

# Outbreak Investigation of Acute Watery Diarrhea with Flu Like Symptoms in Pediatric Unit in a Peripheral Hospital in Sri Lanka

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## Abstract

**Introduction:** Acute watery diarrhea outbreaks are common in children and Rotavirus is the leading cause which cannot be clinically differentiated from other pathogens and confirmation needs specific laboratory diagnosis. This brief report is on small-scale outbreak of rotavirus infection at a pediatric unit in a peripheral hospital in Sri Lanka.

**Objective:** The aim is to describe the investigation of children with acute watery diarrhea admitted to a pediatric unit in a peripheral hospital in low resource setting country.

**Methodology:** The virus National Reference Laboratory conducted this investigation. A peripheral hospital received admissions of children with fever, vomiting and diarrhea. Limited resources restricted only to selected samples for testing. Blood, stools, and throat swabs received along with the socio demographic and clinical profile. Clinical details analyzed to decide the tests and to facilitate the interpretation of laboratory results. Stool samples were tested for Rota-virus antigen and blood samples for Hepatitis A virus antibody using Rota virus antigen and Hepatitis A IgM antibody EIA kits. Multiplex-respiratory-PCR was performed with throat swabs to exclude any possible pathogens to flulike illness.

**Results:** Only stool samples tested for rotavirus antigen became positive. Among the tested samples, positivity was noted on the samples collected less than 2 days of onset of illness.

**Conclusion:** Study demonstrated rotavirus is a common cause of diarrhea leading to hospitalization of children. Sample collection in the early stage of illness for testing is important to avert false negative results. Findings discloses initial outbreak investigation road map in low resource setting countries.

**Keywords:** Outbreak investigation; Acute watery diarrhea in children; Rota virus infection; Peripheral hospital; Low resource setting.

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## Introduction

Outbreaks of acute watery diarrhea are common in children due to many reasons including poor sanitation. Rotavirus is the leading cause of acute watery diarrhea among children and is a vaccine preventable [1]. This is known to be the leading cause of dehydrating gastroenteritis in children of less than 5 years of age throughout the world [2]. Children who become infected with rotavirus may experience severe watery diarrhea, often with vomiting, mild-to-moderate fever, and abdominal pain yet gastrointestinal symptoms generally resolved in 3-7 days. However, some infants may present with necrotizing enterocolitis and some immunocompromised patients may develop persistence encephalitis [3-5]. Moreover, rotavirus is often reported as outbreaks of hospital acquired infection [3]. Diarrheal diseases caused by rotavirus cannot be clinically differentiated from other enteric pathogens and specific laboratory diagnosis needs to confirmation of the etiology. Antigen detection and viral nucleic acid detection is most useful in early-stage diagnosis. Antigen detection Enzyme Immunoassay (EIA) and Polymerase Chain Reaction (PCR) tests are sensitive diagnostic techniques available and used in most of the laboratories to confirm the outbreaks leading to management guide. In the present paper, authors report a small-scale outbreak of rotavirus infection at a pediatric care unit in a peripheral hospital in Sri Lanka.

**Objectives:** The aim of this analysis and write up is to describe the investigation of children with acute watery diarrhea admitted to a pediatric unit in a peripheral hospital in low resource setting country.

## Methodology

The present laboratory investigation was conducted at the National Reference Laboratory, Department of Virology, Medical Research Institute. The samples and filled request forms were received from a peripheral base hospital in southern province, in the country. This peripheral hospital received admissions of children with fever, vomiting and diarrhea. All the children had experienced an episode of three looser-than-normal or watery stools within a 24-hour period, with or without episodes of vomiting. Clinical details were collected and carefully analyzed to decide the series of testing and to facilitate the interpretation of laboratory results. The admitted patients gave histories of ages between 1-10 years and from different locations which spread across 15 kilometer radius from the hospital.

During a one-week period 25-30 patients admitted to the hospital unit with a duration of illness from 1-2 days. All the patients presented with fever up to 38.4°C and episodes of watery diarrhea. A few of the patients complained of mucous substance with stools. These children had frequent watery stools after admission too. In addition to those symptoms patients were complained flulike illness. The children came directly from the community and not referred from another health centers or dispensaries. Detailed examinations noted non-tender abdomen and no respiratory or neurological abnormalities. Although there was no travel-history or exposure to people with similar illnesses, history revealed a few parents developed watery diarrhea and recovered after 3-5 days. No histories of immunosuppressed conditions or extremely poor hygienic conditions were reported among the patients admitted. The patient's developmental milestones were up to date. However, rotavirus immunization history was not given. Decisions on investigations, hospitalization and treatment were mainly due to the clinician attending to the children.

Due to the limited availability of resources for laboratory testing samples were collected only from selected inward patients for laboratory analysis. The initial collection and transportation of samples from first selected cases (5-10) were done following the CDC guideline for food borne outbreak investigation [6]. On the first day of admission to the ward stool samples, throat swabs and blood samples were collected to identification of infective cause and to exclude possible pathogens. Cohort care and environmental disinfection were immediately implemented. The precautionary measures regarding hand hygiene and contact isolation taken by healthcare providers and family members were educated especially regarding the control and prevention of infection.

National Reference laboratory at the Department of virology, Medical Research Institute, received three types of samples maintaining cold chain and specific sample transportation criteria along with the socio demographic and clinical profile of the patients. Testing was performed on the same day according to the clinical history. Upon receiving the samples, all stool samples were tested for Rota-virus antigen and blood samples were tested for Hepatitis A virus antibody. Rota virus antigen capture enzyme immunoassay kit, (rotavirus antigen detection 'ProSpecT' Enzyme Immunoassay Oxoid Ltd, United Kingdom) and Hepatitis A IgM antibody EIA kit (Biorex Diagnostic Ltd, United Kingdom,) were used to test and determine the rotavirus infection and the Hepatitis A virus infection respectively.

According to clinical history of flulike illness, multiplex-respiratory-PCR was performed with throat swabs to exclude other possible pathogens. Throat swabs were tested with the commercial real-time RT-PCR consisted of influenza A, B, H1N1, coronavirus NL63, 229E, OC43, HKU, parainfluenza 1-4; human metapneumovirus (hMPV) A/B; rhinovirus, respiratory syncytial viruses (RSV) A/B; enterovirus, paraechovirus, bocavirus, adenovirus and *Mycoplasma pneumonia*.

## Results

In this study, series of testing was done with different samples and only stool samples tested for rotavirus antigen became positive in the tested children (Table 1).

Among the tested samples, rotavirus positivity was noted on the samples collected less than 2 days of onset of illness (Table 2).

**Table 1:** Results of laboratory test parameters.

Test parameter	Results
<b>Stool specimens (collected at day 1-2 of admission)</b>	
Rotavirus Antigen EIA	Positive
<b>Serum (collected at 1-2 of admission)</b>	
Hepatitis A IgM EIA	Negative
Enterovirus PCR	RNA Not detected
<b>Throat swab (collected at day 1-2 of admission)</b>	
Influenza A/B PCR	RNA not detected
Coronavirus NL63, 229E, OC43, HKU PCR	RNA not detected
hMPV PCR	RNA not detected
RSV A/B PCR	RNA not detected
Rhinovirus PCR	RNA not detected
Enterovirus PCR	RNA not detected

**Table 2:** Rotavirus positivity and Stool specimen collection summary.

Sample collection day of illness	Rota virus Antigen EIA results
3	Negative
2	<b>Positive</b>
3	Negative
1	<b>Positive</b>
2	Negative

### Discussion

Herein, we report a small-scale rotavirus outbreak in a pediatric care unit in a peripheral hospital in low resource setting country.

Hospital staff noted increases in the number of cases with watery diarrhea in the admission room in relate to time and place. Based on that fact suspected an outbreak in the community. As an initial outbreak control activity, it is utmost important to conduct a laboratory investigation to confirm with the causative agent and exclude other possible pathogens. This will assist to strengthen the management of patients and contain the infection through early introducing of appropriate infection prevention control methodologies.

The study results confirmed cases were due to rotavirus infection even though testing was performed for Rotavirus, Hepatitis A virus, Enterovirus, and respiratory viruses. A confirmed Rotavirus case was defined as any patient that tested positive for rotavirus antigen with the Rota virus antigen detection EIA kit which has a sensitivity and specificity of 98% and 99% respectively. Days from onset of symptoms to collection of samples should be very early as 1-2 days since virus disappearance can occur due to individual immune response if the individuals are immunocompetent. If late samples tested this may lead to false negative laboratory results misleading the team involve in outbreak management. However, watery diarrhea and vomiting are significantly commoner in children with rotavirus diarrhea and this clinical profile was compatible with the suspected cases admitted to the pediatric unit in this peripheral hospital.

In Sri Lanka, Hepatitis A, play a larger role in gastroenteritis in areas with poor sanitation, unhygienic practices related to the drinking water and poor knowledge about Hepatitis A [7]. Due to this reason study subjects were tested for Hepatitis A virus infection though it was negative in this group. Similarly, none of the tested children showed up any laboratory confirm respiratory virus infection even though they showed flulike illness at their presentation.

Rotavirus was identified in 40% of tested children with diarrhea presented to this hospital, representing a detection rate of 40% in Rotavirus infection. Thus, the study demonstrates that rotavirus is a common cause of diarrhea leading to hospitalization in children. A study done between 2005-2007 noted Rotavirus causes 24% of hospitalizations for diarrhea among children in Sri Lanka [8], which indicated an upward trend of Rotavirus infection in acute gastroenteritis. Another study demonstrated Rota virus was detected overall 30% throughout the year though the prevalence was higher to the 40-50% during the rainy season [9]. In 2016 almost similar detection rate, 37% was noted throughout the year [10]. However, seasonal pattern was unable to demonstrate in this study since this is a one time-point analysis.

During this period 25-30 cases presented to the hospital with an age range of 1-8 years, the positive cases were 2 years old and 7 years old children respectively whose residences are not close to each other. Although the age group in which rotavirus was detected most frequently is less than 5 years, current study partially demonstrated the fact due to the limited number of laboratory test facility in poor resource setting.

Rotavirus is highly contagious and can survive on hands, surfaces, and fomites for weeks. Hand hygiene, separation of patient and thorough cleaning of the environment with an appropriate disinfection agent are the most important suggested steps in infection control when facing a highly contagious pathogen such as rotavirus [11]. Since rotavirus is resistant to several antiseptic solutions including alcohol, timely investigation is utmost important to identify the etiology to initiate and extend the prevention and control of infection with effectively and efficiently. Furthermore, this reduced the chances of emerging a hospital acquired infection and minimized the risk to the immunocompromised population in the special care units in the hospitals such as intensive care units and special care baby units.

Meanwhile, its crucial to know the causative pathogen to minimizes the redundant antimicrobial usage in this type of gastroenteritis. Besides, it was a great opportunity to made aware of timely Rota virus vaccination although study could not reveal the vaccination status of this cohort.

### Conclusion

Current study demonstrated rotavirus is a common cause of diarrhea leading to hospitalization of children. In addition, findings convey sample collection in the early stage of illness for laboratory testing is important to avert false negative results. Moreover, study disclose initial outbreak investigation road map in low resource setting countries with selected number of cases.

### Declarations

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