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Some Clinical and Epidemiological Features of Rotavirus Incidence at Children in the Republic Sakha (Yakutia)

ABSTRACT

The article presents an analysis of the long-term rotavirus infection incidence in children of the Republic Sakha (Yakutia), and a comparison of the age structure of children hospitalized in the Children's City Clinical Hospital № 2 during the epidemic season 2012-2013. The detection rate of the rotavirus antigen has been identified in patients with symptoms of acute enteric infection as well as the main clinical manifestations of rotavirus gastroenteritis.

Key words: acute enteric infection, rotaviral infection, rotavirus, gastroenteritis, rotavirus antigen.

INTRODUCTION

Rotavirus is one of the issues to be actually concerned with practical public health service and medical science, it is confirmed by unfavorable statistical data: annually rotavirus is the cause of about 25 million outpatient attendances, 2 million hospitalizations and over 500 thousand fatalities worldwide (about 30% of all fatal cases among juniors) [9,10,11]. Rotavirus gastroenteritis is widespread and is the most common of all acute enteric infections that leads to the development of severe diarrhea with dehydration in children during their first years of life [3]. According to the World Health Organization data, almost every child, regardless of their race and socioeconomic status, within their first five years of life has rotavirus gastroenteritis, which causes considerable economic damage to the health care system and the society on whole [8,12]. In this respect, rotavirus is unique, since it is the only in a wide range of diarrheal diseases that is so obviously age-related [5].

In the recent years all over the world including the Russian Federation, there has been prevalence of rotavirus incidence in children. Since 1993 in Russia it has increased over 20 times (from 3.2 per 100 thousand people in 1993 to 71.6 in 2013) [1,4]. For 2011-2013 there were 99,384, 100,889, 102,485 registered cases of rotavirus gastroenteritis, of which 90.4% - 91.1% fell on children under the age of 14 [7]. Rotavirus infection accounted for 44-47% of all acute enteric infections in children under 5 years of age. Up to 5% of fatal cases among children till 5 years are induced by rotavirus gastroenteritis. Rotavirus gastroenteritis is especially severe in children aged 6-24 months [6]. The abovementioned facts call for effective therapeutic and preventive measures against rotavirus gastroenteritis [3].



The aim of the research: to determine clinical and epidemiological features of the rotavirus incidence in the child population in the Sakha Republic (Yakutia).

MATERIALS AND METHODS

The present study was carried out in the Infectious Bacterial-Diagnostic Department of SBI RS(Y) Children's City Clinical Hospital № 2 (CCCH№2). The analyses of 810 medical records of inpatient children with the diagnosis of rotavirus gastroenteritis were examined during the epidemic season 2012-2013. The prevalence rate of the rotavirus antigen in patients with the clinical picture of acute enteric infection was estimated on a basis of data from the clinical-diagnostic laboratory. The study of feces was conducted by immune chromatographic assay (IChA) for one-stage qualitative detection of rotavirus antigen by RotaStick (NOVamed Ltd, Israel) testing systems. The sensitivity of the testing system is 97.3%, specificity - 97.4%, the antigen luminal value - 106 particles/ml. For the comparative analysis of the long-term incidence of rotavirus infection in the republic and the Russian Federation, official statistics provided by the Directorate of Rospotrebnadzor for the Sakha Republic (Yakutia) were applied.

The research involved commonly used statistical methods; statistical processing and graphic presentation of the data are done with the use of standard Microsoft Office package programs (Excel, Word, 2010).

RESULTS AND DISCUSSION

Before 2008 the clinical laboratory diagnostics of rotavirus infection in the republic was possible only in the Virology Laboratory of the Center for Hygiene and Epidemiology in the Sakha Republic (Yakutia), which did not allow the total coverage with diagnostic tests. With the introduction of the laboratory diagnostics of rotavirus infection in the CCCH № 2 in 2008, the etiological decoding of acute enteric infections in children hospitalized in Yakutsk has been conducted regularly, so the present study covers the period from 2008 to 2013.

Over the past six years (2008-2013) in the republic there has been growth of the etiological role of viral agents of the gastrointestinal tract infectious pathology, their parameter increasing from 47.2% in 2008 to 73.2% in 2013 in the structure of causative agents of the acute enteric infections of proven etiology. The rotavirus infection accounts for up to 90% in the structure of viral enteric infections.

Since 2008 the incidence of rotavirus infection increased by three times, and at the end of 2013 it amounted to 85.4 per 100,000 people. Since 2009 the incidence in the republic has exceeded the average Russian incidence rate, with the latest figure at 19.3% in 2013 (Fig. 1).

In the Sakha Republic (Yakutia) the rotavirus infection is registered all-the-year-round and as in other regions of the country, it is characterized by winter-spring seasonal incidence rate from December to April with the peak in February-March. Such within-year incidence dynamics is confirmed by statistical data of the Infectious Bacterial-diagnostic department of the CCCH № 2. In the epidemic season 2012-2013, 66.6% of patients with laboratory-confirmed diagnosis of the rotavirus infection were hospitalized in the period from December to April with the maximum percentage of hospitalizations (34.1%) observed in February and March.

The main incidence of rotavirus infection occurs in the child population under 6 years, but with a different proportion of individual age groups. The maximum risk was noted among children at first year of life with average 47.8% in the course of six years of the study, followed by children of 1-2 years - 42%, 3-6 years - 8%, 7 - 14 years - 2%.

As mentioned above, the age group of the highest risk of rotavirus infection are children in their first year of life, whose incidence rates (937.3 - in 2008; 2,259.4 – in 2013) were higher than that of children under 14 years of age by 6-7 times (127.0 – in 2008; 381.0 – in 2013) during the analyzed period. (Fig. 2)

The share of children under 1 year hospitalized in the Children's City Clinical Hospital № 2 in the season 2012-2013 made 86.5%. A more detailed analysis of the age structure of the patients showed that 3.7% of the total number of children admitted to hospital were children under the age of 3 months, 15.8% - 6 months, 67% - 12 months. The percentage of children aged 18 months was 11.5%, 2 years - 2%. Thus, the results confirm that children of 1 year are the most vulnerable group to rotavirus infection in the republic.

The analysis of the incidence in pre-school children revealed that children attending daycare institutions of 3-6 years are more vulnerable than non-attending ones, since the former get infected through everyday contacts in kindergartens. The incidence in children attending kindergartens is 364.4 to 100,000 (61.3%), the incidence among children who do not attend child care centers - 230.4 to 100.000 (38.7%).

For 2008-2013 in the clinical-diagnostic laboratory of the CCCH № 2, the rotavirus nature of diarrhea was established in 2,954 children, or 23.1%, of 12,788 children with acute enteric infection with the use of immune chromatographic method. The high prevalence rate of rotavirus antigen was observed in the age group up to 2 years - 25.4% and from 3 to 6 years - 16.9%. In school-age children of 7-14 years this figure was 4.7% (Table).

The molecular-biological method used in other regions allowed to detect the rotavirus



diarrheal diseases with increased verification at 58.2%, which enables timely adjustment of causal treatment and rejection of antibacterial drugs, given the confirmed viral nature of the disease [2]. However, our study has testified that the rotavirus is widespread among children of the republic in the epidemic season.

The analysis of clinical incidences of the disease distinguished the following typical manifestations of rotavirus infection: symptoms of catarrhal inflammation of the upper respiratory tract were observed in 92% children of 6 - 12 months, and 87% in children older than 12 months. Symptoms of gastroenteritis with watery stool were observed in 91% children of 6-12 months, while 100% children were over 12 months old. It should be noted that in the early days of the disease the catarrhal syndrome prevailed, which resulted in referral diagnosis. The acute respiratory viral infection was diagnosed in 62% inpatients of 6-12 months and in 69% children over the age of 12 months. The diagnosis of acute enteric infection in the prehospital phase was made for 38% patients of 6-12 months and 31% patients over 12 months.

The vast majority in all age groups, or 92%, had temperature rise up to 37.5 - 39 C. 4% of the patients suffered from a fever reaction in 39 C and above, and 4% of the patients had a slight increase up to 37.5 C (Fig. 3).

The coprogram of sick children revealed neutral fats in moderate concentration in 91-100% of the cases, muscle fibers in 43-66, a small amount mucus in 13-17%.

Taking into account the fact that Yakutsk is a home to almost a third of the child population, and the CCCH № 2 also provides medical care to children from regions of the republic, results obtained in the study, including the incidence rates of rotavirus, can be extrapolated to the bulk of the child population.

Like any other infectious disease, the rotavirus infection can and should be prevented. Until recently the prevention of rotavirus infection was limited to sanitary-hygienic measures. In October 2012 the Russian Federation registered Rotatek, a vaccine against rotavirus, proven to be effective and safe means for specific prevention of rotavirus gastroenteritis in numerous clinical trials. In the Sakha Republic (Yakutia), the possibility to immunize infants appeared in 2014, and over this year, the preventive vaccination against rotavirus infection was provided to over 200 children. At present, the small coverage with immunization cannot significantly affect the incidence. However, following the recommendations of the World Health Organization, the annual increase of vaccination coverage will promote reduction of intensity of the rotavirus epidemic process, as well as decreasing the number of hospitalizations, outpatient visits and prevent fatalities.

CONCLUSION

The results of the study on the clinical and epidemiological features of rotavirus incidence of the child population of the Sakha Republic (Yakutia) show the higher prevalence rate of rotavirus infection in the structure of confirmed acute enteric infections (up to 90% of the cases) and demonstrates the growing trend every year.

The rotavirus infection is characterized by seasonality, with the maximum hospitalization of patients in the winter-spring season; it mainly affects children under the age of 2 years, with the maximum incidence at first year of life, though children under the age of 6 months are also involved in the epidemic process.

The leading syndromes of the disease include the syndrome of acute gastroenteritis, symptoms of catarrhal inflammation of the upper respiratory tract and the fever reaction.

Laboratory diagnostics of the rotavirus infection is carried out only in the city of Yakutsk; thus, the recorded incidence is incomplete to reflect the overall intensity of the epidemic process in the republic, it requiring the expansion and modernization of laboratory facilities, introduction of high-tech methods of research, re-examination of the rotavirus infection.

It is necessary to get the maximum immunization coverage; therefore, listing of the vaccination against rotavirus infection in the Regional Calendar of Preventive Vaccinations in the Sakha Republic (Yakutia) should be considered as a priority.

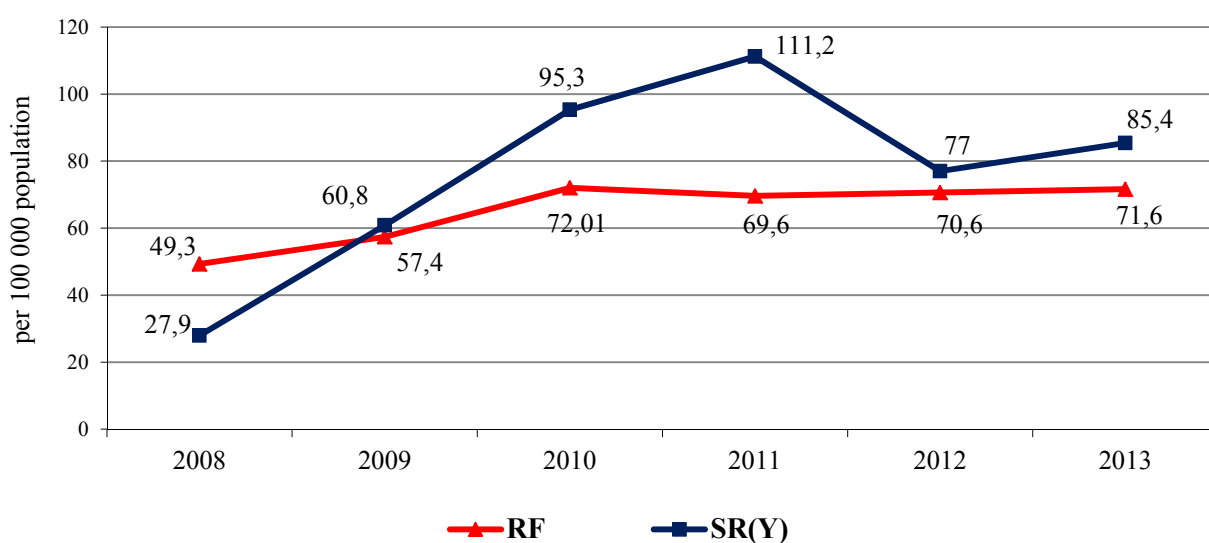


Fig. 1. Rotavirus incidence rates in the Sakha Republic (Yakutia) and the Russian Federation, 2008 – 2013

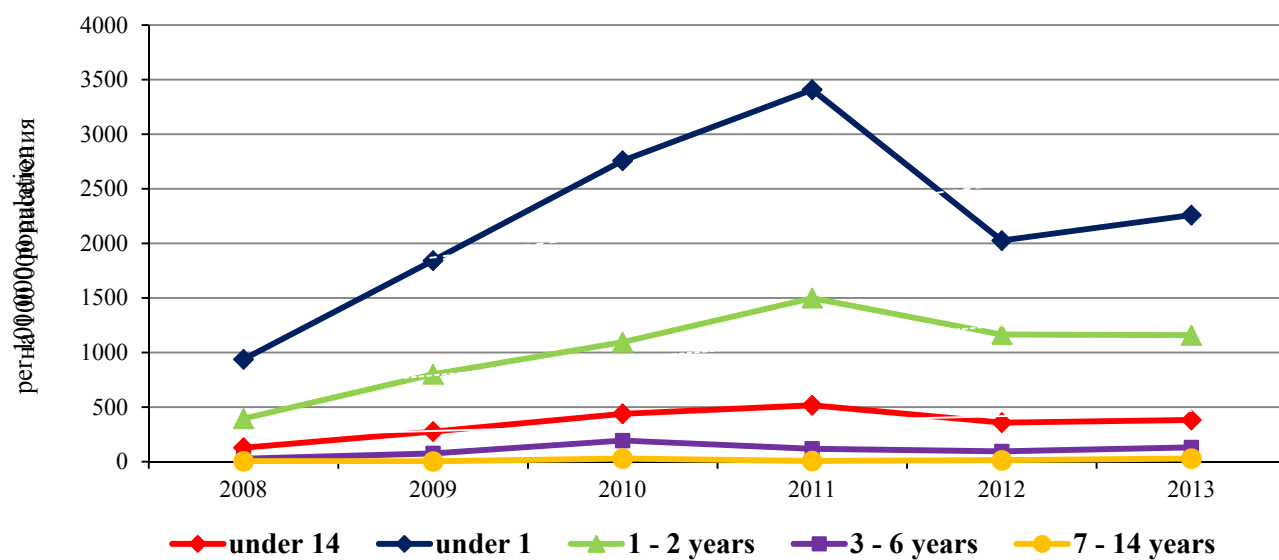


Fig. 2. Rotavirus incidence at children in the Sakha Republic (Yakutia), 2008 – 2013

Rotavirus antigen detection rate in the clinical material of the patients with acute enteric infection

Years	Examined in total	Incl. (+) for rotaAG		0-2 years			3-6 years			7-14 years		
				Total	Incl. (+) for rotaAG		Total	Incl. (+) for rotaAG		Total	Incl. (+) for rotaAG	
		abs.	%								abs.	%
2008	1257	42	3.3±0.5	1077	35	3.2±0.5	128	7	5.5±2.0	52	0	0.0±0
2009	2725	512	18.8±0.7	2175	476	21.9±0.9	488	35	7.2±1.2	62	1	1.6±1.6
2010	1456	557	38.3±1.3	1120	446	39.8±1.5	278	108	38.8±2.9	58	3	5.2±2.9
2011	2801	918	32.8±0.9	2156	737	34.2±1.0	513	176	34.3±2.1	132	5	3.8±1.7
2012	2781	708	25.5±0.8	2098	660	31.5±1.0	574	44	7.7±1.1	109	4	3.7±1.8
2013	1768	217	12.3±0.8	1183	176	14.9±1.0	355	24	6.8±1.3	230	17	7.4±1.7
Total:	12788	2954	23.1±0.4	9809	2530	25.8±0.4	2336	394	16.9±0.8	643	30	4.7±0.8

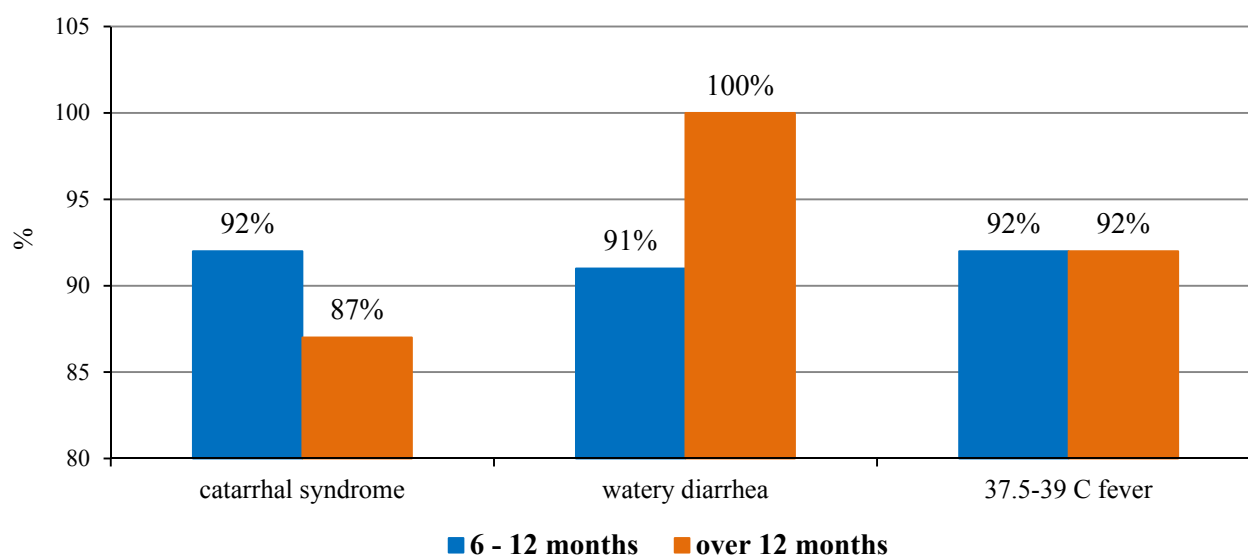


Fig. 3. Main rotavirus symptoms at patients treated at the Children City Clinical Hospital No. 2



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