), while in females (n=55, 39.57%). The seasonal distribution of rotavirus. The results showed that the highest rotavirus infection rate was in spring (n=42, 56.00%), followed by winter (n=39, 52.00%), autumn (n=36, 48.00%) and the least infection rate was in summer (n=25, 33.33%). The results revealed that a high significant (P = 0.0005), rotavirus infection rate among children living in rural areas (n=98, 55.68%) compared to those living in urban areas (n=44, 35.48%). According to the duration of diarrhea, the results showed the highest rate of rotavirus infection in children with duration of diarrhea from 24 to 48 hours was (n=42, 40.38%) while those suffering from diarrhea for less than 24 hours (n=68, 55.74) and those suffering from diarrhea over 48 hours (n=32, 43.24%), there was significant (P=0.0505)

between them. The results are presented in the descriptive of the demographic factor in Table 2.

Table 2: Prevalence of rotavirus according to demographic factors

Parameters	N	RV+ (%)	p-value	Sig/NS
Age(month)				
≥ 5	46	17 (36.95)	0.415	NS
6 – 12	68	38 (55.88)		
13 – 24	83	41 (49.40)		
25 – 36	48	22 (45.83)		
37 – 48	36	17 (47.22)		
49 – 60	19	7 (36.84)		
Gender				
Male	161	68 (42.24)	0.639	NS
Female	139	55 (39.57)		
Season				
Summer	75	25 (33.33)	0.0317	Sig.
Autumn	75	36 (48.00)		
Winter	75	39 (52.00)		
Spring	75	42 (56.00)		
Residency				
Urban	124	44 (35.48)	0.0005	High Sig.
Rural	176	98 (55.68)		
Duration of diarrhea				
> 24 hr.	104	42 (40.38)	0.0505	Sig.
24-48 hr.	122	68 (55.74)		
<48 hr.	74	32 (43.24)		

NS: No Significant Sig.: Significant

Prevalence Rotavirus according to clinical features

According to the clinical features, the results showed the rate of rotavirus infection in children with and without fever was (n=56, 54.90%) vs. (n=86, 43.43), while children with and without vomiting (n=58, 42.03%) vs. (n=84, 51.85%) and those suffering from severe dehydration (n=64, 48.85) while children suffering from Some dehydration (n=78, 46.15%). However, the difference between them did not reach statistical significance (P= 0.216) with dehydration but successful with fever (P= 0.059) and vomiting (P= 0.089). Results presented in the descriptive for clinical features in Table 3.

Table 3: Prevalence of rotavirus according to clinical features

Clinical features		N	RV+ (%)	p-value	Sig/NS
Fever					
	Yes	102	56 (54.90)	0.059	Sig.
	No	198	86 (43.43)		
Vomiting					
	Yes	138	58 (42.03)	0.089	NS
	No	162	84 (51.85)		
Dehydration					
	Severe	131	64 (48.85)	0.216	NS
	Some	169	78 (46.15)		

NS: No Significant Sig.: Significant

DISCUSSION

The current study was conducted to find out the prevalence of rotavirus among children with diarrhea, and the correlation with demographic factors and some factors including age, gender, and the type of nutrition among children under the age of five in Diyala governorate, northeast of Baghdad. Fenjan, et al. detected rotavirus in 45% of cases in Thi-Qar Province south of Iraq in multi-health center surveillance [8]. Whereas, Abd-Al Fattah, et al. reported a 32.6% positivity rate in children in Al-Anbar Province west of Iraq [9] and Adnan Abd-Al Fattah, et al reported 93.33% in Diyala Province east of Iraq [10]. Our results are similar to those reported from other countries, including Saudi Arabia 30% [11], Iran 36.5% [12]. India (36.9%) [13], Turkey (36.1%), Jordan (33%) and Kuwait (40%) [14]. The noticeable difference between our study and previous studies may be attributed to the sample size, the date of sample collection, and the concentration of viral antigen in the sample. Like previous studies [15]. The current result, with the agreement of others, has been shown that risk factors for developing acute diarrhea in infants are related to rotavirus feeding of infants. Gastroenteritis is less common in breastfed babies [16] [17]. Also, the results of our study do not agree with Al-Saidy, as he found that children less than 5 months old are less likely to be affected [17]. Our study is consistent with previous research in the same province, as the number of infections among children who live in rural areas is higher than those who live in the urban areas [18]. The results of our study also indicate that most of the clinical signs that affected children suffer from are vomiting, and agree with another researcher [19]. Abdulridha indicated that females are more susceptible to infection than males, and this does not agree with our study [20]. Suzuki et al. concluded that Rotavirus activity has shifted gradually from winter to early spring for unknown reasons [21], Than et al., Reported seasons typically occur during the winter months, beginning in late autumn or winter and lasting until the spring [22].

CONCLUSION

An increase in the prevalence of rotavirus infection among children in the Iraqi province of Diyala compared to previous years. Both ELISA and ICA tests have shown a good level of sensitivity and specificity in detection of RV in stool specimens, although the false positive of the ICA test was 25/142 (24.64%). A significant relationship was found between rotavirus and some variables like the season, residency, duration of diarrhea and fever.

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