CLINICAL AND FACTORIAL ANALYSIS OF PATHOLOGICAL STATES IN ACUTE INTESTINAL INFECTIONS IN CHILDREN

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ABSTRACT

The author reported clinical characteristic features and risk factors for acute intestinal infections in 225 children (140 boys and 85 girls, mean age 1.5 years old). 90 (40%) patients aged up to 12 months, 101 (44.9%) were from 1 to 2 years old, and 34 (15.1%) were more than 2 years old. Most children were hospitalized in the first week of illness and had moderate severe course of disease. Severe forms of illness reliably more often were noted in children being on artificial feeding. Toxic-dystrophic condition, severe forms and perinatal encephalopathy were prevailed in boys. Factorial analysis revealed 20 most significant factors with factorization fullness 70.8%. The most significant factors were F-1 (factor of hyperthermia duration) with 8.5% effect, F-2 (factor of pain syndrome) - 5.8%, F-3 (factor of normal enzymatic activity of colon bacillus) - 4.9%, F-4 (etiological factor) - 4.6%, as well as F-5 (factor of opportunistic flora of the intestine) - 4.4%, respectively.

UDC CLASSIFICATION & KEYWORDS

■ 616.34-053.2 ■ Acute Intestinal Infection ■ Children ■ Factorial Analysis ■

INTRODUCTION

Studies on various aspects of the issue of acute intestinal infections (All) are growing last decade and significant advantages have been achieved. However, according to the WHO definition, this problem as acute diarrheal diseases remains to be serious for many countries of the world. The number of clinical forms of All exceeds 30 nosological notions, which infectious agents can be bacteria, viruses and protozoa. According to the literature, infectious diarrhea is caused by viruses in 30-40% of cases, by pathogenic bacteria in 20% of cases. In 40% of cases microorganisms may not be identified [1,2,3,4,5,6]. According to the WHO data, annually about 1-1.2 billion of people die from intestinal infections and their complications in the world [5,6].

In the structure of infectious morbidity of population, all occupy the second place after acute respiratory-viral infections and are characterized by absence of seasonal prevalence and age dependence, development of unstable, short-term type-specific immunity that assumes repeated development of infectious process induced by other infectious agent during limited time. Wide and polyetiological group of these diseases are rightfully named as "diseases of civilization" because of being under the effect of the processes of urbanization, activation of the population migrating, increase of export-import relations between countries.

Nowadays, all should be considered in the resource of the most serious medical and social problems for the Republic of Uzbekistan. All in children continue to be significant problem for the Public Health of Uzbekistan due to great burden for the health of children and economics of the country. It is necessary to note especially that the prevalence of infections is a major component of "the index of health" of the country, and the efforts directed to decrease in morbidity and liquidation of infections are considered as "preservation of health of the nation".

The purpose of our research was to study clinical characteristic features and risk factors of acute intestinal infections in children of young age.

Material and methods

We examined 225 children with All: 140 (62.2%) boys and 85 (37.8%) girls. 90 (40%) patients aged up to 12 months, 101 (44.9%) were from 1 to 2 years old, and 34 (15.1%) were more than 2 years old. Mean age of children was 1.5 years old.

The study of epidemiological anamnesis showed that contagious way of infection transmission noted in 31 (13.8%) children, from food in 172 (76.4%), from water in 2 (0.9 %) patients, and in 20 (8.9%) children the source of infection was not identified.

Etiology of infectious agents for All was established by bacteriological, serological (IFA) and immunological (PCR) methods. Etiological diagnosis was established in 83.1% of patients: Clostridium in 23 (10.2%), Salmonellosis typhimurium in 60 (26.7%), dysentery Zonne in 46 (20.4%), dysentery Flexner in 14 (6.2%), Escherichia coli infection in 30 (13.4%), Rotavirus infection in 14 (6.2%) children, respectively.

Statistical analyses included methods of variational parametrical and non-parametrical statistics with calculation of average arithmetic parameter (M), average quadratic deviation (σ), standard error of average arithmetic parameter (m), relative values (frequency, %). Statistical significance was determined by Student's t-test with calculation of mistake probability (P) at checking of distribution normality (by criterion of excess) and equality general dispersion (Fisher F-criterion). The significance was established at $P < 0.05$.

Criteria of evaluation of the severity degree of disease were as follows: acute development of infectious process, severity degree of toxicosis and exicosis, duration of temperature reaction and gastrointestinal disturbances, degree of involving of cardiovascular and central nervous systems into pathological process, blood parameters and coprogram findings.

Results and their discussion

The distribution of patients according to the forms of diarrhea offered by the WHO in 2006, acute diarrhea was found in 50.2% of patients, refractory diarrhea in 28%, and bloodstained diarrhea in 21.8% of patients. The study showed that the distribution of patients by the forms of diarrhea on admission subsequently defines tactics of a doctor and principles of treatment.

The analysis of clinical features showed that the disease occurs mainly by type of gastroenterocolitis, in 69.8% of patients it was moderate severe. Severe forms of all were noted in 28.4% of children with development of toxicosis and exicosis of III degree, and infectious-toxic shock of I-II degree.

Acute onset of disease was noted 88% of children. 126 (56%) children were hospitalized at the 1-3 days after disease onset, 61 (27.6 %) at the first week, and later than 1 week were admitted 37 (16.4%) patients.

Thus, in the most of cases the sick children were hospitalized in the first week of illness that gave an opportunity to perform study and to begin treatment at early time of disease.

On the basis of objective status, even on the 1st day of hospitalization, 54 (36%) patients with toxic syndrome had neurotoxicosis and signs of perinatal encephalopathy, and 98 (64%) patients had toxicosis with dehydration. 46 children had compensated metabolic acidosis at the 1-3 day after disease. More than 10% of patients had loss of weight.

Intestinal infection was manifested by dry and pallor skin integuments and mucosa, weakness and flaccidity in all patients. Poor appetite was noted in 96.6% of patients and sleep disorders in 52.4%. Dyspeptic symptoms such as abdominal pains occurred in 88%, abdominal distention in 62.2 %, collywobbles in 56.4%, pain in the sigmoid intestine in 40.4%, tenesmus and its equivalents in 26.2%, vomiting in 58.2% of patients, respectively. All children had stool with pathological impurities (slime, pus, blood) with change of consistence and frequency more than 5 times a day.

Intestinal infections were characterized by generalization of infectious process, as well as sepsis development, especially salmonella and clostridium infections. In 30% of cases there was recurrent course of disease with signs of intestinal dysfunction and aphthous stomatitis. At control cultivation in 17% of patients we isolated antibiotic-resistant strains of intestinal infectious agents (salmonellosis, shigellosis).

In 1-years old children the clinical process of All was accompanied by significant more frequent infectious-toxic shock of I-II degree, toxic-dystrophic state, sepsis, rachitis, perinatal encephalopathy and intestinal dysbacteriosis, in comparison with children of older age. 65.2% of children being on artificial feeding had severe forms of illness reliably more often.

The study of clinical course of acute diarrhea, depending on gender of children, showed the prevalence of toxic-dystrophic condition, severe forms of illness, perinatal encephalopathy in boys.

Severity and unfavorable outcome of disease were connected in many respects with extreme degree of intoxication, acute electrolyte disorders, presence of toxic-dystrophic state, and partially with outlying congenital pathology.

Common blood analysis did not show reliable critical changes that, in our opinion, confirmed the WHO recommendation to perform blood analysis, according to the doctor's discretion.

We revealed high resistance of the majority pathogenic agents to antibiotics that promotes increase of disbacteriosis and nosocomial infections among children due to resistant hospital strains. Our study found the highest antibiotic-resistance of "hospital" strains of salmonella typhimurium.

Development of antibiotic-associated diarrhea in children may be a factor predisposing to nosocomial distribution of this pathology which is especially long and repeatedly treated by antibiotics in hospital and out-patient departments. This is confirmed by identification of the culture of *Clostridium difficile*.

Taking into account the complex and multifactorial parameters characterizing clinical development of All (with syndrome of acute diarrhea) in our children, we performed factorial analysis allowing selection of the rational quality of the most significant factors (causes) that play the important role in clinical signs and complications in the initial state of All and treatment efficacy.

For model creation and performance of the factorial analysis we used methods of the main components. The optimal quality of the selected factors was determined on the basis of Craiser criteria, "Scree -test" and stage of factorization fullness. Taking into account the infinitesimal great number of decisions obtained during turning of the axes of the general factor space, we used methods of selection of the appropriate system of coordinates using revolving factors ("Vazimax normalized").

Criteria of model adequacy was factorization fullness (>60%) and factor values (>1.0). Factor effect was analyzed at value of factor loading of parameters more than 0.3 by model.

The initial state of patients with All was orientator for evaluation of all pathogenic disorders revealed in salmonellosis, dysentery, escherichiosis, clostridiosis, rotaviral infection. Assessment of the effect of all factors on the individual components of formation of whole clinical picture allowed study purposefully causes, conditions, and results of the systemic positions. Besides, identification of factors of the initial state of All emphasized to the general system-forming elements which should be taking into account in the further detailed study of the results of investigation.

The results of factor analysis revealed 20 most significant factors with factorization fullness 70.8%. Non-identified factors of this model were unified in F-0 (29.2%).

The summarized interpretation of isolation of 20 factors directly effecting on the initial state of patients and results of correcting therapy, determining about 71% of the effect of studied clinical, clinical-laboratory findings, parameters characterizing deviation and results of correcting therapy.

In the structure of factor model, the relationships of the first five factors (F-1-F-5) accounted 28.3%; (F-6-F-10) – 18.1%; (F-11 – F-15) – 13.6%; (F-16-F-20) – 25.2%; 29.2% was null factor.

Factorial analysis showed that in the structure of general factor effect on the initial state of children with All the most significant factors were F-1(Factor of hyperthermia duration) with 8.5% effect, F-2 (factor of pain syndrome) – 5.8%, F-3 (factor of normal enzymatic activity of colon bacillus) – 4.9%, F-4 (etiologial factor) – 4.6%, as well as F-5(factor of opportunistic flora of the intestine) – 4.4%, respectively.

Majority of patients in anamnesis had indications for accompanied diseases, such as pneumonia, rachitis, bronchitis, cardiovascular pathologies which were premorbid basis for intestinal intoxication. The concomitant diseases determined indications of factors F-1, F-4, F-5, F-6, F-9, F-11, F-16, F-18. Disbacteriosis has the important role in All because it participates in the pathogenesis, clinical picture of All and their complications. The parameters F-2, F-10, F-12, F-14 showed that functional insufficiency of the gastrointestinal tract provided bacterial proliferation, that, consequently, damaged microecology of the bowel (F-14, F-19). The normal contents of the microbial population and their biochemical activity after antibiotic therapy underwent more sensitive changes.

F-6, F-8 showed that disbacteriosis developed and deteriorated insufficiency of the bowel functions (absorptions of carbohydrates, amino acids, fats and salts) and increased deficit of vitamins and some biologically active substances.

Majority of studied children (F-19) noted clear reduction of bifidum bacteria and colon bacillus contents, increase in cocci flora, appearance of atypic lactoso-negative *Escherichia coli* with hemolytic activity.

1/3 patients (F-11, F-12) revealed representatives of the opportunistic microorganisms (fungi of *Candida* species, *Proteus*).

Clinical manifestations of disbacteriosis were characterized by intestine collywobbles and distention (F-12).

Syndrome of hypotrophy was significant (nutrition disturbance) among children being under mixed and artificial feedings (F-5, F-6, F-8). There was found effect of pathogenic type of diarrheal syndrome (F-16).

The results of factorial analysis showed that All were found in children under mixed and artificial feeding with aggravated premorbid state.

It is known that the treatment of diarrheal infection is more difficult task, in comparison with therapy of other pathological conditions, as, besides correction of disorders of intestinal activity, it pursues not less difficult task as eradication of infectious agent focus. Unfortunately, this task is least successfully resolved by specialists of the primary health care system which share the main work in treatment of diseases of infectious nature.

Despite of growing role of bacterial factor in various intestinal pathological conditions, the experience of management of children in polyclinics and infectious hospitals is still not changed.

The treatment of such patients consists of empirical prescription of the most fashionable and available antibiotics, as both real opportunities and desire of the doctors to investigate infectious process in dynamics of development are absent. For best of our knowledge, only unitary serological or microbiological studies which revealed a probable infectious agent are accepted as sufficient argument for making clinical diagnosis and prescription of therapy. Therefore, we are not surprised that at absence of appreciable progress in productivity of treatment of the most mass diseases such as All in the republic, there has been observed growth of negative consequences such as medicinal illness, immunity disorders, formation of disbiosis in children of young age, as well as appearance of polyresistant microorganisms, increase of frequency of nosocomial infections for the last decade.

It is necessary to note that development and creation of the large number of antibacterial and antiviral medicinal preparations today, certainly, expand considerably therapeutic opportunities for All treatment. However, in turn, it requires the obligatory scientific confirmation and, first of all, differential approach.

Conclusion

Despite of the tendency to reduction of morbidity due to intestinal infections, this problem continues to remain urgent. Unfavorable agents rendering the negative influence on function of the digestive tract during the period of its development and maturation of all structures of growing organism show necessity of introduction of such modern methods of identification of pathogenic and opportunistic infectious agents of intestinal infections as PCR-diagnosis, genotyping, study of plasmid profile and other methods of diagnosis and prognosis of diseases, especially concerning children of young age.

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