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PRIMARY CHILDREN MORBIDITY – AS AN INFORMATIVE CRITERION OF RISK ASSESSMENT FOR POPULATION HEALTH

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Abstract
There has been carried out the preliminary medical-biological analysis and preliminary mathematical processing of the medical statistics data, covering children morbidity in the Murmansk region as well as a number of geophysical and meteorological parameters. There have been identified disease classes for which it is expedient to perform an analysis of the correlation between the environmental factors and the children population health. For groups aged 2-6 there has been found a mean correlation with meteoparameters and no correlation with a number of geophysical indices. However, no unambiguous conclusions as to the cause-effect relations could be drawn at this stage of studies, as the contribution value of either factors varies considerably under various character of diseases.

Introduction

The issue of health of children living in conditions of the European North is very important from social and medical point of view. Ecological conditions of the Far North areas produce a well-manifested effect on the formation of the growing organism, on the state and development of its physiological systems. Among the most significant negative stress factors, which influence the general state of health, capacity for mental and physical work, physical development, degrees of clinical course of the disease, we can mention the low temperature impact, long solar light starvation, abrupt atmospheric pressure differential, changes of oxygen partial pressure, magnetic storms, seasonal dependence of the physical state etc. However, Nowadays a quantitative assessment of geophysical factors contribution to the population health is a very complex problem in the ecoepidemiological studies. The climate discomfort for the population is traditionally assessed by mortality and morbidity rates indices. The use of the children morbidity as an integral criterion of the population health assessment is stipulated, on the one hand, by the fact, that while possessing ontogenetic peculiarities of the development and functioning of immune, endocrine etc. systems, children belong to the group of increased risk by the sensibility to negative impacts of the environment, on the other hand, the influence of such factors as professional and social-economical, determine the morbidity level of children population to a much smaller degree than that of adult population. Therefore, the studies on the correlation between the children morbidity dynamics in different towns of the Murmansk region and the solar activity indices (SA) are the most important and interesting.

Results and discussion

The Kola peninsular territory is situated in the auroral zone and is considered to be one of the most technogenically polluted areas in Russia. According to the regional Health Committee the general children morbidity levels in the Murmansk region exceed 1,3-1,5 times on a permanent basis those average for the rest of Russia.

Our studies, previously carried out in Apatity, revealed mainly a strong and mean correlation of yearly mean indices of the general children morbidity and the leading disease classes with the solar activity indices like sun spot indices (W), $F_{10,7}$ cm and the cosmic ray flow (Perminova et al., 2006). In numerous epidemiological and experimental studies the correlation between the heliogeophysical factors and cardiovascular activity disorders was proven. According to literature data, one of the main targets of heliogeomagnetic disturbances is the cardiovascular system (Rozhdestvenskaya, 2001; Kharlamov etc.., 2001; Breus et al.., 2005, etc.). A close relation was also found between the monthly mean index of sun spots area and the development of asthmatic status cases, the correlation between the number of lethal outcomes resulting from bronchial asthma and flashes on the Sun exceeds 2B (Volkov et al., 1996). In the current study we have used meteorological parameters indices (air temperature T ^{0}C, humidity RH, pressure P mB) based on the Apatity meteostation and geophysical measurements data (Woulff numbers, indices of the radioemission flux index F $_{10.7}$ - http://www.wdcb.ru/stp/index.ru.html the cosmic ray flow - http://192.168.224.1/CosmicRay/Default.htm, K-index - www.sgo.fi). The morbidity was assessed by monthly mean indices of children morbidity cases (2-6 years), visiting infant-schools in Apatity during the period from 2001 to 2003 (the observation group number was 1492 children) and by yearly mean data of official statistics of public health based on the primary morbidity of children population (0-17 aged) in six industrial towns of the Murmansk region during the period from 1998 to 2005. It does not seem feasible to assess the dynamics of morbidity levels for a greater period due to changes that have been made into statistic accounting since 1998 (a group of teenagers (aged 15-17) was included in a group of children (0-14 aged)). The analysis was performed in basic classes of diseases, for which the representative sampling had been obtained.

At the first stage of work to determine the priority physical factors of the environment in the formation of the health quality of children from the group aged 2-6 (absolute values) there was performed an analysis of the correlation of mean monthly indices of the morbidity with meteofactors and a number of geophysical parameters. Fig. 1 shows the correlation between the indices of air temperature, humidity and morbidity of children, who visited infant schools, seasonal fluctuations are brightly manifested. The correlation analysis for mean monthly indices of meteorological and geophysical parameters and mean monthly cases of the total morbidity testify of the greater significance of meteorological parameters such as air temperature and humidity, the correlation coefficients made -0,66 and 0,5 respectively. The dynamics of the respiratory organs disease determines the dynamics of the total morbidity. This group of pathologies takes the leading position in the structure of children population morbidity and makes 87-89 %. At the same time, acute respiratory diseases make a considerable share in this group. This results, in particular, from the anatomy peculiarities of the upper airways of children, which stipulates their sensibility to cold air and high susceptibility to pathogenic flora. However, it is not possible to draw single-valued conclusions about cause-effect relations as the contribution value of either factors varies significantly under various character of diseases.

At the next stage of studies the task was to determine classes of diseases, in which it is expedient to assess the impact from geophysical factors. For that, relative yearly mean indices of primary children morbidity for 8 years (1998-2005) in several towns of the Murmansk region. The comparative analysis revealed the following trends:

- there are identified analogies of the solar activity and children morbidity dynamics: total, primary and by leading classes of diseases;

- in the most towns, as on the whole in the Murmansk region, two peaks of primary children morbidity are traced: the first one coincided with the maximum of solar activity in 2000 and was lower than the second one, which falls on 2003 – a period of high solar flash activity;

- the most significant result of the performed assessment is that we have identified those groups of diseases in the structure of the primary children morbidity for which it is expedient to perform an assessment of the influence of geophysical factors for the chosen period of time. As a result of the performed analysis 5 classes of diseases were chosen, which are connected with the level of immune system functioning (Fig. 2). In all groups the dynamics of the primary morbidity coincided excluding groups of inflectional and parasitic diseases (which is connected with etiopathogenesis);

- the analysis of basic causes affecting the dynamics of primary children morbidity also allowed to identify groups of diseases, which can not be used in the studying of impact effects of the geophysical nature factors (Fig. 3).
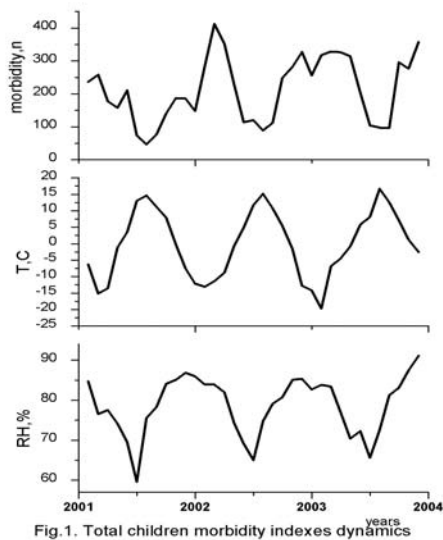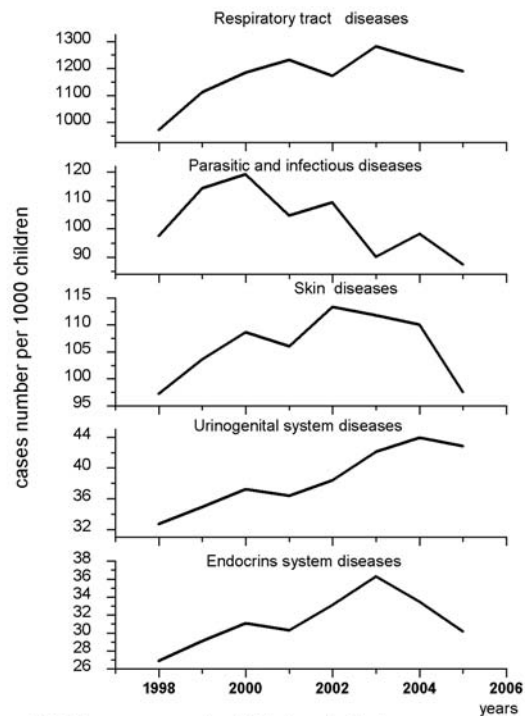

Fig.1. Total children morbidity indexes dynamics

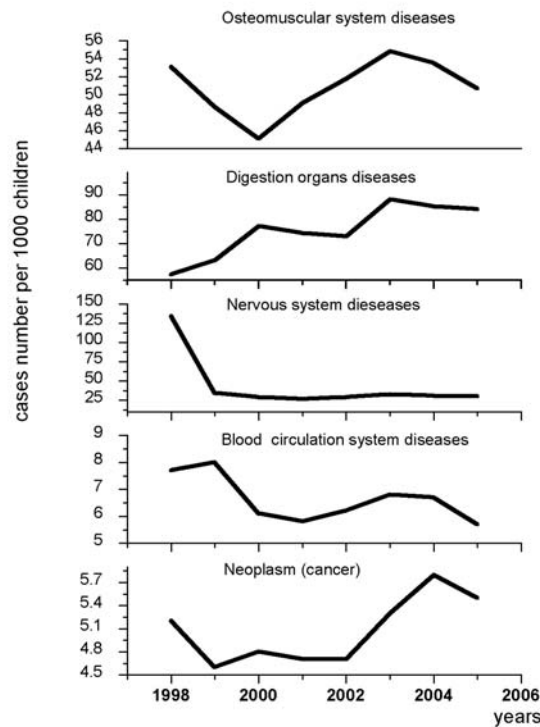Fig.2. An average annual morbidity dynamics by disease groups

Fig.3. An average annual morbidity dynamics by other disease groups

Conclusions

In conclusion it should be noted that during the assessment of epidemiological situation by morbidity indices it is necessary to consider the fact that nosologic forms are united in disease classes, which affect one of organism systems, however, the distinctions in the etiopathogenesis are not taken into consideration. So, the rhythm disorder and disorder of heart conduction in the overwhelming majority of cases in the infancy are stipulated by the dysfunction of the vegetative nervous system but belong to the class of diseases of the circulatory system. Therefore, the most optimum is to analyze single nosologic forms, which presents certain difficulties, as in official sources statistical data are presented only by disease classes and single nosologic forms, which lead to a disability. Besides, to identify the cause-effect relations between child morbidity and environmental factors the age characteristics of the group should be taken into consideration, since for children 1 and 2 year old, 2-6, 7-14, 15-17 years old the structure of the morbidity differs considerably. Thus, it is necessary to perform a preliminary medical-biological assessment and the analysis of causes that determine the levels and the dynamics of morbidity indices up to mathematical processing and construction of mathematical models, at the same time, there should be taken into consideration such factors as etiopathogenesis of diseases, changes in the system of disease cases registration, preventive measures etc.
The analysis of correlation of the primary children morbidity with the studied indices of solar activity using correlation coefficients is little informative due to complex, non-linear relations and the current absence of mathematical statistics methods, allowing to obtain convincing proofs of the solar activity influence on such microparameters of human population as morbidity and mortality of population (Ozheredov et al., 2006). Therefore, at the following stage of our work, it is planned to use the results we have obtained for construction of an adequate mathematical model, allowing to theoretically ground both the behaviour of the time series of morbidity in the past and to construct non parametric predictions for the future. In particular, the application of such model will allow to determine the contribution of geochemical, geophysical, natural-climatic and other factors in formation of morbidity levels of children population in the leading classes of diseases.

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