Our Heritage

ISSN: 0474-9030

Vol-68-Issue-1-January-2020

Impact and Assessment of Rotaviral Diarrhoea in a Tertiary Care Center with Special Consideration towards Youngsters

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Abstract

Rotavirus is a leading cause of infant diarrhea worldwide and is responsible for about 20 per cent of diarrhea-related deaths in children under the age of 5. Rotavirus is responsible for between 20-50 per cent of hospitalized diarrhea cases. The study was carried out from June 2014 through November 2014. A total of 191 samples of stools with history of diarrhea were obtained from infants & children under 5 years of age. State of vaccination with Rotavirus has been noted. A Rotavirus stool antigen detection kit (SD-Bioline) was used to detect rota viral antigen in the stool sample. 78 (40.8 per cent) of the 191 stool samples analyzed were positive for Rotavirus antigen. 134 (70.2 percent) belonged to under 2 years of age in this sample and 57 (29.8 percent) were between 2-5 years of age. Of the 191 babies, 100 have been vaccinated against Rotavirus. Positive to Rotavirus antigen was found among the 91 unimmunized, 78 (85.7 per cent). The increase in the incidence of unimmunized Rotavirus diarrhea as compared with immunized children indicates the need for vaccination with Rotavirus. Thus vaccination with Rotavirus may lead to substantial reduction of Rotavirus diarrhoea in children under the age of 5. Widespread use of the Rotavirus vaccines over the next decade will prevent around 2 million deaths.

Keywords:*Rotavirus, Diarrhoea, Vaccination.*

Introduction

Globally, diarrheal infections are significant causes of hospitalization and infant mortality. They account for around one in six deaths among children under the age of five (Black RE et al).WHO and UNICEF reports indicate 2 billion cases of diarrheal disease worldwide per year (Bass CW et al). 1,9 million children under the age of five die from diarrhea per year. Diarrhea accounts for 18 percent of all deaths of children younger than 5 years. More than 5,000 children die every day in Africa and South East Asia (Bassani DG et al., Parashar UD et al.).

In India, around 2.3 million deaths in children under 5years occur annually in India. Diarrheal diseases cause 3,34,000 of these diseases (Black RE et al., Parashar UD et al.). Rotavirus is the leading cause of extreme diarrhea in both developed and developing countries among children (CDC, 2008). Rotavirus infects almost all children as young as five, both in developing and developed countries (WHO recommendations for 2005). It was estimated that 370,000 episodes of Rotavirus

ISSN: 0474-9030

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diarrhea occur annually, 50,000 cases are hospitalized, and 2,000 deaths worldwide (Zheng BJ et al). Throughout India, around 20-30 per cent of cases of hospitalized diarrhea are caused by gastroenteritis Rotavirus throughout infants and young children during winter months (Nath G et al).

Rotavirus belongs to the Reoviridae family, the virus genome is made up of 11 segments of the double stranded linear RNA molecule. There are 7 groupings of Rotavirus (A to G). Just Humans infect classes A, B, and C. Class A, with several strains, induces most infections in the childhood (Zheng BJ et al., Phukan AC et al). While humans of all ages are susceptible to infection with Rotavirus, children aged 3 to 24 months account for the vast majority of serious infections (Ram S et al). The disease normally lasts 3-8 days but the shedding of viruses continues for about 10 days to 1 month (Barnes GL et al).

Clinically, rotavirus gastroenteritis is characterized by abundant diarrhea, mild fever and vomiting which leads from mild to severe dehydration (Bon F et al). Rotavirus diarrhea clinical presentations alone are not sufficiently distinguishable to allow for diagnosis. It is found that children under the age of 5 who had been hospitalized for extreme diarrhea showed Rotavirus positive. Realizing that rotavirus causes severe diarrhea, it is desirable to establish simple, easy and cost-effective detection methods (Versalovic J et al).

Single-step rapid testing of rotavirus, enzyme-linked immunosorbent assay, lattice agglutation test, ribonucleic acid — polyacrylamide gel electrophoresis & polymerase chain reaction (PCR) (WHO Guidelines 1997) can be used. Early detection of Rotaviral diarrheal diseases may decrease indigenous antibiotic use, and resistance growth. Initiate vaccination against Rotavirus which prevents hospitalization and disease fatality (Kelkar SD et al).

Two Rotavirus vaccines have currently been shown to be effective against Rotavirus and are approved in over 100 countries, including India (Bahl R et al). In the present study children less than 5 years of age were evaluated using standard diagnostic Bioline Rotavirus stool antigen kit for Rotavirus diarrheal diseases. The aim of this study was to find out about the incidence of Rota viral diarrhea in our institute.

Materials and Methods

This prospective research was performed at Rajarajeswari medical college & hospital, Bengaluru, from June 2014 to November 2014. Authorisation was received from the Institutional Ethical Committee for performing this research. The present research included a single stool sample of 191 babies and children less than 5 years treated in the pediatrics ward for diarrheal diseases. History of vaccination against Rotavirus has been well reported. Both diarrheal cases over 5 years were

ISSN: 0474-9030

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excluded. Stool samples were obtained using sterile plastic containers & transported to the laboratory for examination as early as possible and refrigerated at 40C in the event of delay samples.

A fast, one-step lateral immunochromatographic assay that detects group A rotavirus was identified using the standard rotavirus stool antigen kit for diagnostic bioline. This package used monoclonal colloidal gold-labelled antibodies against the capsid protein of Rotavirus gene 6 (VP6). Test procedure was conducted as per instruction from the manufacture.

Results and Discussion

Among 191 stool samples collected, 134 stool samples were taken from children under 2 years of age and 57 stool samples were taken from children between 2-5 years of age as shown in Table 1.

134 patients were under the age of 2 years, 83 (43.4 percent) of whom were mostly male. The remaining 57 years (29.9 per cent) were in the age group of 2 to 5.

Table 2 shows that 64 (82 percent) cases in patients less than 2 years of age were positive for Rotavirus compared with 14 (18 percent) in patients 2-5 years of age. It reflects the larger number of cases that arise in patients under the age of 2 years.

Table 3 indicates that 64 (70.3 per cent) of the 67 unimmunized patients had developed diarrhea with Rotavirus. Whereas the 67 patients who were immunized were positive for Rotavirus.

Worldwide, rotaviral gastroenteritis is responsible for 611,000 childhood deaths in low-income countries (Bahl R et al). Rotavirus is the most important cause of non-bacterial gastroenteritis in early childhood in both developed and developing countries. In older children and adults too, the infection is observed. In developed countries 50% of pediatric hospitalization is due to acute diarrhea, while it is responsible for an estimated one million deaths per year (Paramita SG) in developing countries like India. For the worldwide roughly 600,000 annual deaths from Rotavirus, over 150,000 occur in India (Bass CW et al., Bassani DG et al.).

Rotaviruses (Parashar UD et al., Bassani DG et al.) are also caused by 20 to 30 per cent hospitalized cases of diarrhea. Rotavirus is believed to be responsible for 24 million outpatient visits, 2,4 million hospital visits and 6,11,000 deaths per year, 80 per cent of which occur in developing countries (zafer K et al).

In India, 350,000 children under 5 die each year from acute diarrheal diseases, one-third of which are due to gastroenteritis rotavirus. In hospitalized children under 5 years of age with acute gastroenteritis (Ayman J et al), the prevalence of rotavirus diarrhea in India has been found to range from 7 to 71 per cent.

ISSN: 0474-9030

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In our study Rotavirus diarrhea was observed in children under 5 years is (78) 40.8 percent which is in near connection with the study by Jain V et al &Gazal S et al, which showed 41 percent & 41.9 percent (Jane S et al., Bettina E et al). Prevalence of Rotavirus diarrhea in children ranged from 33.3 per cent in 1995 to 19.0 per cent in 1998 (Bahl R et al) in earlier studies.

Few other short- and long-term research in other parts of India revealed varying prevalence rates ranging from 4% to 62.6% (Kelkar SD et al., Bahl R et al., Paramita SG, zafer K et al., Jane S et al., Bettina E et al.). These large ranges clearly reflect variations in the age group surveyed, methods of detection used, geographic area, starting time and length of the investigation (Kelkar SD et al., Jane S et al.).

Table1: Demographic Diarrheal Distribution

Age group	Male (%)	Female (%)	Total(%)
Less than 2 years	83(43.4%)	51(26.7%)	134 (70.1%)
Between 2-5 years	45(23.5%)	12 (6.2%)	57 (29.9%)
Total	128(67.1%)	63(32.9%)	191 (100%)

This is attributable to an increased vulnerability of male children to Rotavirus diarrheal disease exposure and a greater probability that they will be brought to medical treatment (Patwari AK et al.).

Table2:Rotavirus Cases in Children

Diarrheal cases	Total number	Number of positive
Less than 2 years	134(70.1%)	64 (82%)
Between 2-5 years	57 (29.9%)	14 (18%)

Table3: Total number of babies vaccinated and unimmunized

Age group	Immunized		Unimmunized	
	Total	Rv positive	Total	Rv positive
Less than 2 years	67	0 (0%)	67	64 (70.3%)
More than 2 years	33	0 (0%)	24	14 (15.4%)
Total	100	0 (0%)	91	78 (85.7%)

ISSN: 0474-9030

Vol-68-Issue-1-January-2020

Table 1 in our study indicates that 128 (67 percent) stool samples were positive for Rotavirus from male patients among them 62 (48.6 percent). Samples 16 (25.3 percent) of 63 (33 percent) female stool patients were positive for Rotavirus. The frequency of male patients is up to 22% higher than that of female patients, which coincides with Shetty Ak et al who reported 23 (65.71%) males & 12 (34.2%) female patients.

Figure1: Shows Sd Rapid Test Card and Diluents, Positive Test is Seen

Figure 2: Shows Negative Card Test with Red Band in Control Line

Seasonal Variations

Rotavirus diarrhea was observed throughout the year, an rise was observed during the rainy and winter season, i.e. June to November months. This has associated with other studies such as Nath et al., Phukan et al., & Bahl R et al., where the peak of Rotavirus diarrhea in winter, as humid conditions promote survival of Rotavirus and surface replication (zafer K et al., Chatterjee B et al.).

Among 191 stool samples as shown in Table 2, 134 (70.1%) cases of Rotavirus were found in children below 2 years of age group, which is in close contrast with Patwari Ak et al., who showed 25 (71.43%). It appeared that infants below 6 months of age were initially protected to some degree by maternal antibodies from extreme diarrhea due to Rotavirus (Brown DW et al., Broor S).

In 91 unimmunized patients in table 3, our analysis showed 78 (85.7 per cent) Rotavirus positivity. Thus demonstrating vaccination with Rotavirus decreases Rota viral diarrhea in children under 5 years. It will help to reduce global acute diarrheal disease burden. Rotavirus vaccine widespread use should prevent about 2 million deaths over the next decade (Selim A et al., Jain V et al.).

Immunochromatography is a fast, simple diagnostic tool that needs no skilled person as a bedside test.

Limitation of our study

- Cannot be used to differentiate between less sensitive serotypes of Rotavirus than PCR.

ISSN: 0474-9030

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- In conclusion, this study highlights that in hospitalized children less than 5 years of age in Bengaluru, Rotavirus diarrhea accounts for a significant proportion of diarrheal disease, and is seen more during the winter months of the year.
- Thereby that morbidity & mortality in children due to Rotavirus to regularly immunize against Rotavirus. Thus it prevents Rotavirus gastroenteritis synonymous with hospitalization and fatality.

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