THE CLINICAL-POPULATION ANALYSIS OF THE PREVALENCE OF BONE TISSUE PATHOLOGY IN CHILDREN

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Annotation
The planning of regional-population studies of the structural-functional state of the bone tissue in children should foresee a possible effect of the environment and rest on principles of proof-based medicine, particularly on grounding of the quantitative filling of the age-sex groups, there by making it possible to take into account peculiarities in the children's growth and development.

Keywords: children, ecological, bones, osteopenia

Introduction.

Modern approaches to the assessment of the state of health are based on clinical-population principles in the analysis of the prevalence of diseases and pathological states, it being the most significant for children's population. In the past time, the clinical-etiological aspect of the formation of the structural-functional state of the bone tissue (SFSBT) is assigned the leading part in the paediatric practice [1, 2]. Peculiarities in the industrial-economic development of populated areas and separate regions are formed under the influence of ecological factors, which, not without any reason, are considered as the etiological or triggering factor for SFSBT disorders [2, 3]. Just therefore, planning of mass-scaled researches on SFSBT should integrally take into account ecological, demographic and other peculiarities of children's population groups.

The available data about the prevalence of the osteopenic syndrome and osteoporosis are in favour of a significant rate of these manifestations among children; these data require systematization and standardization in the context of the consideration of the effect, produced by social, ecological, alimentary, hygienic and other factors, and perfection of the methods and technologies for diagnosis, pathogenetic correction and assessment of the efficacy of the prevention and treatment [4, 5].

The purpose of the research was to scientifically ground an integral approach to the study of regional peculiarities in the prevalence of SFSBT disorder among children and adolescents of the Kharkov Region (Ukraine).

Taking into consideration the effect of environmental factors, an ecological-etiological clustering of the Kharkov Region districts was performed. With this purpose, we conducted a regional ecological-etiological clustering of the children's population of the Region, and it was based on a distribution of the children's population of the administrative districts by the level of the ecological well-being. In order to study relationships between ecological factors and the morbidity rate of osteopenia (OP) among children, the ecological-etiological factors were grouped using quantitative-analytical methods and data of official state researches. Values of direct measurements of certain environmental characteristics served as quantitative indicators of ecological factors in each district. These indices were divided into three groups: agroecological factors, factors of the anthropogenic loading on natural components, and hydroecological factors. The significance of certain ecological factors was identified with the index of correlation between the OP morbidity rate and the index, which characterized the environmental state. The conducted study of correlations between OP morbidity rate indices among the children's population of the Region and environmental characteristics resulted in a correlation grid (Table 1), which demonstrates a relationship between the OP prevalence and certain environmental factors.

By the results of the analysis, the most significant environmental factors were excess in the content of heavy metals in the terrestrial atmospheric interlayer (rXY = +0.70; rank 1) and excess in the content of heavy metals directly in the soil (rXY = +0.65; rank 2), as well as presence of proving grounds for disposing solid household, industrial or agrochemical waste in the living area (rXY = +0.64; rank 3).

Table 1. Correlation between ecological factors and OP morbidity rate among children's population of the Kharkov Region

Environmental characteristics	Soil removal intensity	Excess of heavy metal content in soil	Soil erosion rate	Area dust loading	Soil type	Content of lead, chromium, copper, nickel and zinc in terrestrial interlayer	Intensity of water object pollution from diffuse sources	Intensity of contaminated industrial wastewater disposal	Intensity of contaminated domestic wastewater disposal	Intensity of contaminated drainage wastewater disposal	Presence of proving grounds for disposing solid household, industrial or agrochemical waste	Water-bearing level mineralization	Presence of floodings caused by domestic activities	Osteopenia prevalence among children of school age
	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}
X_1	-	0.48	0.83	0.14	0.36	0.01	0.31	0.51	0.34	0.32	0.23	0.27	0.31	0.07
X_2	0.48	-	0.52	0.66	0.30	0.52	0.41	0.60	0.38	0.55	0.62	0.45	0.51	**0.65**

X_3	0.83	0.52	-	0.30	0.44	0.11	0.44	0.52	0.38	0.63	0.23	0.51	0.34	0.09
X_4	0.14	0.66	0.30	-	0.52	0.68	0.46	0.49	0.30	0.55	0.63	0.45	0.62	**0.60**
X_5	0.36	0.30	0.44	0.52	-	0.34	0.29	0.35	-0.03	0.30	0.27	0.33	0.29	0.07
X_6	0.01	0.52	0.11	0.68	0.34	-	0.22	0.44	0.12	0.30	0.47	0.22	0.30	0.70
X_7	0.30	0.41	0.44	0.46	0.29	0.22	-	0.31	0.19	0.63	0.38	0.31	0.16	0.23
X_8	0.51	0.59	0.52	0.49	0.36	0.44	0.31	-	0.48	0.35	0.65	0.38	0.34	**0.59**
X_9	0.34	0.38	0.38	0.30	-0.03	0.12	0.19	0.48	-	0.35	0.41	0.40	0.39	0.47
X_{10}	0.32	0.55	0.63	0.55	0.30	0.30	0.63	0.35	0.35	-	0.26	0.68	0.27	0.37
X_{11}	0.23	0.63	0.23	0.63	0.27	0.47	0.38	0.65	0.41	0.26	-	0.16	0.39	**0.64**
X_{12}	0.27	0.45	0.51	0.45	0.33	0.22	0.31	0.38	0.40	0.68	0.16	-	0.29	0.24
X_{13}	0.31	0.51	0.34	0.62	0.29	0.30	0.16	0.34	0.39	0.27	0.39	0.29	-	0.32
X_{14}	0.07	0.65	0.09	0.60	0.07	0.70	0.23	0.59	0.47	0.37	0.64	0.24	0.32	-

Along with the agro- and aeroecological environmental factors, a reliable effect on the OP morbidity rate is produced by hydroecological factors, first of all it being caused by the influence of the intensity of contaminated industrial wastewater disposal (r_{XY} = +0.59), the intensity of contaminated domestic wastewater disposal (r_{XY} = +0.47), and the intensity of contaminated drainage wastewater disposal (r_{XY} = +0.37).

By the results of our research, a number of environmental factors, which are regarded as significant by some researchers, are minor and did not produce any independent effect on the level of OP prevalence in children. Of them: the type (X_5), erosion rate (X_2) and removal intensity (X_1) of soils, as well as water object pollution from diffuse sources (X_7) and the water-bearing level mineralization (X_{12}). It is worth mentioning that some of these factors demonstrated a strong relation with significant environmental factors (from the viewpoint of OP formation). Thus, the intensity of contaminated industrial wastewater disposal (X_8) is interrelated (r_{XY} = +0.51) with the soil removal intensity (X_1), while the intensity of contaminated drainage wastewater disposal (X_{10}) is interrelated with the soil erosion rate (X_3; r_{XY} = +0.63), the intensity of water object pollution from diffuse sources (X_7; r_{XY} = +0.63) and the water-bearing level mineralization (X_{12}; r_{XY} = +0.68).

It is clear that the environmental influence on the process of OP formation in children is a system of a mainly external effect; combining and interrelating among themselves, environmental factors can create “external preconditions” for a clinical manifestation of osteopenic disorders, while the nosological kind, severity and degree of the influence on the quality of health of healthy children and those with chronic diseases can create individual ones. But, conventionally, it is possible to reveal the most influential complexes of environmental factors: a complex of agroecological factors (X_2+X_4): excess of heavy metals content in the soils combined with their increased erosion rate; a complex of hydroecological factors (X_{10}+X_8): the intensity of contaminated industrial wastewater disposal combined with an intense disposal of contaminated drainage wastewater and an intense disposal of contaminated domestic wastewater together with the water-bearing level mineralization; a complex of aeroecological factors (X_4+X_6): excess in the content of lead, chromium, copper, nickel and zinc in the terrestrial atmospheric interlayer combined with the area dust loading; a complex of factor of the anthropogenic loading (X_{11}+X_{13}): presence of flooding caused by domestic activities combined with presence of proving grounds for disposing solid household, industrial or agrochemical waste.

The reflection of the relationship between environmental factors and the spread of OP among the children’s population was examined in the aspect of a multicomponent loading and ecological-etiological factors, which belong to four groups: aeroecological, hydroecological, agroecological, and those of the anthropogenic loading on the natural components: the influence of environmental factors on the level of OP spread (studied with help of correlation analysis) was demonstrated by elaboration of a correlation matrix of relationships between ecological-etiological factors and the spread of OP; it was found out that the level of OP spread in children was characterized by a direct, moderately and highly strong relationship with ecological factors which form several groups: agroecological, aeroecological, hydroecological, and those of the anthropogenic loading on the natural components; the component contribution of the above groups of ecological factors differs, it being explained by their total nonspecific influence and selective preponderance of the influence of some ecological factors or their complexes in concrete conditions of the children’s life.

Conclusions.

1. The planning of regional-population studies of the structural-functional state of the bone tissue in children should foresee a possible effect of the environment and rest on principles of proof-based medicine, particularly on grounding of the quantitative filling of the age-sex groups, there by making it possible to take into account peculiarities in the children’s growth and development.
2. The methodology of ecological-etiological division into districts makes it possible to take into consideration regional peculiarities, when studying the spread of osteopenic syndrome and the morbidity rate of osteopenia, and can become a precondition for perfecting the population health monitoring in relationship with environmental factors.
3. The use of the sample method and expedition forms for collecting raw material in the above research made it possible to ensure a standardized analysis of osteopenic syndrome spread regularities in children.
4. The variety of environmental effect on the formation of osteopenic disorders should be taken into account, when planning and conducting population studies, as well as perfecting the system of giving primary medical-sanitary aid.

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