

The impact of rotavirus vaccination on rotavirus diarrhea in Sudanese children

Abstract

Background: Diarrhea is a serious public health issue on a global scale and is prevalent in underdeveloped nations. Diarrhea kills at least four million children under the age of five annually. The Rotavirus is the most prevalent infectious agent causing diarrhea in young infants throughout the world. The point of the study is to reveal the significance of the Rotavirus vaccine in counteracting Rotavirus diarrhea, the incidence of cases among completely vaccinated children, the severity and mortality of Rotavirus diarrhea in vaccinated children, and seasonal fluctuations in Rotavirus diarrhea prevalence, Omdurman Pediatric Teaching Hospital was the setting of the current investigation.

Methods: A prospective hospital-based inquiry was conducted at Omdurman Pediatric Teaching Hospital, where children aged three and under who visited the study region complained of three loose or watery bowel movements in 24 hours, as well as two or more episodes of inexplicable vomiting. To participate in the current trial, patients had to be hospitalized or treated for gastroenteritis as a primary disease and had symptoms for seven days or fewer. Age, gender, weight, immunization status, and illness severity were the study parameters. The outcome variable was whether or not the child was diagnosed with Rotavirus diarrhea. Patients are chosen if they meet all of the criteria for inclusion. Enzyme-linked Immunosorbent Assay (ELISA) was used for the presence of group A Rotavirus.

Results: There were 368 patients in the investigation, with 59.8% of them being males. The average age was 13.83 months (range 1-36 months). Rotavirus antigen was detected in 28% of the overall specimens. Patients under the age of one year had the greatest infection incidence (49.5%). The risk of Rotavirus infection was reported to be 32.6% in children who got one dose of the vaccination and 25.7% in children who received two doses. Those who were partly vaccinated had a higher rate of patients with extremely severe illness (30%).

Conclusion: The prevalence, severity, and mortality of Rotavirus diarrheas are reduced when children are vaccinated against it. Fully vaccinated children were less likely to become infected and had a lower severity rate. In order to be included in the vaccine, more research is needed to pinpoint the virus serotype that causes illness in Sudan.

Keywords: rotavirus, gastroenteritis, vaccine, Omdurman, Sudan

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Abdel Wahid Ali Abdel Wahid,¹ Mohammed Ahmed Ibrahim Ahmed,² Magdi Babikir Omer,³ Nahla Ahmed Mohammed Abdelrahman,⁴ Mosab Nouraldein Mohammed Hamad⁵

¹Assistant professor of Microbiology, University of Alrazi, Sudan

²Assistant professor of Microbiology, Nile Valley University, Sudan

³Assistant professor of Microbiology, Al Yarmouk University College, Sudan

⁴Assistant professor of Biochemistry, Nile Valley University, Sudan

⁵Lecturer of Parasitology, Department of Medical Laboratory Sciences, Faculty of Health Science, Elsheikh Abdallah Elbadri University, Sudan

Correspondence: Dr. Mohammed Ahmed Ibrahim Ahmed, Assistant professor of Microbiology, Nile Valley University, Faculty of Medicine, Atbara, Sudan, Tel 00249122570655/00249912656095, Email mohammedabukleewa@gmail.com

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Abbreviations: dsRNA, double-stranded segmented RNA; WHO, World Health Organization; FMOHS, federal ministry of health-Sudan; NIP, national immunization programs; ICC, international coordination committee; GAVI, global alliance for vaccine initiative; ELISA, enzyme-linked immunosorbent assay

Introduction

Rotavirus is a Reoviridae virus with icosahedral symmetry and double-stranded segmented RNA (dsRNA). It causes acute gastroenteritis in infants and children all over the world, resulting in severe watery, non-bloody diarrhea and vomiting.¹ Rotavirus gastroenteritis kills over 450,000 children under the age of five years old every year throughout the world. It is responsible for 37% of all fatalities among children under the age of five in the world.² In June 2009, the World Health Organization (WHO) and the Federal Ministry of Health-Sudan (FMOHS) established the viral gastro-enteritis surveillance, which revealed that Rotavirus was found in 33% of all stool samples (>9000 samples) gathered from sentinel locations.³ It's beneficial that there's a Rotavirus vaccine that's been included in the National Immunization Program's (NIP), which has the support of all members of the International Coordination Committee (ICC). In 2011, the vaccine was authorized by the Global Alliance for Vaccine Initiative (GAVI).⁴ The first Sudanese infant was vaccinated against

Rotavirus gastroenteritis on July 17, 2011.⁵ So, with the help of GAVI, the Sudan became the first African country to introduce Rotavirus vaccine. GAVI aimed to offer the Rotavirus vaccination in 40 GAVI-eligible countries by 2015, following the launch of the vaccine in Sudan.⁶

Methods

From November 2015 to August 2016, a prospective hospital-based research was performed at Omdurman Pediatric Teaching Hospital. Children aged three or less who visited the research region complained of three loose or watery movements in 24 hours, as well as two or more episodes of inexplicable vomiting, were part of the study. Children aged three and under who had gastroenteritis, had been hospitalized or treated for gastroenteritis as a primary disease, and had symptoms for seven days or fewer were included. Children above the age of three, children with symptoms that lasted more than seven days, children who contracted gastroenteritis while in the hospital for another illness (hospital acquired gastroenteritis), and children with bloody diarrhea were also omitted. A non-probability purposive sampling method was used. The study confirmed the participation of 368 children.

Age, gender, weight, immunization status, and illness severity were the study parameters with an intent to diagnose the presence

or absence of Rotavirus diarrhea. Personal, demographic, and clinical data from the patient was collected through a questionnaire and consent form. The presence of a vaccination card was required to deem the kid immunized, however we erred and relied on verbal information from the parents instead for those who do not have a valid immunization card. During an incident of acute gastroenteritis, a single feces sample was collected in a dry, clean, wide mouth screw-capped container, put in an ice chest, and delivered straight to the Omdurman Pediatric Hospital laboratory. Patients are chosen if they meet all of the criteria for inclusion. A solid phase sandwich Enzyme-linked Immunosorbent Assay (ELISA) was used to check for the presence of group A Rotavirus (Biocompare, South San Francisco, USA). The information gathered was double-checked, coded, and put into the Statistical Package for Social Sciences (SPSS version 19). Tables and figures were used to present the findings. Chi-square trend test was applied to examine variation in trends. A p-value < 0.05 was considered statistically significant.

Table 1 Distribution of study variables and presence of Rota viral antigens

Variable	Rota Positive				
	Characteristic	Number	Frequency	Percentage %	P-value
Gender	Male	220	56	25.5	0.1
	Female	148	47	31.8	
Total		368	103	28	
Age\months	12-Jan	196	51	26	0.35
	13 - 24	144	46	31.8	
	25 - 36	28	6	21.4	
Total		368	103	28	
Disease severity	Ill	295	86	29.2	0.19
	Very ill	73	17	23.3	
Total		368	103	28	
Vaccine Doses	One dose	123	40	32.5	0.1
	Two doses	245	63	25.7	
Total		368	103	28	
Vaccination status	Fully vaccinated	63	5	7.9	0.12
	Partially vaccinated	40	12	30	
Total		103	17	16.3	

In this study, the prevalence peaked documented in December 2015, January, April, May, and August 2016 as shown on figure 1.

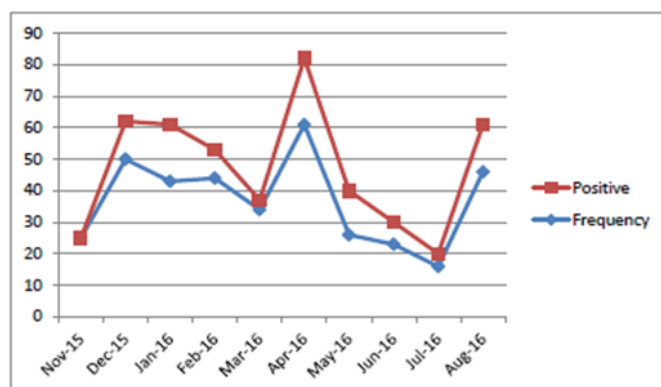


Figure 1 Seasonal distribution of the disease.

Discussion

The current study disclosed the prominence of vaccination and has confirmed a drop in Rotavirus diarrhea up to 33% in 2009³ to 28% in 2016. The current study recorded 28%, less reduction among Sudanese

Ethics approval

The Sudan Medical Specialization Board's Council of Clinical Microbiology's ethical review committee approved the study. Khartoum State, Omdurman Pediatric Teaching Hospital Administration, Ministry of Health, Khartoum State, given authorization..

Results

The study investigated 368 patients of whom 59.8% were males. Mean age was 13.83 months (range 1-36 months). 28% of the total specimens were positive for Rotavirus antigen. The highest rate of infection (49.5%) was found among patients less than one year age. The rate of infection with Rotavirus was found to be 32.6% among children whom received one dose of the vaccine compared to 25.7% among those who received two doses. Patients with very severe disease were more in those whom were partially vaccinated (30%) table 1.

children revealed by Magzoub's study prevalence, 16%,⁷ and Kenya study prevalence rate, 17%.⁸ This study prevalence (28%) was similar to that of M. Ali, F. Kamal, I. Mohamed and S. Rahoud (27.3%).⁹ The prevalence of this study, was less than that of Mustafa A, et al study, 36%. In this study, the prevalence peaked in December 2015, January, April, May, and August 2016, whereas it peaked in Mustafa A, et al's study in March to May and November to December.¹⁰

The prevalence rate in this survey ranged from 21.4 % in the United Arab Emirate¹¹ to 32 % in Brazil¹² Mare. The rates in our study were greater than those reported in the United States (18%)¹³ and Valencia, Spain (15%),¹⁴ these discrepancies in research might be due to disparities in Rotavirus infection rates. It might possibly be attributable to the fact that different study approaches and laboratory techniques were used. Other considerations, such as disparities in cleanliness and sanitation, are vital to keep in mind when comparing rates between countries.¹⁵

In current study, Sudanese females were more likely to be infected than males, this is possibly attributable to the research sample's limited size, in relation to the Rotavirus infection rate between males and females, which differs from what has been published from Italy,¹⁶ Vietnam, Nigeria,¹⁷ and Oman,¹⁸ this is also disagreement to some worldwide studies which indicated that males are more susceptible to

Rotavirus infection and actually exhibited a higher rate of Rotavirus in their faeces than females.⁷ Infected children under the age of two years made up 97 (94.2 %) in this study, while they made up 107 (88.1 %) in Sudanese Magzoub's study. When comparing the prevalence among patients less than one year in this study (51%) to Sudanese Magzoub's study (88%), it was shown to be lower.⁷ All of these changes were statistically insignificant ($p > 0.05$). The study underlines the importance of ongoing viral enteropathogen surveillance for effective diarrhea treatment and management, as well as the establishment of public health strategy.

Conclusion

Rotavirus vaccination minimizes the prevalence, severity, and mortality of Rotavirus diarrheas in children. Fully vaccinated children were less likely to become infected and had a reduced severity rate. In order to be included in the vaccine, more research is needed to pinpoint the virus serotypes that carry disease in Sudan.

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Conflicts of interest

The authors declare no competing interests.

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