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Detection the incidence of Rota virus infection among children under eight years presenting with diarrhea

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Abstract

Acute diarrhea is a major cause of death worldwide in children and neonates. Rota virus is the most common cause of severe pediatric gastroenteritis and diarrhea, especially in those countries that have not launched a Rota virus immunization program. The primary aim of the study was to detect the incidence of Rota virus infection among children in Al-Asiel Hospital, Al-Bayda City, Libya, from March 2021 to January 2022. Stool specimens from children under 8 years of age with gastroenteritis were examined using a qualitative immunochromatographic assay for rapid detection of Rota virus antigens. There were 100 samples from patients aged between 4 months − 8 years. The data analysis showed that 61% of diarrheal cases were positive for Rota virus antigens. Rota virus infections were mostly found in children between 5 and 11 months of age, as well as in children between one and 8 years of age. Most cases occurred in the winter. Laboratory testing should be undertaken to identify Rota virus in samples from sick children and babies, as the diagnosis of cases that was followed in most pediatric departments in medical clinics was based on clinical symptoms rather than an accurate laboratory diagnosis.

Keywords: Rota virus, Gastroenteritis, age, male and female.

Introduction:

Rota virus recognized as the most common cause of gastroenteritis in infant and young children worldwide and considered the second cause of death in children (*1, 2*). As the vast majority of cases occur in developing countries, Rota virus infection is seen as a global health concern, but also in developing countries Rota virus associated gastroenteritis remains a major cause of hospitalization in children (*3*). The primary mode of virus transmission is by fecal-oral route. The incubation period of virus range from 24 to 84 hours (*3*). The virus enters the body through the mouth and replicated in the villous epithelium causing diarrhea by several mechanisms including destruction of entrecotes which lead to malabsorption and stimulation of enteric nervous system (ENS) by virus encoded toxin leads to villus ischemia. The clinical presentation of Rota virus infection range from mild to severe watery diarrhea with vomiting and fever which can lead to dehydration, electrolyte imbalance, and even death (*4*). Rota virus infection is not routinely diagnosed by clinical spectrum of signs and symptoms which are similar to other gastroenteritis (*5*). In developing countries, few laboratories in referral hospitals can regularly conduct enzyme immunoassays, latex agglutination tests whereas, laboratories in rural areas are restricted to light microscopy detection of intestinal parasites (*6, 7*).

There is a relationship between the incidence of Rota virus infection and climate factors such as temperature, humidity and rainfall (*8, 9*). Indoor crowding, low humidity and cold weather promote the transmission of Rota virus. The peak Rota virus infection age range between 3-24 months but the highest rate range from the age of 6 to 11 months. Neonates are more susceptible to Rota virus infection in their first days of life due to immaturity of their intestines, lack of genotype of specific antibodies and the unconfirmed protection of maternal antibodies (*9*). Rota virus infection in infants and young children can lead severe diarrhea that can result in dehydration late, with electrolyte imbalance, shock and even death (*10*). Rota virus could be associated with several other serious clinical conditions in infants: necrotizing enterocolitis (NEC), pneumonia, diffuse intravascular coagulopathy (DIC), encephalitis, Seizures may constitute the most frequently recognized extra-intestinal manifestation (*11*). This study was aimed to detection the incidence Rota virus among children less than eight years presenting with diarrhea at Al-Assiel Hospital in El-Bayda City.

Material and Methods:

Sample collection: Stool samples were collected from each child (hundred children) who had diagnosed as acute gastroenteritis case; from March 2021 to January 2022 as soon as symptoms appeared in pediatric department, Al-Assiel Hospital.

Five grams of stool were collected in labeled containers, patients name, age, sex, and the date of collection. Then transported to the laboratory of Al-Assail Hospital and examined within two days. The stool specimens were examined macroscopically to identity the color and consistency of the stool in addition to the presence of mucus and visible blood. The Rota virus antigen in stool was detected by immune chromatographic test kit, (Diagnostic Automation/ Cortez Diagnostics/Immunodiagnostics Inc. USA). The numerical data were shown as number and percentage. To find the significant difference between the observed variable studied, Pearson Chi-Square Test for Association was used, P value was taken as level of significance at <0.05.

Results

In this study, 100 stool samples were examined. The children from one month to eight years who were suffering from acute gastroenteritis and were examined for Rota virus, 39 negative (21 male and 18 female) and 61 positive (24 male and 37 female), as shown in Table 1. (Upon Pearson Chi-Square = 2.021, DF = 1, P-Value = 0.155 without significant difference between male and female cases). A relationship was recorded between the number of positive and negative cases for both males and females according to age, as the age was divided into the two categories every six months, excluding the months in which no cases were recorded.

Table 1 shows the number of infected cases for both sexes (male and female) according to the division every six months. The highest number of cases was recorded in the second half of the year in the age group (from 7 to 12 months), and the majority were in the female category. The number of cases conducted for gender according to age group is shown in Figure 1. The highest percentage of cases was in females, more than males, and in the age group between 31 and 36 months and more than 37 months. Meanwhile, data showed that the largest number occurred in the first six months.

Table1. Presence of Rota virus antigens in Gastroenteritis patients

Age Months	Total	No of negative cases (%)	No of positive cases (%)	No of males& female negative for Rota virus (%)		No of males& female positive for Rota virus (%)	
1-6	16	11(68.75)	5 (31.25)	F	M	F	M
				6(54.5)	5(45.5)	3(60)	2(40)
7-12	53	18 (33.96)	35 (66.04)	F	M	F	M
				6(33.3)	12(66.7)	22(63)	13(37)
13-18	0	0(100)	0(0)	F	M	F	M
				0	0	0	0
19-24	18	6(33.3)	12(66.7)	F	M	F	M
				4(66.7)	2(33.3)	7(58.3	5(41.7)
25-30	0	0(100)	0	F	M	F	M
				0	0	0	0
31-36	3	0(0)	3(100)	F	M	F	M
				0(0)	0(100)	3 (100)	0(0)
37-42	4	2(50)	2(50)	F	M	F	M
				2(100)	0 (0)	0 (0)	2(100)
43-48	4	2 (50)	2 (50)	F	M	F	M
				0(0)	2 (50)	0(0)	2 (50)
More than 49	2	0(0)	2 (100)	F	M	F	M
				0(0)	0(100)	2 (100)	0(0)
Total	100	39 (39)	61 (61)	18(46.2)	21 (53.8)	37 (60.7)	24(39.3)

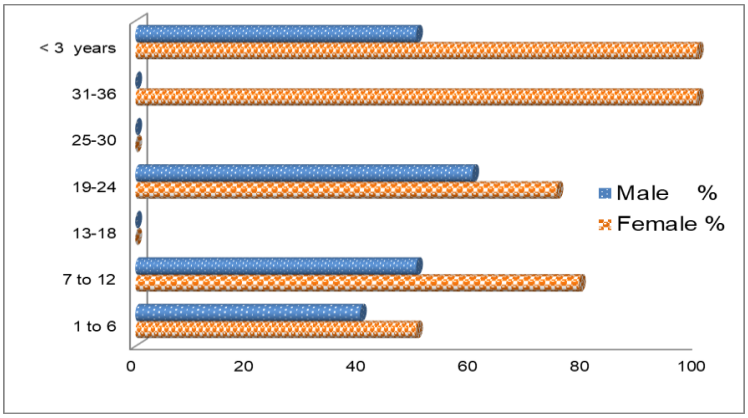

Figure 1. Age (months) and Sex distribution of Acute Gastroenteritis patients

Number of cases in which Rota virus diagnoses was conducted for both males and females during the months of the year, where the highest percentage of cases were in December and January for the year 2021-2022, respectively (Figure 2). Upon Pearson Chi-Square = 18.229, DF = 3, P-Value = 0.000, there is significant difference between male and female cases at four seasons. Positive and negative cases for both sexes were identified, through the Figure 3 which shows an increase in the number of positive cases in the months of December and January. There are no significant differences between the number of cases (P>0.05).

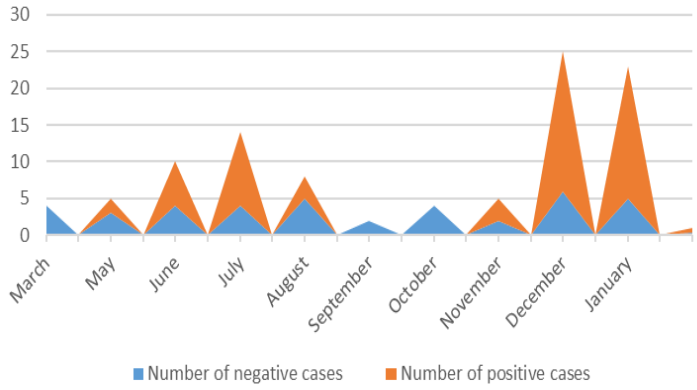

Figure 2: Percentage of months-specific rates of Rota virus infection

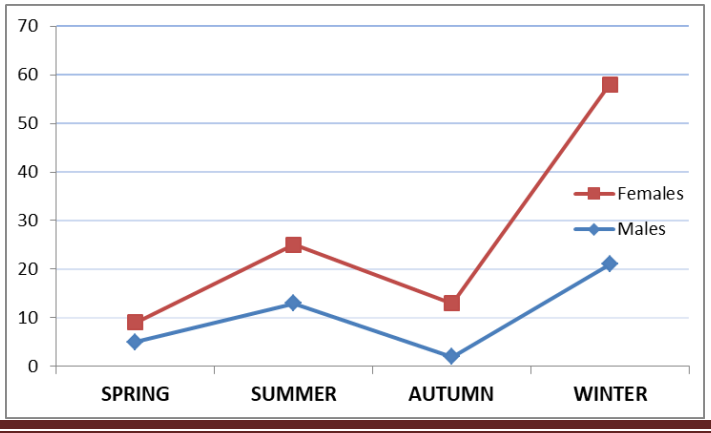

Figure 3: Seasonal and Sex Distribution of Gastroenteritis Patients with Rota virus Antigen

Discussion

The results of this study show that the Rota virus is important agent of diarrhea and acute gastroenteritis throughout the year among hundred children at pediatric department, Al-Assiel Hospital in Al-Bayda City. This virus still represent high percentage of diarrheal cases and estimate 61% positive cases from 100 total cases number & 39% of negative cases. An important finding from our study was the majority of Rota virus infection was among neonate especially an age between 7 - 12 months which estimate 57.37% from total positive cases comparing with other infected ages. These results are in agreement with the result of (*4, 12*), who found that the peak infection age range with Rota virus is 3–24 months, the highest rate being between the ages of 6–11 months. Furthermore, the infection with Rota virus was higher in pediatric female which estimate 61% in comparison with positively infected pediatric male which estimate 39%. where the results revealed that, there are substantial differences in positive infection between males and females at a significant level of 0.05 and this differences might be due to malnutrition in this groups which has a direct influence on the body's immunity; and their ability to resist viral illnesses (*2, 4*). Children less than 12 months of age have shown to be three times more likely to be infected by Rota virus than children between 24 and 96 months of age; and this may resulting from their intestinal immaturity and lack of genotype of specific antibodies. The current study found that Rota virus infection is more common in newborns aged 5 to 11 months, as well as children aged 1 to 8 years and females being more vulnerable than males. The majority of incidents happened during the winter. These results are in agreement with the result of (*13*). Observational studies of human Rota virus illness have showed that low temperatures, humidity, and precipitation levels are associated with an increased risk of Rota virus infection and may create optimal conditions for Rota virus propagation, transmission, and maintenance in the environment (*8, 14*). However, cold weather causes individuals to cluster in more enclosed places, presenting sensitive people to contaminated surfaces or products more frequently and strongly. During this investigation, it was discovered that the diagnoses of Rota virus in the laboratory is not done in any medical laboratory in Al-Bayda except the laboratory of Al-Asil Hospital, which raises the likelihood of

misdiagnosis of diarrhea cases in children, which may be caused by this virus. As previously stated, laboratory testing should be undertaken to identify Rota virus in samples from sick children and babies as the diagnosis of cases that was followed in most pediatric departments in medical clinics was based on clinical symptoms rather than accurate laboratory diagnosis. Moreover, vaccination should continue to be promoted to minimize the prevalence of Rota virus related diarrhea.

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الكشف عن الاصابة بفيروس الروتا بين الأطفال المصابين بالإسهال دون سن الثامنة

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المستخلص العربي

تعتبر أمراض الإسهال الحاد من الأسباب الرئيسية لوفاة الأطفال وحديثي الولادة في جميع أنحاء العالم. فيروس الروتا هو السبب الأكثر شيوعًا لالتهاب المعدة والأمعاء الحاد عند الأطفال والإسهال خاصة في البلدان التي لم تطلق برنامجًا للتحصين ضد الفيروس.كان الهدف الأساسي من الدراسة هو الكشف عن معدل الإصابة بفيروس الروتا بين الأطفال وحديثي الولادة في مستشفى الأصيل ، مدينة البيضاء ، ليبيا من مارس 2021 إلى يناير 2022. تم فحص عينات البراز من الأطفال وحديثي الولادة الذين تقل أعمارهم عن 8 سنوات المصابين بالتهاب المعدة والأمعاء باستخدام مقايسة الكروماتوجرافي المناعي النوعي للكشف السريع عن مستضدات فيروس الروتا. كان هناك 100 عينة من مرضى تتراوح أعمارهم بين 4 أشهر و 8 سنوات. يمثل تحليل البيانات نسبة عالية من حالات الإسهال ويقدر عدد الحالات الإيجابية 61٪ من إجمالي 61 حالة و 39٪ من الحالات السلبية. تم العثور على الإسهال الشديد بسبب عدوى فيروس الروتا في الغالب عند حديثي الولادة الذين تتراوح أعمارهم بين 5 و 11 شهرًا ، وكذلك في الأطفال الذين تتراوح أعمارهم بين 1 و 8 سنوات. حدثت معظم الحالات في الشتاء. يجب إجراء الفحوصات المخبرية لتحديد فيروس الروتا في عينات من الأطفال والرضع المرضى حيث أن تشخيص الحالات التي تم اتباعها في معظم أقسام الأطفال في العيادات الطبية كان يعتمد على الأعراض السريرية بدلاً من التشخيص المختبري الدقيق

الكلمات المفتاحية: فيروس الروتا ، التهاب المعدة والأمعاء ، العمر ، ذكر وأنثى.