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Assessment of rotavirus diarrhoea in urban populations of children under four years

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Abstract
The rotavirus causing diarrhoea is an important contributing factor for malnutrition, which in turn predisposes the child to further diarrhoea, thereby initiating a vicious cycle. Hence based on this background, we conducted a study with the objective to know the proportion of rotavirus diarrhoea in children presenting with acute diarrhoea, and to study its clinical profile.
The enrolled study Childrens were supervised for number of loose stools, consistency of stool and time since last loose stool every six hours in a day. The samples were analysed in Microbiology department in vaccine carrier; rotavirus detection was done by ELISA using Rota IDEIA Kit (DAKO, Germany).
We conclude that rotavirus is responsible for about one-fourth of childhood diarrhoea under age of four years, and is associated with significant risk of dehydration and prolonged diarrhoea.

Keywords: rotavirus diarrhoea**,** acute diarrhoea, Stool culture, dehydration etc.

Introduction
Rotavirus is a contagious virus that can cause gastroenteritis (inflammation of the stomach and intestines). Symptoms include severe watery diarrhoea, vomiting, fever, and abdominal pain. Infants and young children are most likely to get rotavirus disease. They can become severely dehydrated and need to be hospitalized and can even die. Rotavirus is the most common cause of diarrhoeal disease among infants and young children. It is a genus of double-stranded RNA viruses in the family Reoviridae. Nearly every child in the world is infected with rotavirus at least once by the age of five. Immunity develops with each infection, so subsequent infections are less severe; adults are rarely affected [1]. There are eight species of this virus, referred to as A, B, C, D, E, F, G, H and I. Rotavirus A, the most common species, causes more than 90% of rotavirus infections in humans.
The virus is transmitted by the faecal-oral route. It infects and damages the cells that line the small intestine and causes gastroenteritis (which is often called "stomach flu" despite having no relation to influenza). Although rotavirus was discovered in 1973 by Ruth Bishop and her colleagues by electron micrograph images and accounts for approximately one third of hospitalisations for severe diarrhoea in infants and children, its importance has historically been underestimated within the public health community, particularly in developing countries. In addition to its impact on human health, rotavirus also infects animals, and is a pathogen of livestock [2].
Rotavirus is usually an easily managed disease of childhood, but in 2013, rotavirus caused 37 per cent of deaths of children from diarrhoea and 215,000 deaths worldwide, and almost two million more become severely ill. Most of these deaths occurred in developing countries. In the United States, before initiation of the rotavirus vaccination programme, rotavirus caused about 2.7 million cases of severe gastroenteritis in children, almost 60,000 hospitalisations, and around 37 deaths each year. Following rotavirus vaccine introduction in the United States, hospitalisation rates have fallen significantly. Public health campaigns to combat rotavirus focus on providing oral rehydration therapy for infected children and vaccination to prevent the disease. The incidence and severity of rotavirus infections has declined significantly in countries that have added rotavirus vaccine to their routine childhood immunisation policies [3].
Rotaviral enteritis is a mild to severe disease characterised by nausea, vomiting, watery diarrhoea and low-grade fever. Once a child is infected by the virus, there is an incubation period of about two days before symptoms appear. The period of illness is acute. Symptoms often start with vomiting followed by four to eight days of profuse diarrhoea. Dehydration is more common in rotavirus infection than in most of those caused by bacterial pathogens, and is the most common cause of death related to rotavirus infection [4].
Rotavirus a infections can occur throughout life: the first usually produces symptoms, but subsequent infections are typically mild or asymptomatic, as the immune system provides some protection. Consequently, symptomatic infection rates are highest in children under two years of age and decrease progressively towards 45 years of age. The most severe symptoms tend to occur in children six months to two years of age, the elderly, and those with immunodeficiency. Due to immunity acquired in childhood, most adults are not susceptible to rotavirus; gastroenteritis in adults usually has a cause other than rotavirus, but asymptomatic infections in adults may maintain the transmission of infection in the community. There is some evidence to suggest blood group secretor status and the predominant bacteria in the gut can impact on the susceptibility to infection by rotavirus [5].
The rotavirus causing diarrhoea is an important contributing factor for malnutrition, which in turn predisposes the child to further diarrhoea, thereby initiating avicious cycle. This in

turn results in periodic evaluation of bacteriologic patterns of diarrhoea and therapeutic trials. Hence based on this background, we conducted a study with the objective to know the proportion of rotavirus diarrhoea in children presenting with acute diarrhoea, and to study its clinical profile.

Methodology

The study was planned in the Department of Paediatrics in Patna Medical College and Hospital, Patna. The patients aged between 1 month and upto 4 years suffered with acute diarrhoea were enrolled into the study. Diarrhoea was definedas passage of three or more loose stools in the last 24 hours.

Following was the inclusion and exclusion criteria of the patients.

Inclusion criteria

1. Abrupt onset of four or more loose stools per day
2. Less than 14 day's duration.
3. Age between 1 month to 4 years.

Exclusion Criteria

All cases who received antibiotics before collection of stool samples were excluded.

All children were managed according to their dehydration status, as per WHO guidelines [6]. Children were monitored for number of loose stools, consistency of stool and time since last loose stool every six hours in a day. Stool samples of enrolled children were collected in sterile screw-top container. The samples were analysed in Microbiology department in vaccine carrier; rotavirus detection was done by ELISA using Rota IDEIA Kit (DAKO, Germany).

Results & Discussion

The data from the 100 childrens suffered from diarrhoea of age below 4 years were collected and presented as below. Children were monitored for number of loose stools, consistency of stool and time since last loose stool every six hours in a day.

Table 1: Age, Sex & No. of Cases

Age	No of cases
1.1- 1 years	70
1 – 2 years	15
2 – 3 years	6
3 – 4 years	9
Total	100
Sex	No of cases
Males	54
Females	46
Total	100

Table 2: Rotavirus Cases and Variables

Variable	Rotavirus Positive	Rotavirus Negative
Fever	75 cases	51 cases
Dehydrated	57 cases	45 cases
Loose Stools per day	6-7 times	5-6 times
Duration of hospital stay (days)	3-4 days	2-3 days
Duration of diarrhoea at time of enrolment (days)	2.5 - 4.5 days	2.2 – 3.5 days
Total duration of diarrhoea (days)	5 - 7 days	4 - 6 days

Kang, *et al*. [7] detected rotavirus in 39% cases in Indian multi-centric surveillance whereas Bahl, *et al*. [8] reported 23.5% positivity rate in children below 5 years, hospitalized for acute diarrhoea. A review of 46 epidemiological studies reported rotavirus in 20% of children hospitalized for acute diarrhoea [9]. The difference observed between our study and previous studies may be attributed to variation in enrolment criteria among the studies, and inclusion of outpatient children in our study. Like previous studies [10], we also found more dehydration and longer duration of diarrhoea in rotavirus-positive children.

Conclusion

In conclusion, despite having a diarrhoea control programme for over three decades, India continues to suffer from a disproportionately high morbidity and mortality from this preventable condition. Prioritizing diarrhoeal disease control interventions in the child health programme is urgently needed.

We conclude that rotavirus is responsible for about one-fourth of childhood diarrhoea under age of four years, and is associated with significant risk of dehydration and prolonged diarrhoea.

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