Table 1

The content of microelements in the blood (μg / l)

Microelements	n	Me (Q25-Q75)	Reference values
Nickel (Ni)	100	< 13	1-28
Cadmium (Cd)	79 21	0,8 (0,6-1,1) < 0,5	0,01-2
Cobalt (Co)	100	< 6	0,05-0,1
Chromium (Cr)	20 80	1,0 (0,7-1,2) < 6	0,05-0,5
Zinc (Zn)	47 53	975 (754-1289) <625	543-1130
Copper (Cu)	100	959 (664-1295)	750-1300
Arsenic (As)	100	< 13	2-62
Ferrum (Fe)	100	2515 (2020-3347)	600-1800

Table 2

Micronutrients content in the water environment of the Tomtor rare-earth metal deposit (in MPC, 2015) *

Microelements	Water environment	Excess of MPC
Fe (ions)	brook Pomanistochka	in 9-10 times
	R. Anabar	2.5 times
Cu (copper)	R. Malaya Kuonapka	in 3,5-4,4 times
Mn (manganese)	R.Malaya Kuonapka	in 1,5 times

* The content of aluminum, lead, arsenic, mercury, antimony, bismuth, beryllium, uranium, thorium, etc. is lower than the established standards.

environmental studies in the monitoring mode with a certain periodicity in the zone of activity of mining enterprises will allow to identify environmental pollution and the development of human medical pathology caused by it in the form of microelementoses in their early stages, which will be a significant contribution of Yakut scientists to environmental medicine. Such a methodical approach will help to save the population of the North / Arctic, including the indigenous small population of the North, from the negative impact of the inevitable further development of the Arctic's natural resources.

Reference

Data of the All-Russia Population Census of 2002 and 2010 www.gks.ru.

Parameters of Medical and Environmental Monitoring

- Radiation situation;
- The content of priority for this field of heavy and rare earth metals in the environment;
- The content of the same metals in human blood;
- Basic medical and demographic indicators - birth rate, mortality, natural population growth, life expectancy, etc .;
- Morbidity of the population with diseases of the circulatory system, respiratory and digestive organs, urogenital, musculoskeletal and endocrine systems, blood and hematopoietic tissue, and other pathologies;
- Disability;
- Indicators of the main types of metabolism - lipid, protein, carbohydrate, mineral, vitamin;
- The main indices of immunological homeostasis - AFP, REO, gamma-IFN, IL-16, IL-6, SRB;
- Quality of life of the population on the questionnaire of WHO KZh-100.

Application

The authors

1. KRIVOSHAPKIN Vadim Grigorievich - Doctor of Medical Sciences, Professor, Academician of the Academy of Sciences of the Republic of Sakha (Yakutia), Adviser of the Academy of Sciences of the RS (Ya). Cont. Tel. 8-914-305-46-35. E-mail: kukai1937@gmail.com;
2. TIMOFEEV Leonid Fedorovich - MD, professor of the Department of Public Health and Public Health, General Hygiene and Bioethics of the Medical Institute M.K. Ammosov NEFU. Address: 677000 Yakutsk, ul. Oyunsky, 27. Cont. Tel. 8-914-225-88-45. E-mail: tlfnauka@mail.ru.

V.B. Egorova, M.A. Fedorova, Ya.A. Munchalova, T.G. Dmitrieva, S.N. Alekseeva

CLINICO-LABORATORY FEATURES OF MENINGITIS IN CHILDREN

DOI 10.25789/YMJ.2018.63.18

ABSTRACT

Meningitis continues to be the most common form of central nervous system damage in children. In the structure of neuroinfections, the frequency of meningitis in children is about 30%, remain an important medical and social problem due to the weighting of their current course. Acute meningitis has a high frequency of severe forms, high lethality, expansion of the spectrum of etiopathogenesis and their resistance to the most common antibiotics, difficulties in differential diagnosis.

The article analyzes the clinical and laboratory features of meningitis in children and their outcomes according to the data of the State Institution of Children's Departments of the Republic of Sakha (Yakutia) «Children's Infectious Clinical Hospital». The clinical manifestations, the etiological landscape of meningitis in children, and the demonstrators of laboratory analyzes were studied. A retrospective analysis of 40 medical charts of inpatient patients according to the GBU RS (Y) «Children Infectious Clinical Hospital» for 2016 was conducted.

In the etiologic structure, serous meningitis of enterovirus etiology (90%) predominated among meningitis with refined etiology, which was confirmed by laboratory tests. The causative agents of enteroviral meningitis in children in Russia, European countries, the United States and Japan in the last 10-20 years were most often ECHO30, ECHO11 [1, 4].

In children with meningitis, in most cases, moderate forms of the disease with a hypertensive syndrome leading in the clinic, polymorphism of clinical manifestations, febrile fever, rigidity of the occipital muscles, catarrhal phenomena were observed. Most of the children were hospitalized 24 hours after the onset of the disease, while there were certain difficulties in the clinical diagnosis at the prehospital stage. Thus, meningitis was suspected only in 70% of cases, in others, food toxicoinfection, acute gastroenteritis, acute respiratory viral infection, acute nasopharyngitis, enterovirus infection, acute enterocolitis, acute enteritis were suspected.

At the hospital stage, the most informative for the diagnosis of a neuroinfectious disease are changes in the cerebrospinal fluid, which closely contacts the structures of the nervous tissue.

Keywords: neuroinfections, meningitis, children, etiology.

Introduction

Meningitis is an inflammation of the membranes of the brain and subarachnoid space, which often lead to adverse effects. In the structure of neuroinfections, the frequency of meningitis in children is about 30%, remain an important medical and social problem due to the weighting of their current course. Acute meningitis has a high frequency of severe forms, high lethality, an expansion of the etiological spectrum and difficulties

in differential diagnosis [1, 3].

Despite the sporadic incidence in the Russian Federation as a whole among children, the incidence is 2.48 per 100,000 children under 17 [5]. It should be noted that viral meningitis prevails (up to 75%) compared with bacterial one (up to 25%). However, bacterial meningitis remains relevant, as late diagnosis and lack of treatment in 100% of cases lead to death, and severe disabling effects are possible even with adequate therapy.

The analysis of clinical and laboratory diagnostics, the results of treatment of meningitis of various etiologies shows that the most urgent problems of practical medicine at the present stage are: early clinical diagnosis at the prehospital stage, transportation of patients to specialized departments, diagnosis and laboratory confirmation of the diagnosis in the hospital, correct assessment of the severity of the condition patient with subsequent adequate therapy [2, 4].

The purpose of our work was to study the clinical and laboratory features of meningitis and their outcomes in children of different ages.

Materials and methods of the study

The work was carried out on the basis of the GBU RS (Y) "Children's Infectious Clinical Hospital". A retrospective analysis of the case histories (f.003 / y) of children treated with a diagnosis of viral meningitis, bacterial meningitis, viral-bacterial meningitis and serous meningitis, of unspecified etiology, was conducted.

In 2016, 40 children were treated at the Children's Infectious Clinical Hospital for the treatment of meningitis of various etiologies, of which 65% (26 people) were boys, 35% (14 people) were girls. By age composition: from 2 months. up to 3 years - 2 people (5%), from 3 to 6 years - 8 people (21%), from 7 to 16 years - 22 people (70%). Among the patients, rural residents - 10 children (25%), urban - 30 (75%).

Results and discussion

In most cases (18 children - 45%) there was a development of enterovirus meningitis. In 10 children (25%) bacterial meningitis was diagnosed, in 9 children (22.5%), meningitis had a mixed viral-bacterial etiology, in 3 children (7.5%) - serous meningitis, of unspecified etiology.

Hospitalization in the hospital in most cases (34 children - 85%) occurred within the first three days after the disease, 6 children (15%) were admitted in later periods.

In case of enteroviral meningitis, children (18 prs) were hospitalized on the 1st day of the disease - 4 (22%), on the second day - 7 (39), on the third day - 4 (22), in later terms - 3 (17%).

In case of bacterial meningitis (10 children), 2 children (20%) were admitted on the first day, 5 (50) on the second - 1 (10), 2 (20%) were hospitalized in later periods.

In case of virus-bacterial meningitis (90 children), 3 (33.3%) were hospitalized on the first day after the onset of the disease, on the second - 4 (44.4), on the third - 1 (11.1), later - 1 (11.1%).

Patients with a diagnosis of serous meningitis of unspecified etiology (3 children): 1 child received a transfer from another department (after the bronchopneumonia), on the second - 1 child, on the third - 1 child.

The analysis showed that patients were mainly in the direction of "first aid" (57%), by self-reversal (5%), in the direction of the district pediatrician (27%), in the direction of the central district hospital (7%), transfer from another ward (5% %).

Patients were referred to the hospital with various preliminary diagnoses: acute meningitis - 70% of cases, "food toxicosis" - 11%, "acute gastroenteritis" - 5%, "acute respiratory viral infection, acute nasopharyngitis" - 5%, "enterovirus infection" - 3%, "acute enterocolitis" - 3%, "acute enteritis" - 3%.

A study of the seasonality of meningitis made it possible to identify a large incidence of meningitis in the summer months, as well as in the autumn period. Peak hospitalization of patients fell in August - 40% (Fig. 1).

An analysis of the etiological structure of acute meningitis among our patients indicates a large proportion of meningitis of the unspecified etiology of 50% (20 cases).

Among meningitis with specified etiology (20 cases), enterovirus infection was confirmed in 18 children (90%), herpes simplex virus was detected in 1 child (5%), hemophilic infection in 1 child (5%). This may be due to the early onset of antibiotic therapy, to the collection of biological material, as well as to the limited capabilities of the diagnostic laboratory (Fig. 2).

The onset of the disease was 100% acute regardless of the etiology of meningitis. The most common clinical symptoms in children with meningitis were nonspecific manifestations - increased body temperature, lethargy, inhibition, decreased appetite, which were observed in all cases. Catarrhal phenomena in the initial stage were observed in 29% of patients (of which tonsillitis was detected in 64%, pharyngitis - 27%, follicular angina - 18%).

In addition, often with objective examination, stiff neck muscles were observed in 66% of patients, photophobia in 16%. Less frequently, the positive Kernig symptom was 13%, and the symptoms of Brudzinski in 5% of cases. Vomiting as a cerebral symptom, caused by cerebrospinal fluid hypertension, not associated with eating and not bringing relief, was observed in 71%, of which single vomiting occurred in 32%, multiple vomiting 39%.

In blood tests on admission, leukocytosis in viral meningitis ranged from 10-15.3x10 ^ 9 / L in 44%, an increase in ESR to 25 mm / h in 82%.

In bacterial meningitis, leukocytosis within 10-18x10 ^ 9 / l in 55%, an increase in ESR of 35-54 mm / h in 80%.

With viral-bacterial meningitis, leukocytosis ranges from 10-14 × 10 ^ 9 / L in 50%. With serous meningitis of unknown etiology, leukocytosis was noted within 10-22x10 ^ 9 / l, ESR 32-35mm / h.

Analysis of cerebrospinal fluid in bacterial meningitis revealed a neutrophilic

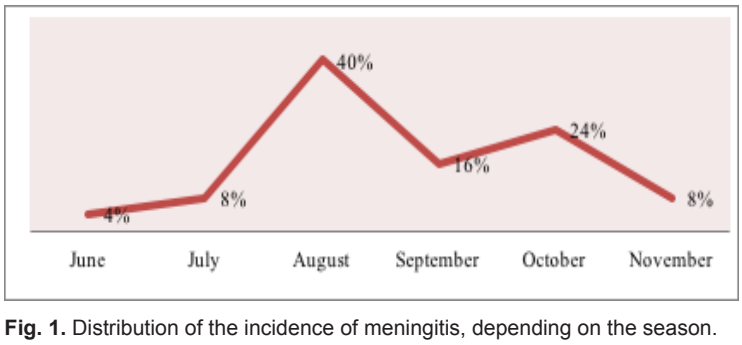

Fig. 1. Distribution of the incidence of meningitis, depending on the season.

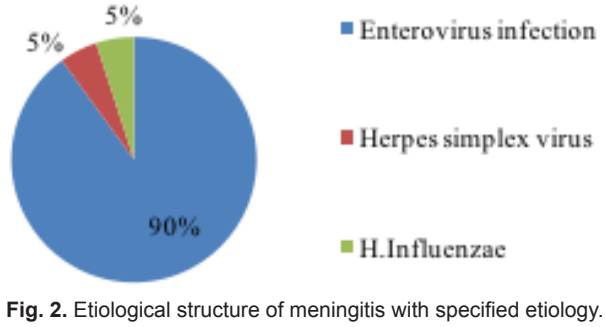

Fig. 2. Etiological structure of meningitis with specified etiology.

cytosis within 15.3-395 cells in 1 μl, in one child 1600 in 1 μl. The increase in protein level was observed only in 22% of cases, the decrease in glucose level in 62%. Reduction of chlorides in 35%.

In children diagnosed with enteroviral meningitis, the cytosis was within 150-501 cells in 1 μl, which was lymphocytic in nature. An increase in protein levels occurred in 31%, a decrease in chloride levels was observed in 38%, an increase in glucose level in 41%.

In viral-bacterial meningitis, cytosis within 7-173 cells in 1 μl was of a mixed nature. Decrease in chloride levels in 100%, increase in protein level in 13%. The glucose level remained within normal limits.

In serous meningitis, pleocytosis was lymphocytic, cytosis 160-314.6 in 1 μl.

The duration of inpatient treatment averaged 14 days: for enterovirus meningitis, an average of 14 days, for bacterial meningitis - 20 days, for virus-bacterial meningitis - 16 days, for serous meningitis, unspecified - 14 days. Analysis of the outcomes of the disease showed that the bulk of children were discharged in a satisfactory state 84% of children and with an improvement of 16%. With improvement, children were discharged, who, with a background of ongoing treatment, showed a persistent positive dynamics.

The conclusion

Thus, meningitis more often hurt boys than girls. Age characteristics distinguish the predominance of school-age children. Patients with meningitis had moderate-severe forms of the disease, with a predominance in the clinical picture of hypertensive syndrome, nonspecific symptoms, and moderately expressed meningeal symptoms. Difficulties in clinical diagnosis at the prehospital stage are associated with the nonspecificity of the initial manifestations. Most of the children were hospitalized 24 hours after the onset of the disease, while there were certain difficulties in the clinical diagnosis at the prehospital stage. Thus, meningitis was suspected only in 70% of cases, in others, food toxicoinfection, acute gastroenteritis, acute respiratory viral infection, acute nasopharyngitis, enterovirus infection, acute enterocolitis, acute enteritis were suspected.

In the etiological structure of meningitis in children aged 2 months up to 17 years, the following pathogens prevailed: enterovirus - 90%, heamophilus influenzae - 5%, herpes simplex virus - 5%. There remains a large proportion of cases with an unspecified etiology - 50%, which requires improvement of approaches to diagnosis.

Etiologic and clinical polymorphism of infectious diseases of the nervous system determines the problematic issues of their diagnosis and treatment, the main ways of solving which are continuous clinical and laboratory and epidemiological monitoring with analysis of the pathogen characteristics and current features of the infection process, determining the priority link of pathogenesis, targeted improvement of therapeutic tactics with rational use of medicines and technologies. At present, the issue of vaccine prevention of neuroinfections remains urgent.

References

1. Demina A.V., Netesov S.V. Enterovirusnaya infekciya: mnogoobrazie klinicheskih proyavlenij [Enterovirus infection: a variety of clinical manifestations] Byulleten' SO RAMN [Bulletin of the SB RAMS]. Novosibirsk, 2009, №6, pp.116-123.
2. Sejbil' V.B., Frolochkina T.I. Seroznyj meningit [Serous meningitis] Mikrobiologiya [Microbiology], 2006, №1, pp. 87-92.
3. Simachenko O.V., Germanenko I.G., Lisickaya T.I. Izuchenie kliniko-ehpidemiologicheskih i diagnosticheskih markerov meningita u detej na sovremennom ehtape [Study of clinical and epidemiological and diagnostic markers of meningitis in children at the present stage] Medicinskaya panorama [Medical panorama], 2010, pp. 10-13
4. Skripchenko N.V., Alekseeva L.A., Ishchenko I.A., Krivosheenko E.M. Cerebrospinal'naya zhidkost' i perspektivy ee izucheniya [Cerebrospinal fluid and prospects for its study] Rossijskij vestnik perinatologii i pediatrii [Russian Bulletin of Perinatology and Pediatrics], 2011, №6, pp.88-96.
5. Skripchenko N.V., Ivanova M.V., Vil'nic A.A., Skripchenko E.YU. Nejroinfekcii u detej: tendencii i perspektivy [Neuroinfections in children: trends and perspectives] Rossijskij vestnik perinatalogii i pediatrii [Russian Bulletin of Perinatology and Pediatrics], 2016, №4, pp. 9-22.

The authors:

1. Egorova Vera Borisovna - Candidate of Medical Sciences, Associate Professor, Associate Professor of the Department of Pediatrics and Pediatric Surgery of the Medical Institute of the M.K. Ammosov North-Eastern Federal University. Address: 677018, Yakutsk, ul. Oyunsky, 27. E-mail: veraborisovna@yandex.ru
2. Fedorova Michiliye Alekseevna - the resident of group O-P-16 of the Medical Institute of the M.K. Ammosov North-Eastern Federal University. Address: 677018, Yakutsk, ul. Oyunsky, 27. E-mail: michiliyef@mail.ru,
3. Munkhalova Yana Afanasievna - Candidate of Medical Sciences, Head of the Department of Pediatrics and Pediatric Surgery of the Medical Institute of the M.K. Ammosov North-Eastern Federal University. Address: 677018, Yakutsk, ul. Oyunsky, 27. E-mail: tokmacheva@mail.ru.
4. Dmitrieva Tatyana Gennadievna - doctor of medical sciences, professor of the pediatrics and pediatric surgery of the Medical Institute of the M.K. Ammosov North-Eastern Federal University. Address: 677018, Yakutsk, ul. Oyunsky, 27. E-mail: dtg63@mail.ru.
5. Ivanova Olga Nikolaevna - doctor of medical sciences, professor of the pediatrics and pediatric surgery of the Medical Institute of the M.K. Ammosov North-Eastern Federal University. Address: 677018, Yakutsk, ul. Oyunsky, 27. E-mail: olgadoctor@list.ru;
6. Alekseeva Sargylana Nikolaevna - Candidate of Medical Sciences, Associate Professor of the Department of Pediatrics and Pediatric Surgery of the Medical Institute of the M.K. Ammosov North-Eastern Federal University. Address: 677018, Yakutsk, ul. Oyunsky, 27. E-mail: sargylanao@mail.ru.