

CLINICAL AND EPIDEMIOLOGICAL FEATURES OF SALMONELLOSIS IN EARLY AGE CHILDREN

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Abstract. *The brief review of modern clinical and epidemiological features of salmonellosis in children is submitted. Results of studying of clinic and epidemiology of salmonellosis in early age children are presented. The clinical and epidemiological differences related with age of patients and serotype of microorganism are marked.*

Keywords: *a salmonellosis, early age children, epidemiology, clinical features.*

Introduction

Salmonellosis is a widespread infectious disease. The current trend in the incidence of coronavirus disease is observed throughout the world. The incidence in different countries is not the same. The risk group for salmonellosis infection is young children. For example, in the United States, according to the Centers for Disease Control and Prevention, more than 40,000 cases of salmonellosis are reported annually, about a third of which occur in children under the age of five. Traditionally, the incidence of salmonellosis is believed to be highest among children in the first year of life and reaches its peak in the second month of life. Infants usually become infected at home from their mother or other relatives. In such cases, the source of infection is humans, and the main routes of transmission are contact transmission through additional food products and food transmission. There are reports in the literature of nosocomial cases of Salmonellosis typhi murium, and the main route of transmission is through household contact. Children in the first year of life and especially the first months of life are most susceptible to nosocomial salmonellosis. Nosocomial transmission of Salmonella Typhi murium in children is greatly facilitated by a decrease in the resistance of the child's body due to underlying somatic or infectious diseases and deterioration of the pre-morbid condition, as well as the spread of more virulent strains of S. Typhi murium in the nosocomial environment. Low invasive (S. Derby), moderate (S. Typhi murium and S. Enteritidis) and highly invasive (S. Cholerae suis) serovars were identified as causes of invasive infections in children. According to many authors, S. Typhi murium is the main pathogen outside of intestinal salmonellosis; in salmonellosis caused by S. Typhi murium, the incidence of damage to the distal intestine is higher, which may be due to the greater invasiveness of S. Typhi murium compared to other serogroups that currently predominate. According to many authors, with salmonellosis, macroscopically detected blood in the stool is a risk factor for the development of bacteremia and extraintestinal manifestations. According to foreign authors, the frequency of prolonged salmonellosis in children of the first year of life is 11-34%, relapses - 15%, prolonged bacteremia - 32%. There is evidence that the disease caused by S. Typhi murium is more severe than that caused by S. Enteritidis. Many authors note prolonged asymptomatic bacteremia after the onset of the disease. Thus, in 60% of children under the age of 5 years, salmonella was isolated 20 weeks after clinical recovery, and in approximately 5% of children, the isolation of this microorganism continued a year later.

Materials and methods

In the period from 2023 to 2024, 42 children under the age of 3 years (0-36 months) were observed in the Fifth City Children's Infectious Diseases Hospital with gastrointestinal salmonellosis; 23 (54.8%) cases were caused by *S. Typhi murium* strains and 19 (45.2%) by enteritidis strains; There were significantly more resistant and multiresistant strains of *S. Typhi murium*. Therefore, to assess the effect of antibiotic resistance on the course and epidemiology of the disease, a group of children with Salmonellosis *Typhi murium* and a comparison group of children with Salmonellosis Enteritidis were used as the main group. A comprehensive examination included anamnesis, life history, clinical examination, complete clinical blood count, urinalysis, examination of the parathyroid glands and bacteriological examination of feces. For each patient, an epidemiological history was determined, including various characteristics, including nutritional status (natural or artificial nutrition of children under 1 year of age, information about products that may be associated with the development of the disease), contact with patients with acute intestinal infections (salmonellosis in the patient's family), previous diseases, intestinal tract infections, etc. The analysis included data on the patient's health status, as well as information on the history of his admission to the hospital. The contact route of transmission was confirmed by the presence of bacteriologically confirmed salmonellosis in the patient's family members or other contact persons, including asymptomatic carriage in the mother, and the absence of obvious symptoms of foodborne transmission. The food route of transmission was established if there were clear signs of the disease after eating certain foods and signs of clustered disease in the family. Since bacteriological confirmation of the role of food in disease causation has generally not been carried out, analytical data on foodborne transmission routes are unreliable. Relapse was defined as repeated cases occurring more than 14 days after clinical recovery, provided that the same *Salmonella* serotype was isolated in the first and repeated cases. Conditions such as prematurity, anemia, rickets, short stature and atopic dermatitis were considered as aggravated premorbid conditions. In all cases, the diagnosis of salmonellosis was made on the basis of clinical and epidemiological data and bacteriological confirmation. The nature of the initial period of the disease, the severity and duration of clinical symptoms, the timing of normalization of clinical and laboratory parameters, and the effectiveness of bacteriological hygiene after clinical recovery were assessed. Considering the statistically significant differences in the composition of the groups depending on the age of the patients (the average age of patients with Salmonellosis *typhi murium* was 14.78 ± 0.78 months, Salmonellosis enteritidis - 17.32 ± 0.84 months, $p = 0.027$). During the study, a division into age subgroups was carried out, identifying subgroups of patients aged 0 - 6 months, 25 - 36 months. Thus, it was possible to reliably assess the differences in the clinical course and epidemiological features of the disease Salmonellosis *typhi murium* and Salmonellosis enteritidis, regardless of differences in the age structure of the groups. Selected groups and subgroups are assigned designations:

- STm 0–36 — patients with salmonellosis typhimurium aged 0–36 months ($n = 23$);
- STm 0–6 — patients with salmonellosis typhimurium aged 0–6 months ($n = 7$);
- STm12–36 — patients with salmonellosis typhimurium aged 12–36 months ($n = 16$);
- SEn 0–36 — patients with salmonellosis enteritidis aged 0–36 months ($n = 19$);
- SEn 0–6 — patients with salmonellosis enteritidis aged 0–6 months ($n = 6$);
- SEn12–36 — patients with salmonellosis enteritidis aged 12–36 months ($n = 13$).

It was not possible to divide the group of patients with salmonellosis typhimurium into subgroups based on differences in the levels of pathogen resistance (susceptible and resistant

strains), since more than 90% of the strains were multiresistant (resistant to 4 or more antibacterial drugs), about 60% of the strains were resistant to 6–7 drugs.

Results and discussion.

For enteric salmonellosis, foodborne transmission was more common in all age groups. The contact and household route of transmission was equally frequent in the main and control groups with some differences depending on the age of the patient (not statistically significant). Infection with *Salmonella typhi* murium often occurred after hospitalization in various non-infectious hospitals. Thus, 40.5% of patients with *Salmonella typhi* murium under the age of 6 months received hospital treatment the day before and were transferred to an infectious diseases hospital and gave birth within a week after the end of hospitalization. In two patients with *Salmonella typhi* murium, hospitalization was associated with relapse—symptoms of the disease recurred more than 14 days after clinical recovery. These patients were 5 and 13 months old. The proportion of premature children was the same in the main and control groups, but in the age group of 0-6 months, the only premature children were patients with *Salmonella typhi* murium. Slightly more patients with *Salmonella typhi* murium had a worse pre-disease background, but there were no statistically significant differences in any of the age groups. Characteristic features of hospital strains are multiple resistance to antibiotics, lack of sensitivity to typical bacteriophages, and the ability to remain viable for a long time in the external environment; according to L.N.Milyutina, in cases of nosocomial infection of pediatric *Salmonella typhi* murium, multidrug-resistant strains were found 10.6 times more often than susceptible strains were isolated from susceptible strains. Considering the statistically significant differences in the epidemiology of *Salmonellosis typhi* murium (higher probability of nosocomial infection in the younger age group and higher probability of foodborne transmission in the age group 13-36 months), the level of drug resistance of *S.Typhi* murium isolated from children aged 6 months, was rated as high. The development of this disease is often facilitate by various background conditions (prematurity, short stature, anemia, congenital malformations, pathology of the central nervous system), which require long-term hospital treatment and, therefore, increase the risk of nosocomial infection. To test this hypothesis, the results of microbiological monitoring of antibiotic resistance of *Salmonella* were analyzed: age groups were divided into 0 - 6, 12 and 36 months; for each strain of *S. Typhi* murium, the number of resistant or moderately resistant antimicrobial drugs was determined; for each strain of *S.Typhi* murium, the number of resistant or moderately resistant antimicrobial drugs was determined; For each strain of *S.Typhi* murium, the number of resistant or moderately resistant antimicrobials was determined. Most strains were resistant to four to seven of the eight drugs tested. For each age group, the average number of antimicrobial drugs to which *S. Typhi* murium was resistant was calculated. The obtained values for different groups were compared with each other using the Student t-test and the corresponding significance level P. The results are presented in the Table

Levels of antibiotic resistance of S.Typhi murium in different age groups

| | 0–6 months, n = 7 | 7–12 months, n = 6 | 25–36 months, n = 10 |
|---|-------------------|--------------------|----------------------|
| Number of antibacterial drugs to which there is resistance, M ± m | 5,41 ± 0,14 | 5,24 ± 0,20 | 5,34 ± 0,14 |

Considering the similarity of the prevailing resistance profiles of *S. Typhimurium* isolated from adults and young children, a conclusion was made about the commonality of epidemiological processes occurring in the adult and child populations. Despite the different routes of infection with salmonellosis typhi murium in different age groups, the etiological agents of this disease in all age groups are multidrug-resistant strains with similar levels of drug resistance and antibiotic resistance profiles.

The time frame for normalization of clinical and laboratory parameters is higher with salmonellosis typhimurium. The differences are statistically significant in all age subgroups. During a bacteriological examination of the feces of a number of patients, along with salmonella, concomitant opportunistic microflora was found: *Staphylococcus aureus*, *Klebsiella* spp., *Proteus* spp., *Citrobacter* spp. Concomitant opportunistic microflora was isolated in 19.6% of patients from the main group and 28.1% of patients from the control group. A control bacteriological study was carried out 10–21 days from the onset of the disease after normalization of clinical and laboratory parameters to confirm bacteriological sanitation. Repeated isolation of *Salmonella* was detected in 22.1% of patients from the main group and 8.9% of patients from the control group. The frequency of re-isolation of *Salmonella* after clinical recovery decreased with the age of the patients.

Conclusion

1. Statistically significant differences in the supposed mechanisms of infection in the main and control groups were revealed. The food route was recorded more often for salmonellosis enteritidis in all age groups. Household contact was recorded with the same frequency in the study and control groups; some differences were associated with the age of the patients. Salmonellosis typhimurium more often developed after previous hospitalization in various non-infectious hospitals.

2. Differences were found in the frequency of occurrence of some epidemiological factors (the proposed mechanism of infection, previous hospitalization in non-infectious hospitals) in different age subgroups, most noticeable with salmonellosis typhimurium. Despite the pronounced differences in the mechanisms of infection with salmonellosis typhimurium in children in different age groups, the levels of antibiotic resistance and antibiotic resistance profiles of pathogens were the same in all groups and did not differ from the resistance levels of *S. Typhimurium* strains isolated from adult patients.

3. In a number of cases of salmonellosis, especially in children of the first year of life, a non-smooth wave-like course of the disease was noted with two or three peaks of temperature rise, deterioration in general condition and an increase in the frequency of stools. The frequency of development of a wave-like course of salmonellosis depended not only on the age of the patient, but also on the serotype of the pathogen; more often, a wave-like course was observed with salmonellosis typhimurium.

4. Bacteriological sanitation after clinical recovery was more often observed with salmonellosis enteritidis. The frequency of repeated bacterial isolation for salmonellosis typhimurium was 21%.

REFERENCES

1. Милютин Л.Н., Рожнова С.Ш., Цешковский И.С. Клинические аспекты лекарственной резистентности сальмонелл

2. *Pediatric Infectious Disease Journal*. Vol. 16. — P. 277–283. 9. Gonera E. Salmonellosis in Poland in 2000
3. *Przegl. Epidemiol.* — 2002. — Vol. 56. — P. 275–284. 10. Haddock R.L. The origins of infant salmonellosis
4. *Scandinavian Journal of Infectious Diseases*. — 2001. — Vol. 33. — P. 681–685. 13. McCall B.J., Bell R.J., Neill A.S. An outbreak of *Salmonella* Typhimurium phage type 135a in a child care centre
5. *Communicable Diseases Intelligence*. — 2003. — Vol. 27. — P. 115. 14. Nelson S.J., Granoff D. *Salmonella* gastroenteritis in the first three months of life
6. *International Journal of Food Microbiology*. — 2000. — Vol. 62. — P. 1–5
7. Пименов Н.В. журнал «Микробиология» том 92 N1 февраль 2023
8. Журнал микробиологии, эпидемиологии и иммунобиологии *Journal of Microbiology, Epidemiology and Immunobiology*, ЖМЭИ том 100, N6 2023
9. Журнал «Антибиотики и химиотерапия», том 68, №5-6, 2023 Пименов.Н.В.
10. Bolalarda o'tkir diareya kasalliklari O'quv qo'llanma 2023 175-097 Yusupov A.S.
11. Течение Сальмонеллеза у детей, вызванный *Salmonella* Typhi murium устойчивости к антибиотикам - Журнал биомедицины и практики стр. 235-240 2021 Юсупов А.С., Мирисмоилов М.М., Рашидов Ф.А.