

# Clinical features and course of salmonellosis among children in a comparative perspective on the modern stage

Akerke Jarbolova<sup>1</sup>, email: jarbolovaa@gmail.com,  
 Nazira Nurgain<sup>1</sup>, email: nazadai@mail.ru, Laila Kenenbayeva<sup>1</sup>,  
 Ayzhuldiz Dauletkeledi<sup>1</sup>, Roza Zhumabay<sup>1</sup>, Akbota  
 Mazhibayeva<sup>1</sup>, Mombek Tolenov<sup>1</sup>

<sup>1</sup>Department of Childhood Infections, Asfendiyarov Kazakh National Medical University, Almaty, Kazakhstan

salmonellosis caused by *S. enteritidis*. Efficiency of etiotropic treatment at the present stage of salmonellosis caused by control pathogens achieved mainly by using aminoglycosides.

**KEYWORDS:** infectious disease, salmonellosis, salmonella enteritidis, antibiotics, aminoglycosides

## INTRODUCTION

The identification of Salmonellosis, including cases caused by rare serotypes became more frequent in recent years. Cases of salmonellosis among the children at the age of first year are increasing. The features of salmonellosis at this age are severe course of localised forms and high mortality in generalised forms [1]. The purpose of the research is to study the clinical course of salmonellosis in children caused by different serogroups of Salmonella - *S. enteritidis* and *S. virchow*. The objectives of the study are to set the clinical features of Salmonella infection caused by different serogroups in children of all ages at the present stage, make a comparative study of clinical and laboratory parameters of salmonellosis caused by *S. enteritidis*, and *S. virchow*, in children and to establish the most efficient etiotropic treatment (in vivo and in vitro) of salmonellosis in children caused by both *S. enteritidis* and *S. virchow* [3].

## METHODS

Two groups of children with salmonellosis caused by different serogroups - Salmonella enteritidis, which belong to a group D in the classification nomenclature - (hereinafter Group 1) and Salmonella virchow, belonging to the group C - (hereinafter - Group 2) and received inpatient treatment at the Children's State Hospital of Infectious Diseases in Almaty were observed [2]. The number of children in each test group were 30 (100%).

Identification of agent held by traditional method of bacteriological research - by bacteriological seeding patient's feces [4].

## RESULTS

Boys often suffered from salmonellosis caused by *S. enteritidis* - 76,7% ± 8,8 (\*\*P<0,01), *S. virchow*

## ABSTRACT

### BACKGROUND

The identification of Salmonellosis, including cases caused by rare serotypes became more frequent in recent years. This is the first comparative characteristic of Salmonella infection in children of different ages, caused by *S. virchow*, which became etiologically diagnosed in Almaty in recent years, with the frequent etiologically defined salmonellosis caused by *S. enteritidis* on a modern stage.

### METHODS

Two groups of children with salmonellosis caused by different serogroups - Salmonella enteritidis, which belong to a group D in the classification nomenclature - (hereinafter Group 1) and Salmonella virchow, belonging to the group C - (hereinafter - Group 2) and received inpatient treatment at the Children's City Hospital of Infectious Diseases in Almaty were observed. The number of children in each test group was 30 (100%).

### RESULTS

Salmonellosis caused by *S. enteritidis* occurs in children more often than salmonellosis caused by *S. virchow*. Boys often get sick in Group 1 and no sex differences were found in Group 2. Salmonellosis caused by both pathogens most commonly affects children at the age of the first year of life. The main syndromes of intestinal damage in salmonellosis of both group were gastroenterocolitis, and enterocolitis. Invasive diarrhea occurred with equal frequency in both groups. Salmonellosis caused *S. enteritidis* proceeded more as a mixed infection. Salmonellosis caused *S. virchow* disease occur equally often as monoinfection and mixinfection. Drugs of choice in antibiotic therapy of salmonellosis in the two study groups of children were aminoglycosides of 2nd and 3rd generation.

### CONCLUSION

Children at the age of the first year of life suffer from salmonellosis caused as *S. enteritidis*, and *S. virchow* more often than children of other ages. Gastrointestinal form with non-severe toxicity and dehydration prevalent among the clinical forms of salmonellosis in control groups. Mixed infection form is more common for

hurts boys and girls equally often -  $60,0\% \pm 11,5$  and  $40,0\% \pm 14,1$  respectively.

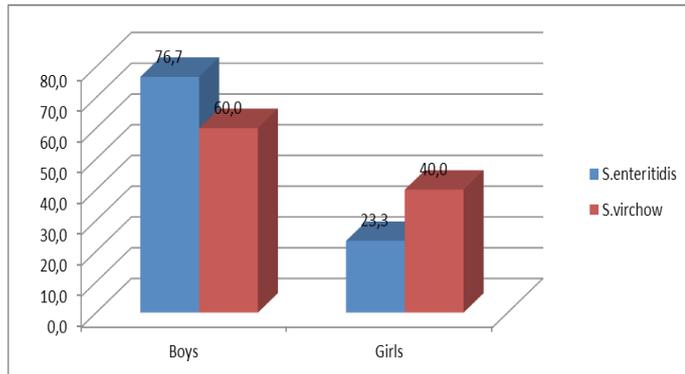


Diagram №1 Sexual differences in salmonellosis in children (%)

Children in the age group up to 1 year most frequently suffered from salmonellosis caused by S. enteritidis -  $73,3\% \pm 9,4$  (\*\*  $P < 0.01$ ), as well as salmonellosis caused by Salmonella virchow -  $56,7\% \pm 12,0$ .

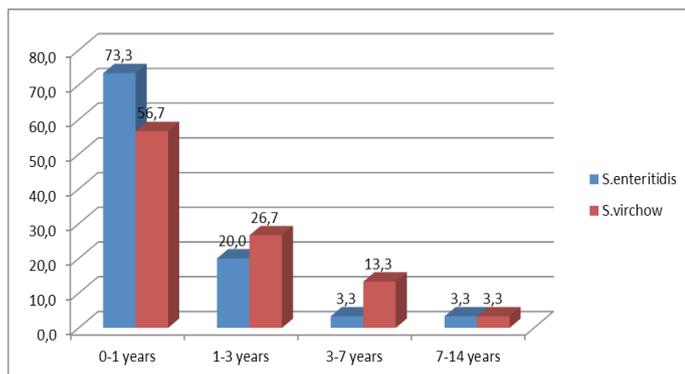


Diagram №2. Age features of occurrence of salmonellosis caused by S. enteritidis and S. virchow (%)

Salmonellosis caused by S. enteritidis as well as S. virchow proceeded in most cases in the moderate form  $83,3\% \pm 7,5$  and  $80,0\% \pm 8,2$ , respectively (\*\* $P < 0.001$ ). In the Group 1 disease often proceeded in the form: gastroenterocolitis and enterocolitis  $43,3\% \pm 13,7$  (\*\*  $P < 0.01$ ) and  $46,7\% \pm 13,3$ , respectively (\*\* $P < 0.001$ ), as in Group 2 -  $43,3\% \pm 13,7$  and  $33,3\% \pm 14,9$  respectively.

In both groups, in 100% of cases the disease begins acutely with symptoms of intoxication and diarrheal syndrome. Fever occurred in both study groups – in  $70,0\% \pm 10,0$  and  $70,0\% \pm 10,0$  of cases respectively. In this febrile and high body temperature also occurred equally often (febrile and high body temperature in Group 1 -  $57,1\% \pm 14,3$  and  $33,3\% \pm 17,8$ , respectively, in Group 2 -  $52,3\% \pm 15,1$  and  $33,3\% \pm 17,8$ . The duration of fever in most cases lasted up to

3 days (\*\* $P < 0.001$ ) in both groups  $85,7\% \pm 8,2$  and  $90,5\% \pm 6,7$  respectively.

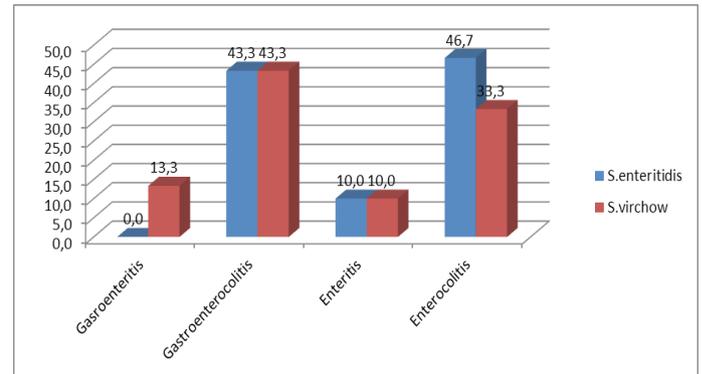


Diagram №3. The incidence of gastrointestinal lesions syndromes in salmonellosis caused by S. enteritidis and S. virchow (%)

Vomiting as a symptom of acute intestinal infection occurred in half of the cases of disease caused by both S. virchow -  $60,0\% \pm 11,5$ , and S. enteritidis -  $43,3\% \pm 14,1$ . In most cases in both studied groups salmonellosis proceeds as invasive diarrhea: in the Group 1 -  $89,3\% \pm 6,2$ , in the Group 2 -  $78,6\% \pm 8,7$  (\*\* $P < 0.001$ ).

Also, the multiplicity of feces more than 5 times occurred with equal frequency in salmonellosis caused by Salmonella enteritidis -  $50\% \pm 13,4$ , and salmonellosis caused by Salmonella virchow -  $46,4\% \pm 13,8$ .

Meteorism often observed in salmonellosis caused by Salmonella virchow -  $37,0\% \pm 14,5$ , in comparison with salmonellosis caused by Salmonella enteritidis  $6,7\% \pm 17,6$ . Such symptoms as abdominal pain could be determined only in older children and it was only in a small percentage of patients: salmonellosis caused by Salmonella enteritidis -  $6,7\% \pm 17,6$ , salmonellosis caused by Salmonella virchow -  $10,0\% \pm 17,3$ .

Hepatomegaly occurred in a small percentage of cases – in Group 1 -  $6,7\% \pm 17,6$ , and in Group 2 -  $3,3\% \pm 18,0$ . Splenomegaly was not revealed in any of the test groups.

Salmonellosis caused by Salmonella virchow proceeded equally often as mono-infection -  $43,3\% \pm 13,7$  and as mixed infection –  $56,6\% \pm 12,0$ . Salmonellosis caused by Salmonella enteritidis proceeded often in the form of mixed infection -  $70\% \pm 10,0$  (\*  $P < 0.05$ ).

The most common associates in salmonellosis caused

by *Salmonella enteritidis* were *Citrobacter* - 47,6% ± 15,8, *Enterococcus* - 19% ± 19,6, in salmonellosis caused by *Salmonella virchow* - *Citrobacter* - 35,3% ± 19,5, *E.coli hemolyticus* - 17,6% ± 22,0, *Klebsiella* 17,6% ± 22,0. Frequent co-morbidities in the study groups were anemia and ARVI.

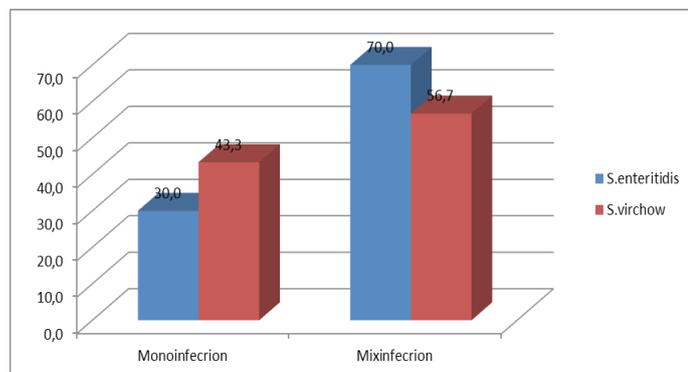


Diagram №4. Monoinfection and mixinfection in salmonellosis caused by *S. enteritidis* and *S. virchow* in children (%)

Anemia occurred in 50% ± 12,9 of cases in both groups, ARVI were observed in equally frequent cases in both groups - 30% ± 15,3 and 20% ± 16,3 respectively. Neutrocytosis in the hemogram was observed equally often in both groups of children with salmonellosis (for *Salmonella virchow* 56,7% ± 12,0, and for *Salmonella enteritidis* 63,3% ± 11,0).

The inflammatory process in the intestine occurred in coprological study with equal frequency in both study groups - 96,7% ± 3,3 and 96,7% ± 3,3, respectively. During the antibiotic therapy choice was given to aminoglycosides of 2nd and 3rd generation in both groups - 46,7% ± 13,3 and 43,3% ± 13,7 respectively. Reserve drugs such as fluoroquinolones were used in 10 0% ± 17,3 and 3,3% ± 18,0 of cases respectively.

High sensitivity was determined to *Salmonella enteritidis* to aminoglycosides - 83,3% ± 7,5 and fluoroquinolones - 80,0% ± 8,2 in comparison with *Salmonella virchow* - 56,6% ± 12,0 and 56, 6% ± 12,0 respectively.

## DISCUSSION AND CONCLUSION

Salmonellosis caused by *S. virchow* and *S. enteritidis* often occurs in moderate form. Children at the age of the first year of life suffer more often than children of other ages from salmonellosis caused by *S. enteritidis* and *S. virchow*. Gastrointestinal form with non-severe toxicity and dehydration is prevalent among the clinical forms of salmonellosis caused by *S. virchow*

and *S. enteritidis*.

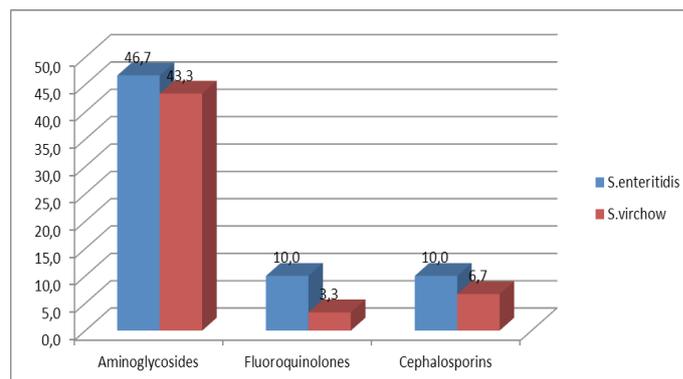


Diagram №5. Antibiotic therapy of *Salmonella* infection in children caused by *S. enteritidis* and *S. virchow* (%)

Mixinfection form is more common for salmonellosis caused by *S. enteritidis*. The manifestations of clinical symptoms of salmonellosis caused by *S. virchow* and *S. enteritidis* depend on the severity of the disease. Efficiency of etiotropic treatment at the present stage of salmonellosis caused by *S. enteritidis* and *S. virchow* achieved mainly by using aminoglycosides.

## Acknowledgement

The authors thank Gulnar Onalbayeva, PhD, Associate Professor, Department of Childhood Infections, Asfendiyarov Kazakh National Medical University, Almaty, Kazakhstan, for support and help with article.

## REFERENCES

1. Timchenko V.N., Bystryakova L.V. *Infektsionnye bolezni u detey* [Infectious diseases at children]. SpetsLit, St. Petersburg, 2001, p. 560.
2. Uchaikin V.F., Nisevich N.I., Shamsheva O.V. *Infektsionnye bolezni u detey* [Infectious diseases at children], GEOTAR, Moscow, 2011, p. 688.
3. Keltsev V.A., Gasilina E.S., Prosvirov E.Yu., Santalova G.V., Klebanova O.R. *Izbrannye lektsii po detskim infektsionnym boleznyam* [Selected lectures on pediatric infectious diseases]. Sodruzhestvoplyus, Samara, 2001, p. 252
4. *Sanitarno-epidemiologicheskie pravila i normy "Organizatsiya I provedenie meropriyatiy po snizheniyu zaboлеваemosti ostrymi kishhechnymi infektsiyami, salmonellezom, bryushnym tifom I paratifami"* [Sanitary-epidemiological rules and norms «Organization and carrying out sanitary-epidemiological (preventive) measures for the prevention of incidencesharp intestinal infections, salmonellosis, typhoid fever and paratyphoid»]. Order ministry of health care RK of 6.02.08, No. 52.