

INTEGRATED ASSESSMENT OF FACTORS AND DEGREE OF RISK FOR DEVELOPMENT OF SEVERE IMMUNODEFICIENCY IN HIV-INFECTED CHILDREN

Examination of 334 HIV-infected children aged from 1 to 6 years old revealed that severe anemia, severe exhaustion, infection caused by herpes simplex-1 virus, recurrent aphthous stomatitis, and early age of child are the main risk factors for severe immunodeficiency in HIV-infected children. Their identification should seriously alert doctors conducting dispensary care and monitoring of HIV-infected children.

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Introduction

In modern medicine, prediction of the appearance and character of the further course and outcome of disease is essential, since the forecast of the disease and its outcome is important both for the physician and patient (Sheptulin, 2007).

Today, studying the probability (risk) of disease (or pathological condition) development is one of the widely used methods of clinical prediction; it aims to identify factors increasing the risk of disease occurrence or progression.

Most modern scientists (e.g. Ischeykina, 2009) agree that the risk factors are the factors of different nature. Their presence in the environment or in human organism determines the emergence or spread of a disease. Denisov (2000) believed that their identification, destroying or elimination is the foundation of the modern standard disease prevention.

Additionally, in HIV-infected children, these activities will be a part of tertiary prevention aimed at preventing the progression of the disease. However, we emphasize, that in spite of their significance, the forecast is still always relative, because there is a certain discrepancy between the incidence in the general population and the probability to suffer from disease in a particular person. As Fletcher et al. (1998) noted "...the probability of developing the disease for a population (e.g., within 5 years) may be high or low, and for an individual has only two options: he will be sick or not ... prediction may be true for many patients and it may direct in connection with the adoption of clinical decision making, but it could be mistaken for an individual".

The article discusses factors and degree of risk for development of severe immunodeficiency in HIV-infected children.

Materials and methods

We examined 334 HIV-infected children aged from 1 to 6 years old. All the children were divided into 4 groups, according to age aspects: 1 group - 19 children less than 12 months (16 boys and 3 girls); 2 group - 107 children aged between 12-35 months (74 boys and 33 girls); 3group - 115 children aged between 36-59 months (79 boys and 36 girls); 4 group - 93 children aged \geq 60 months (53 boys and 40 girls).

The severity of immunosuppression in children was determined according to WHO classification of HIV-associated immune deficiency in children (Geneva, 2006).

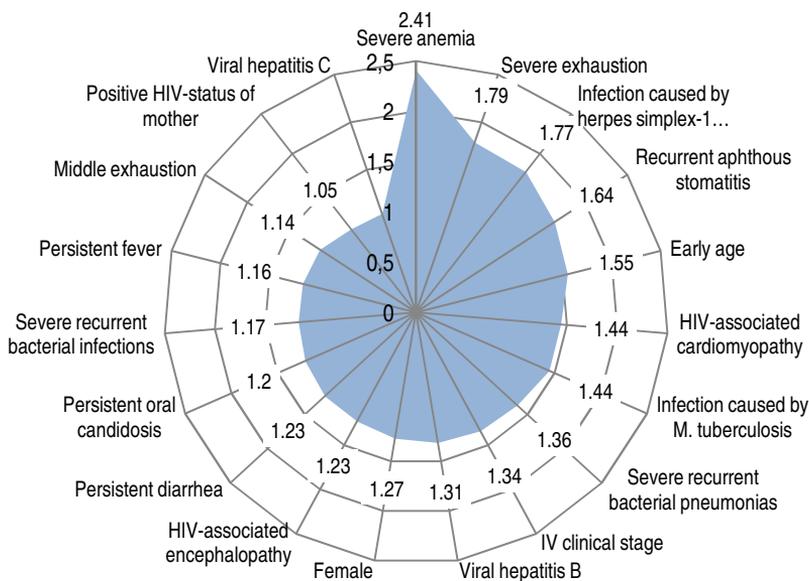
In order to identify prognostic factors that determine the specific outcome of the disease, we estimated forecast of the natural course of disease before medical intervention.

To establish risk factors in the development of the potential pathological condition, we used the method of normalized intensity indexes (NII), developed by Shigan and based on Bayesian probability method. The method is that instead of the usual intensive indicators used NII. NII is calculated as follows: $NII = r/M$, where the NII - normalized intensity index; r - intensive index; M - “normalizing parameter”.

Results

19 risk factors and their contribution to the development of severe immunodeficiency in HIV-infected children were examined (Figure 1).

FIGURE 1. RISK FACTORS AND THEIR CONTRIBUTIONS TO THE DEVELOPMENT OF SEVERE IMMUNODEFICIENCY IN HIV-INFECTED CHILDREN

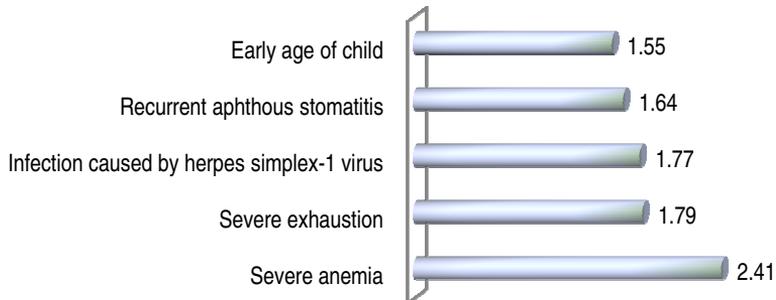


Thus, five most important risk factors in the development of severe immunodeficiency are the following: severe anemia (2.41), severe exhaustion (1.79), infection caused by virus herpes simplex-1 (1.77), recurrent aphthous stomatitis (1.64), and early age of child (1.55) (Figure 2).

Identification of severe anemia as one of the underlying risk factors for the development of severe immune deficiency is considered to be an indirect indication of defeat of pluripotent stem cell (Burmester, 2007), despite the fact that so far this has not been proved.

Nevertheless, the relationship between severe anemia caused by malnutrition and severe immunosuppression, apparently, is bilateral in nature: lack of nutrients affects the progression of HIV infection, but HIV infection may itself violate the nutritional status due to lack of nutrient substances in the diet, malabsorption, increased nutrient requirements and metabolic disorders, especially on a background of opportunistic and other infections. The proof of this fact serves to identify severe exhaustion as a major risk factor for severe immunodeficiency.

FIGURE 2. RISK FACTORS WHICH HAVE THE GREATEST INFLUENCE ON THE DEVELOPMENT OF SEVERE IMMUNODEFICIENCY IN HIV-INFECTED CHILDREN



In addition, according to Moye et al. (1996) and Miller (2000), chronic protein-energetic insufficiency (malnutrition) is accompanied by a decrease in T-lymphocytes number and function, suppression of delayed-type hypersensitivity, decrease in the levels of complement components and primary humoral immune response, and leads to atrophy of lymphoid tissue, especially in children.

From the previous studies (e.g. Heng et al., 1994; Brodsky, 1999) it is known that between HIV and herpes viruses there are complex and ambiguous interactions. It is not surprising, since herpes viruses, which includes herpes simplex-1 virus, successfully apply the same kinds of strategies of damaging immune response, that similar to HIV (“secret presence” allowing the pathogen to avoid immediate recognition by the host immune system; damage of the immune defense mechanisms and use of the mechanisms of immunity in its own interests).

As Heng et al. (1994) noted, *in vitro*, many cells infected with cytomegalovirus or herpes simplex virus are more vulnerable to HIV; and in HIV-infected cells cytomegalovirus and herpes simplex virus stimulate HIV expression and increase its reproduction, thus being a co-factor in the progression of HIV infection. Thus, the interaction of HIV and herpes simplex-1 viruses leads to severe immunodeficiency.

Identification of recurrent aphthous stomatitis as a risk factor, which etiology is difficult to establish even after repeated studies, should seriously alert doctors, who conduct dispensary care and monitoring of HIV-infected child.

Conclusion

Severe anemia, severe exhaustion, infection caused by herpes simplex-1 virus, recurrent aphthous stomatitis, and early age of child are the main risk factors for severe immunodeficiency in HIV-infected children. Their identification should seriously alert doctors conducting dispensary care and monitoring of HIV-infected child, and should influence on the decision of physician in determining the future strategy of the management of child.

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