

## A Fatal Case of Rotavirus Enteritis in a Child Aged 1-Year and 2-Months

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### Abstract

The overall health burden of infectious diarrhea is significant, particularly among children, both in the United States and a worldwide problem. Annually in the US, more than 210,000 children under the age of 5 are hospitalized for gastroenteritis for an average of 4.5 days at an annual hospital cost of nearly \$1 billion dollar. During the period 1973-1983, an average of 500 children in the United States died of diarrhea each year, one hundred children lost twenty-five school days as a result of acute gastroenteritis, and approximately 14% of children in the United States were treated by a physician for rotavirus diarrhea.

**Keywords:** rotaviruses; children; neurological; pediatrician; gastroenteritis

### Introduction

Worldwide, between 3-5 billion cases are reported per diary, with 5-10 million deaths per year [1,2,3]. Rotaviruses (RV) belong to the genus Rotavirus of the family Reoviridae. They are RNA viruses that resemble a wheel under an electron microscope, hence the name of their genus. The virus measures 65-100 nm in diameter. The genome of the virus consists of 11 segments of double-stranded RNA. Contains 6 structural proteins (VP1, VP2, VP3, VP4, VP6, VP7) and 6 non-structural proteins (NSP1, NSP2, NSP3, NSP4, NSP5, NSP6). The nucleic acid is surrounded by two capsid layers - an inner capsid (VP6) and an outer capsid (VP7). VP4 is a spike protein that is located on the cell surface and plays the role of receptor receptor [4,5,6]. RVs possess comparative resistance in the external environment. On different surfaces (including dirty hands) they are kept alive for hours. They remain infectious for months in the faeces. Due to the absence of a lipid membrane, the viral particle is resistant to the action of various detergents and disinfectants containing alcohol, ether and others. RVs are inactivated relatively quickly at 100 degrees and at Ph above 10 and below 3. Rotavirus gastroenteritis (RGE) is a socially significant disease. 95% of children between one and five years of age experience rotavirus infection. It is also the

most common cause of severe diarrhoea in childhood [7,8,9]. About 3.5 million cases are registered in the USA every year, 3.6 million in the EU, and 140 million worldwide. Every year, 800,000 people die from rotavirus enteritis worldwide, mostly children in developing countries. Data from the European Center for Disease Control and Prevention (ECDC) indicate that the mortality rate from rotavirus enteritis in European Union (EU) countries is very low (0.2 per 100,000 children under 5 years of age) [10]. The clinical picture of rotavirus infections is polymorphic. In the neonatal age, the infection is in the form of a carrier. Clinically manifested forms affect the age between 6 months and 5 years. In older children, the disease begins acutely. Along with the rapid deterioration of the general condition and the moderate initial febrile reaction, the symptoms from the side of the gastrointestinal tract appear. Vomiting is a characteristic, early and diagnostically important symptom of rotavirus gastroenteritis (RGE). It occurs in 70% of children with rotavirus and lasts one to three days. Diarrheal syndrome is the main manifestation of RGE. Its intensity and duration are the basis of the complications that occur. Diarrhea is found in 80 to 100% of patients. Sometimes this is the only symptom of the disease. The stools are watery, usually without pathological impurities with a

sour smell. The duration of diarrhea varies from 3 to 5, rarely 7 days. In most patients, flatulence and gurgling of the intestines are found as an expression of the lively intestinal peristalsis. The enteritis syndrome is accompanied by moderate, and in older children with severe abdominal pain. In about 30-40% of patients, catarrhal manifestations of the upper respiratory tract are found. Dehydration is found in the majority of patients. I and II degrees of dehydration prevail [11,12,13]. Neurological manifestations such as seizures, encephalopathy and encephalitis are known to occur, although rarely, due to rotavirus infections. Cerebellar involvement is extremely rare, but has been observed in a child with rotavirus enteritis [14]. A polio-like syndrome associated with rotavirus has also been reported [15]. Data on increased liver transaminases in patients with rotavirus enteritis have also been found [16,17]. Toxic megacolon and intussusception can also be complications of rotavirus infection [18,19]. Authors from Japan also reported renal failure occurring among patients with rotavirus enteritis [20].

## Purpose

The purpose of this report is to report a fatal case of rotavirus enteritis in a 1-year-old child. 2 months in a country where a rotavirus vaccine is available, but the same is optional at the moment.

## Clinical case

I.E.F is a boy aged 1 year and 2 months, from the town of Bobov dol, raised by minor parents (the mother and father are 17 years old and of minority origin). She has been ill for about a week with an elevated temperature of up to 37.2 degrees (according to the mother, it may have been higher), repeated vomiting and diarrheal stools. Examined consecutively in two medical institutions on the territory of the Municipality of Dupnitsa - St. Ivan Rilski Medical Center 2003 (private hospital) and St. Ivan Rilski Medical Center EOOD (Municipal hospital). On examination at the private facility by a paediatrician, symptomatic treatment was given, but no oral rehydration solution was prescribed. Due to the reluctance of the mother to accept the child for hospitalization, due to fear of infection with covid 19, she asks employees, and nurses from the kindergartens in the Municipality of Bobov dol to place him with a peripheral venous source and to carry out intravenous rehydration. However, they

refuse, as they do not have a doctor's appointment. On 10.11.2023 the child was examined at the FSMP in Dupnitsa and from there sent for hospitalization in the Children's Department. The mother claims that the paediatrician on duty then did not examine the child, data in the journal of the department for passed and accepted persons of the I.E.F. on 10.11.2023. are missing. On 13.11.2023 the same child was sent for treatment to the Department of Infectious Diseases of the Medical Center "St. Ivan Rilski" EOOD with a working diagnosis of gastroenteritis. Along with him, his cousin, who has B-thalassemia and a proven positive test for rotavirus enteritis, was admitted to the Department. According to the parents, the child also had covid 19 6 months ago, since then he has continued to suffer from frequent respiratory infections. According to the parents, he was consulted in the city of Sofia with specialists in children's lung diseases, and he was prescribed permanent inhalation treatment with the drug Pulmicort. On admission, the child's condition is moderate-severe. He is conscious. Contact. Adequate. Afebrile. With clinical signs of dehydration-II-III degree. His skin is swarthy with decreased turgor, tone, and elasticity, but compared to his cousin's, they are of lesser intensity on examination. Visible mucous membranes are dry. The tongue is dry, coated with a white coating. The throat is hyperemic, intense. With rhythmic breathing and heart activity. Abdomen is soft with lively intestinal peristalsis. HC- without ODOR. At 6:30 p.m. a child was taken to the manipulation room for insertion of a venous source. A first venous source was placed, from which blood was taken for PCC and ionogram. It is noteworthy that it becomes impassable in a very short period. Therefore, a second venous source has to be placed. After placement of the second venous source, the child relaxes, averts his gaze to the left and upwards, and has a generalized clonic-tonic convulsion accompanied by cardiac arrest. Diazepam was administered during the seizure. The child was placed on a bed and immediate cardiopulmonary and saline resuscitation was started with solutions containing NaHCO<sub>3</sub> 38.4% 15ml and KCL 14.9% 10ml by the infectious disease specialist on duty. Subsequently, cardiopulmonary resuscitation was continued by the on-duty pediatrician and anesthesiologist-resuscitator. By the 10th minute of resuscitation, the child has perioral cyanosis, single spontaneous breathing movements are present, auscultatory cardiac activity is absent, on a monitor with fibrillations, pupillary reactions are also available

until the tenth minute of resuscitation. Upon the arrival of the resuscitator, the child was clinically dead with complete areflexia, with no breathing and cardiac activity, with permanently dilated pupils unresponsive to light. CPR by an infectious disease specialist and a pediatrician continued, intubation was immediately performed with a #4 balloon tube, and oxygen ventilation was started. Indirect heart massage, oxygen ventilation, water-salt resuscitation continued. Adrenaline was also applied. Despite the resuscitation measures carried out in full, the child passed out at 19.50. with the picture of acute respiratory and cardiovascular insufficiency. The laboratory tests are shown in table 1 and table 2 Table 1 Laboratory indicators - BKK, ESR

**Table 1:** BCC and ESR

WBC	HGB	HCT	RBC	PLT	ESR
10,3	125	0,36	4,8	289	15

**Table 2:** Biochemistry

CRP	Bl.sugar	Urea	Creatinin	K	Na	Cl
0,82	4,8	1,7	33	3,1	136	108

From the laboratory indicators, the very low CRP as well as the low levels of K ions are impressive, which probably led to cardiac arrest. The child is subject to a forensic autopsy. Due to the fact that the autopsy is forensic, the doctor who performed it cannot provide a report without the permission of the prosecutor's office. When contacting him, however, he reported that during the autopsy, numerous lymph nodes were excised, which, after an immunohistochemical analysis, indicated a rare lymphoproliferative process. The upbringing of the child by underage parents with a low educational qualification, the non-serious behavior regarding rehydration, which was of vital importance, the lack of awareness of the severity of rotavirus infection and the missed opportunity to administer a vaccine are only some of the risk factors for the fatal outcome. , and the lymphoproliferative disease led to a decline in immunity and aggravated the clinical picture. Systemic administration of inhaled corticosteroids also leads to suppression of immunity. Lymphoproliferative diseases are not listed in the contraindications for the administration of the vaccine. In 2006, two live attenuated vaccines for oral use providing prevention against rotavirus disease were authorized in the EU; Rotarix, a monovalent vaccine (RV1) developed from a human rotavirus strain attenuated by serial passage in cell culture

(GlaxoSmithKline Biologicals, Rixensart, Belgium) and RotaTeq, a reassortant pentavalent human-bovine rotavirus vaccine (RV5) derived from several cell culture-adapted human rotavirus strains and bovine rotavirus strain. (Sanofi Pasteur MSD, Lyon, France [21,22]. The indication for these vaccines is active immunization of infants for the prevention of gastroenteritis due to rotavirus infection. The vaccination course consists of two doses. The first dose can be administered after six weeks of age. There should be no less than 4 weeks between doses. It is preferable that the vaccination course is carried out before the age of 16 weeks, but it must be completed by 24 weeks of age. The same dosage of Rotarix can be used in babies born prematurely after at least 27 weeks' gestation Spitting up or vomiting of the vaccine was rarely observed during clinical trials, and no replacement dose was given in such cases. However, if the child spits out or vomits most of the vaccine dose, which is unlikely, a single replacement dose may be given during the same visit to the doctor Contraindications to the use of the vaccine include: Hypersensitivity to the active substances or any of the excipients, hypersensitivity after previous administration of rotavirus vaccine, history of intussusception, children with uncorrected congenital malformation of the gastrointestinal tract that may predispose to the development of intussusception, children with severe combined immunodeficiency (SCID). Administration of Rotarix should be delayed in individuals with acute severe febrile illness. The presence of a mild infection is not a contraindication. Administration of Rotarix should be delayed in individuals with diarrhea or vomiting [23]. Vaccine efficacy has been evaluated in randomized, controlled clinical trials, and both rotavirus vaccines have been shown to be effective against hospitalizations due to G1P[8], G2P[4], G3P[8], and G4P[8] and G9P[8] rotavirus genotypes . In addition, RV5 has been shown to be effective against G12P. Vaccine efficacy against other genotypes has not been evaluated under conditions of low rotavirus mortality. Vaccine efficacy studies against rotavirus hospitalizations have shown protection in the 80-90% range when rotavirus vaccines are introduced into pediatric immunization programs. Furthermore, herd immunity contributes to the overall impact of vaccination programs providing protection to e.g. older siblings of vaccinated individuals [24,25,26,27,28,29,30,31,32,33]. After 2015 the two

live oral vaccines have been introduced in more than 95 countries worldwide [34]. The introduction of the vaccine in the UK has resulted in a significant decrease in the number of hospitalizations for rotavirus gastroenteritis [35]. A serious problem, however, appears to be the decline in vaccine effectiveness in developing countries over time [36]. Therefore, a live attenuated human strain Rotarix vaccine RIX4414 with G1P1A P specificity has been developed. Trials of RIX4414 in infants have begun in developed and developing countries worldwide, with results showing a reduction in the incidence of severe rotavirus gastroenteritis in settings where multiple serotypes are circulating simultaneously. These encouraging results call for further evaluation of the vaccine worldwide and especially in developing countries with the greatest need, thus vaccine trials are ongoing [37].

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