ANNALES
UNIVERSITATIS MARIAE CURIE-SKŁODOWSKA
LUBLIN — POLONIA
VOL. LV, 10 SECTIO D 2000

Department of Neonatal, Infants Pathology, and Cardiology; University School of Medicine, Lublin
Klinika Patologii Noworodków, Niemowląt i Kardiologii Akademii Medycznej w Lublinie

GRAŻYNA POLKOWSKA, MARIA KĄTSKA, MARIA KARSKA, ANNA KUDLICKA, BARBARA WILCZYŃSKA, ELŻBIETA WÓJCIK-SKIERUCHA, HANNA CHRZĄSTEK-SPRUCH

Rotaviral diarrhoea in hospitalised children up to 2 years

Biegunki rotawirusowe u dzieci do lat 2 leczonych w warunkach szpitalnych

INTRODUCTION

Rotaviruses that were found in 1973 by R. Bishop, belong to *Reoviridae* family, and *Rotavirus* genus. These RNA viruses are wide spread in all World. Observations made in several Polish centers show that also in our country rotaviral diarrhoea forms essential clinical problem in children. Based on studies from numerous countries it is now well known that human rotaviral (HRV) infections are the most common reason for acute diarrhoea in the youngest children in age from 6 months to 2 years, and it might have seasonal occurrence. The source of infection are ill and carrier subjects. The virus is very resistant on activity of physical and chemical factors, it is transmitted through alimentary route, but droplet infection is also possible [4]. Etiopathogenesis of the rotaviral diarrhoea is not fully recognised and understood. However it is now accepted that the viruses infect and destroy small bowel enterocytes, but probably an important role plays the enterotoxin NSP4 [10].

The aim of this prospective study was to: 1) assess the prevalence of rotaviral infections in children hospitalised because of acute diarrhoea; 2) analyse season incidence of HRV infections; 3) evaluate role of HRV in the etiology of nasocomial infections; and 4) analyse clinical picture of acute rotaviral diarrhoea.

MATERIAL

The study was conducted from 1st of January 1996 to 31st of December 1999 at the Department of Neonatal, Infants Pathology, and Cardiology of the Medical University School of Lublin. In this period of time, 4401 children ageing from 1 day (new-

borns) to 2 years were hospitalised. Six hundred and three children with acute diarrhoeal syndrome, i.e. 13.7% of all hospitalised children, were included in the study.

Children with acute diarrhoea were grouped according to etiologic factor based on results of faecal test (stool cultures). Groups of children with HRV infections and children with diarrhoea of different aetiology were established. Children with HRV diarrhoea were further subdivided into 2 groups: 1) children with nasocomial inefctions; and 2) children with HRV infection that was the reason for the hospitalisation. Nasocomial infection was defined as infection that became symptomatical after 72 hours of hospitalisation and it was possible to document a contact with infected person in the ward.

Clinical course of the disease was analysed in children. Especially the following features were recorded: duration and character of diarrhoea, vomiting, body temperature, symptoms of dehydration, acidosis, and other infections.

METHOD

In all children with acute diarrhoeal syndrome, at least one stool examination for HRV was done. Stool samples were also routinely examined for Salmonella and Shigella (SS). Rotaviral antigens in stool samples were determined using latex test *Slidex Rota 2* (Bio–Merieux, France).

RESULTS

Out of 603 children hospitalised due to acute diarrhoea, rotaviral aetiology was found in 151 patients (25%). Bacterial (SS) infection was found in 16 (3%) children, whereas in 436 (72%) children a definite etiologic factor could not be determined.

A trend toward increasing role of HRV infection as the etiologic factor of acute diarrhoea was found over the study period: 1996 — 8%, 1997 — 9%, 1998 — 39%, and 1999 — 37%. The majority of rotaviral infections (119/151, 79%) was observed from beginning of November till the end of April every year. Peak incidence of HRV infections was noted in November (37/151, 24%) (Figure 1).

Nasocomial HRV infections were confirmed in 56% (84/151) of patients. In consecutive years of the study period, nasocomial infection rate among patients with HRV diarrhoea ranged from 38% to 60% (Figure 2). Nasocomial infections were reason for prolonged hospitalisation (on average 4 days).

Rotaviral diarrhoea occurred significantly more common in children of age between 6 and 24 months (110/151, 73%), than in newborns and younger infants (41/151, 27%; $p < 0.001$, test chi^2). HRV infections were detected significantly more frequent in children on artificial feeding (117/151, 77%), than in children on natural (breast) feeding (34/151, 23%; $p < 0.001$, test chi^2).

Initially and usually after short (1–3 days) incubation period, upper respiratory tract infection symptoms were observed in 52% (79/151) of children with acute rotaviral diarrhoea. Subsequently in 74% (112/151) of children, fulminant vomiting was

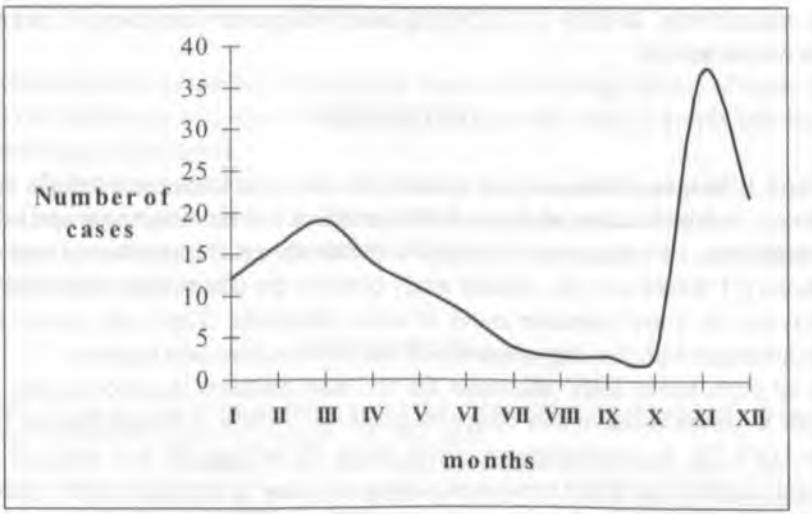

Figure 1. Season incidence of rotaviral diarrhoea over the 4 year (1996–1999) study period

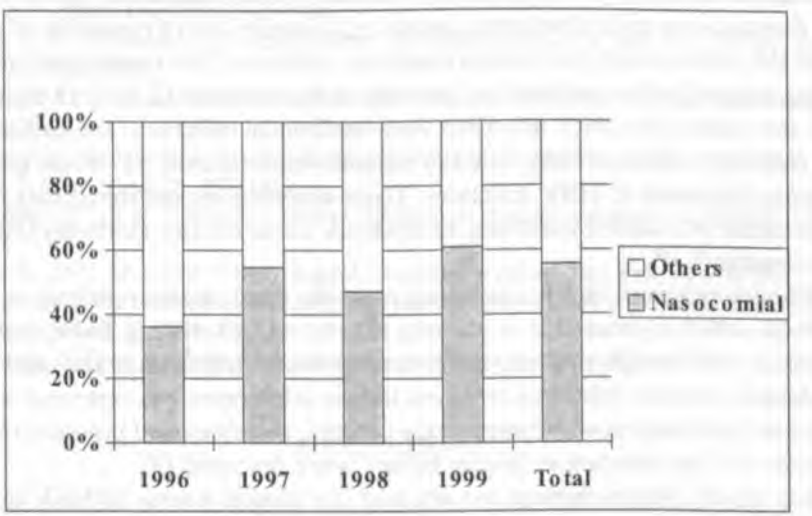

Figure 2. Incidence of nasocomial HRV infections over the study period

observed that lasted 1–2 days, and proceeded occurrence of watery diarrhoea in 94% (142/151) of children. This watery diarrhoea persisted for 8 days at mean. In 71% of children these symptoms were associated with fever (>37,6°C). Dehydration was observed in 51% (77/151) of children, and it was isotonic dehydration in 90% of cases. Neurological symptoms and metabolic acidosis were detected in 18% and in 23% of

cases, respectively. In 81% (123/151) of cases, temporary elevation of hepatic enzymes was observed.

DISCUSSION

Untill 1950 it was believed that bacteria are the most common etiologic factor of diarrhoea in children. Introduction of the antibiotics to the treatment and advances in identification of viruses have changed dramatically current opinion on aetiology of diarrhoea [7]. Results of the present study confirm the observation that rotaviral infections are the most common cause of acute diarrhoea. Their role as an etiologic factor increases with the improvement of the life standard and hygiene.

In all populations HRV infections are the most frequent cause of serious gastroenteritis in young children and this corresponds to 20-50% of hospitalisation because of the HRV [3]. In developing countries about 80 millions of new cases of serious rotaviral diarrhoea is noted every year, being the cause of death in about 1 million of children [5]. Similarly in the present study, 25% of HRV infections among children with acute diarrhoea decided that HRV was the most frequently diagnosed etiologic factor of acute diarrhoea.

Nasocomial infections became serious clinical problem because of high infectiousness, resistance on basic disinfecting agents, and usually lack of possibility of separation of the children with this form of diarrhoea. Moreover, the nasocomial infections prolong hospitalisation and increase the costs of the treatment [2, 6, 8]. In the present study, over half of the HRV infections were nasocomial infections. Intensification of their frequency was especially noted in autumn-winter season, i.e. in the period of increasing incidence of HRV infections. These observations confirmed data on season incidence of rotaviral infections. In moderate climate major morbidity (80%) occurs in winter [1, 5].

Although prognosis in HRV diarrhoea is usually good, characteristic acute watery diarrhoea, which is proceeded in majority of children by vomiting, fever, and upper respiratory tract symptoms, may easily lead to heavy dehydration and acidosis. In complicated rotaviral infections transient lactose intolerance was observed, whereas in patients with immuno-deficiency serious chronic diarrhoea and presence of extraenteric foci of the infection in liver or kidneys were described [9].

Since mostly young children are affected, the clinical course of HRV infection might be serious. Frequent nasocomial HRV infections refer to children with serious concomitant diseases and in this manner they increase the risk of complications and mortality. Therefore, it seems mandatory to use prophylaxis of HRV infections. So far in Poland the most effective prophylactic method is breast feeding. Natural feeding contains anti-HRV antibodies (IgA) [12]. Future research in the filed of HRV infections is directed onto: elaboration of effective active (specific vaccines) as well as passive (hyperimmunised cow milk) prophylaxis, and modification of content of intestinal bacterial flora by applying of probiotics (*Bifidobacterium*, *S. thermofilus*) [11].

CONCLUSIONS

1. Rotaviral infection is the most frequently diagnosed etiologic factor of acute diarrhoea in children up to 2 years. A wide use of diagnostic tests to detect infection of this aetiology is indicated.
2. Nearly all rotaviral infections were observed in autumn-winter season.
3. HRV is an important cause of nasocomial infections in pediatric ward.
4. Dominant clinical symptoms are watery diarrhoea, vomiting, fever, and respiratory tract infection symptoms.

REFERENCES

1. *Bartlett A.V., et al.*: Rotavirus in infant-todler day care centers: Epidemiology releveant to disease control stratiegies. J. Pediatr. 133, 435, 1988.
2. *Dziechciarz P., et al.*: Wewnątrzoddziałowe zakażenia rotawirusami. Ped Pol 72, 499, 1997.
3. *Glass R.J.*: The epidemiology of rotavirus diarrhoea in the United States: Surveillane and estimates of disease burden. J. Infect. Dis. 174 (Suppl. 1), 5, 1996.
4. *Haffejee I.E.*: The epidemiology of rotavirus infectuions: A global perspective. J. Pediatr. 20, 275, 1995.
5. *Ho M.S., et al.*: Rotavirus as a cause of diarrheal morbidity and mortality in the United States. J. Infect. Dis. 158, 1112, 1988.
6. *Jarvis W.R.*: Epidemiology of nasocomiasl infections in pediatric patients. Pediatr. Infect. Dis. J 6, 344, 1987.
7. *Levinson S.S.*: Introduction to the pathogenic human retroviruses. J. Clin. Immunol. 11, 103, 1989.
8. *Pacini D.L.*: Nasocomial rotaviral diarrhoea: Pattern of spread on wards in children's hospital. J. Med. Virol. 23, 297, 1987.
9. *Saulsbury F.T, et al.*: Chronic rotavirus infection in immunodeficiency. J. Pediatr. 97, 61, 1980.
10. *Szajewska H., Albrecht P.*: Ostre biegunki wirusowe u dzieci. Ped. Pol. 72, 495, 1997.
11. *Tucher A.W.*: Cost-effectiveness analysis of rotavirus immunisation program in the United States. JAMA 279, 1371, 1998.
12. *Zalewski T., Pluta A.*: Zakażenia jelitowe rotawirusem. Ped. Pol. 57, 7, 1982.

STRESZCZENIE

Odkryte w 1973 r. przez R. Bishop rotawirusy należą do rodziny Reoviridae, rodzaju Rotavirus. Obecnie na podstawie badań przeprowadzonych w wielu krajach wiadomo, że zakażenia rotawirusami (HRV; ang. human rotavirus) są najczęstszą przyczyną ostrych biegunek szczególnie u dzieci najmłodszych do 2 r.ż.

Celem niniejszej prospektywnej pracy była: 1) ocena częstości występowania rotawirusów u dzieci hospitalizowanych z powodu ostrej biegunki; 2) analiza sezonowości występowania zakażeń HRV; 3) ocena roli HRV jako czynnika etiologicznego zakażeń wewnątrzszpitalnych; oraz 4) analiza obrazu klinicznego ostrych biegunek rotawirusowych.

W okresie od 01.01.1996 do 31.12.1999 w Klinice Patologii Noworodków i Niemowląt AM w Lublinie hospitalizowano 4401 dzieci w wieku od 1 d.ż do 2 r.ż. Badaniami objęto 603 (13,7%) dzieci leczonych z powodu ostrej biegunki. U wszystkich dzieci wykonywano badanie kału w

kierunku HRV (ang. human rotavirus) przy użyciu test lateksowego (Bio–Merieux, Francja).

Etiologię rotawirusową stwierdzono u 151 chorych, co stanowiło 3,4% hospitalizowanych dzieci. W ciągu 3 ostatnich lat zaobserwowano wyraźny wzrost infekcji HRV. Największą liczbę ostrych biegunek rotawirusowych obserwowano co roku w listopadzie. Wewnątrzoddziałowe zakażenie HRV wystąpiło u 84 dzieci, stanowiąc 1,7% ogółu hospitalizowanych dzieci, a 55,6% dzieci z biegunkami rotawirusowymi. Biegunki rotawirusowe znacznie częściej występowały u niemowląt i dzieci starszych, niż u noworodków, częściej u dzieci karmionych sztucznie. W przebiegu zakażenia HRV biegunka wodnista wystąpiła u 94%, wymioty u 74%, podwyższona ciepłota ciała u 71%, a objawy infekcji układu oddechowego u 52% dzieci.

Wnioski: 1) Rotawirusy są najczęstszą ustaloną przyczyną ostrych biegunek u dzieci do 2 r.ż. Wskazane jest powszechne wprowadzenie testów do wykrywanie zakażeń o tej etiologii; 2) Szczyt infekcji HRV odnotowywuje się w miesiącach jesienno–zimowych; 3) Zakażenia HRV są istotną przyczyną zakażeń wewnątrzoddziałowych w pediatrii; 4) Dominującymi objawami klinicznymi były wodnista biegunka, wymioty, podwyższona temperatura ciała i objawy infekcji dróg oddechowych.