



HYGIENIC ASSESSMENT OF THE HEALTH STATE AND PHYSICAL DEVELOPMENT OF PRESCHOOL CHILDREN UNDER COMBINED EXPOSURE TO CHEMICAL FACTORS OF THE ENVIRONMENT

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Resume

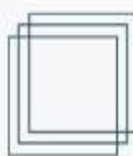
The article is devoted to the study of the state of health, morphometric and functional indicators of the physical development of preschool children living in conditions of the combined effect of chemical factors of industrial production. At present, negative trends in the health indicators of the child population, including chronic morbidity, persist [1, 2]. According to official data, the overall incidence of children under the age of 14 over the past decade has increased by 9.3%, and of 13.62 million schoolchildren, only 21.4% have the first health group, while 21% are diagnosed with chronic forms of somatic pathology. The level of health of modern first-graders is significantly lower than that of children at the end of the last century; only 4.3% of them are now recognized as absolutely healthy, against 8.7% at the end of the 90s [1, 6].

Keywords: somatic pathology, sanitary and hygienic situation, general morbidity, indicators of physical health.

Relevance

One of the key reasons that have a negative impact on the health of the child population is a difficult sanitary and hygienic situation [2, 3, 7]. The results of studies carried out in areas of active industrial production indicate a close relationship between health disorders of the child population and indicators of the quality of the environment, which is determined, first of all, by the anabolic orientation of metabolic processes in the child's body and the imperfection of its adaptive and compensatory defense mechanisms [2]. One of the most important criteria reflecting the level of a child's health is his physical development, which, in turn, is largely determined by the quality of the environment [2]. Acceleration processes characteristic of 60-80 years. XX century, now significantly slowed down and was replaced by a retardation of physical development against the background of the gracilization of the physique of a modern child. In addition, over the past 20 years, the number of children with underweight and low growth rates has increased from 5 to 14% (from 0.5 to 4%) [13,19].

Deceleration processes are accompanied by a decrease in the functional capabilities of children: over the past decades, the indicators of muscle strength have decreased by 18-20%, and the vital capacity of the lungs by 15%. The revealed tendencies are most typical for children living in areas of intensive industrial production [20]. The purpose



of this study was to study the state of health, morphometric and functional indicators of the physical development of preschool children under the conditions of the combined effect of chemical factors of the environment. The object of the study was children aged 3–7 years living on the territory of an industrial center with actively functioning enterprises of the chemical, petrochemical and pulp and paper industries (330 children, of which 150 are boys and 180 are girls). The comparison group consisted of 102 children of the same age living in an area of relative ecological well-being represented by an urban-type settlement (56 boys and 46 girls).[23]

To assess the indicators of physical development, a set of standard anthropometric measurements was used (height, body weight, circumference of the chest, head, lower leg, thigh, shoulder, forearm, waist, hand dynamometry) [4]. Electrocardiographic examination was carried out on a 6-channel electrocardiograph "Shiller AT-10 plus". The assessment of the adaptive capabilities of external respiration was carried out with a forced expiratory spirometric test on a Schiller SP-10 spirometer. Ultrasound scanning of the gastrointestinal tract was performed on a Toshiba Viamo apparatus using a multi-frequency convex transducer. The assessment of the health status of children, in addition to the analysis of individual developmental maps, was carried out according to standard clinical examination methods by a pediatrician, cardiologist, gastroenterologist, neurologist, and physical therapy doctor. Chemical analytical studies with the determination of the content of chemical toxicants in biological media (blood) were carried out using atomic absorption spectrophotometry, liquid and gas chromatography, according to MUK 44.763–99– 4.1.799–99 and MUK 763–99– 4.1.779–99 Ministry of Health [10,11,12].

The accumulation, primary processing, analysis and visualization of information was carried out using standard (SAS V 6.04, STATGRAF, etc.) and specially developed software products [5]. Results and discussion. On the territory of the industrial center there are more than 60 enterprises and organizations that are sources of emissions into the atmospheric air of 97 pollutants (about 2.5 thousand tons per year). Residential buildings are everywhere located near industrial sites.

In the atmospheric air and the air of the closed premises of the center, an excess of hygienic standards for dust, hydrogen sulfide, formaldehyde was established; the percentage of non-standard samples was respectively - 6.7; 16.7 and 16.7%. The industrial center is supplied with water from a surface source. The water quality in the area of the water intake does not correspond to the established standards (66.1% of samples - in terms of microbiological indicators, 30.8% - in terms of sanitary and chemical indicators). The specific combined index of water pollution was 3.10. The share of the population provided with quality drinking water did not exceed 20.1%. The main components of drinking water pollution were products of hyperchlorination (residual free chlorine - 62.5% of the samples above the MPC, residual chlorine bound - 12.5% of the samples above the MPC). Compounds formed during chlorination were

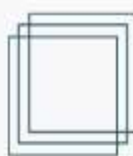


found in drinking water - chloroform, carbon tetrachloride, dichloroethane, dichlorobromomethane and dibromochloromethane. According to the criterion of the sum of the ratios of the detected concentrations, the indicator exceeds the permissible level by up to 2.5 times. In addition, identified in drinking water: p-xylene, caprolactam, benzene and its derivatives, phthalic anhydride. The children of the comparison group lived in a semi-peripheral type territory with an industrial-agrarian resource-saving economy. Water supply to the territory of residence of children of the comparison group was carried out from an underground water source and fully complied with the hygienic standards for drinking water [14].

In biological media in children of the main group, the percentage of samples higher than the comparison group was noted in terms of the content of aromatic hydrocarbons (benzene, toluene, o-xylene); organochlorine compounds (chloroform, carbon tetrachloride, 1,2-dichloroethane, dibromochloromethane); phenol; formaldehyde, acetaldehyde, acetone; manganese, copper. The maximum percentage of samples exceeding similar indicators of the comparison group is set for carbon tetrachloride - 100%; chloroform - 97.5%; acetaldehyde - 94.1%, chloroform - 98.8%, formaldehyde - 68.8%, phenol - 45.9%.[22]

The highest multiplicity of excess was established for phenol - 1.1 times; chloroform - 18 times, acetone - 5.6 times, acetaldehyde - 2.9%. For copper and manganese, the results were evaluated relative to the reference concentrations, which for manganese are 0.0109 mg / dm³; for copper - from 0.79 to 1.6 mg / dm³. The excess of the reference concentration for manganese reaches 1.7 times; for copper, the average concentration for the group is in the range of the reference concentration.[10,11]

An analysis of the medical aid appealability of children of the industrial center at the age of 3-7 years showed its increased level in gallstone disease, diseases of the gallbladder, biliary tract and pancreas by 4.64 times, immunodeficiencies - 4.01 times, conjunctivitis - 8, 58 times, disorders of the autonomic nervous system - 7.21 times, in relation to the comparison group (p <0.01). When studying the health status of children in the main group, it was found that only 5.9% of them had the first health group, while the priority types of chronic pathology were inflammatory diseases of the respiratory system (48.7%) and functional disorders of the gastrointestinal tract (35, 6%). In the comparison group, children with the first health group were significantly higher - 30% (p <0.01), and chronic diseases of the respiratory and gastrointestinal tract were 2.9-2.2 less frequent (p <0.01), than in the main one (17.1 and 16.3%, respectively). The study of the functional state of the respiratory system made it possible to establish that the indicators of external respiration only in 59.9% of children of the main group corresponded to the physiological norm, and in 33.4% of cases deviations of a restrictive nature were recorded, which is associated with a high incidence of respiratory diseases in children and delayed functional development. respiratory system. In children of the comparison group, external respiration indices



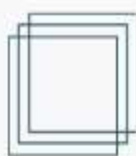
corresponded to the physiological norm in 76% of the examined ($p < 0.01$), restrictive disorders were detected only in 4.7% of children. In the course of ultrasound examination of the abdominal cavity organs in 72.5% of children in the main group, reactive and structural (2.7%) changes in the pancreas, expansion of its duct (4.8%) and aerocolia (13.9%), an increase in the size of the pancreas were found. liver (38.1%), labile (36.4%) and fixed (12.2%) kinks of the bile duct.[21]

The absence of any pathology on the part of the abdominal organs in children of the main group was found only in 7.8% of the examined children, while in the comparison group there were 2.7 times more such children ($p < 0.01$) - 20, eight %. An analysis of the results of electrocardiographic examination of children in the main group made it possible to establish in 90.6% of them the presence of disturbances in the processes of excitation in the myocardium, while in the comparison group this pathology was found 2.5 times less frequently ($p < 0.01$) - in 63, one %.

An analysis of the anthropometric data of the children of the main group showed that 80.9% of boys and 79.9% of girls had mesosomatic development, 17.2% had a macrosomatotype, and microsomia was much less common (in 1.9% of boys and 2.9% of girls) that did not differ significantly from the comparison group, where the frequency of occurrence of the corresponding somatotypes was 81.0-75.0%; 17.3-18.7%; 1.7-6.3%. 17.2% of children in the main group had a weight deficit (in 7% - grade 2), while excess body weight was recorded in 9.3% (in 3.5% - grade 2). At the same time, 15.9% of boys and 20.2% of girls had disharmonious development. In the comparison group, only 6.9% of children had a body weight deficit, and its excess - 6.3%, while no degree 2 weight impairment was found in any child. At the same time, 17.3% of boys and 16.6% of girls in the comparison group had disharmonious development and, according to this parameter, the children of the compared groups did not differ ($p > 0.05$). However, attention was drawn to a more pronounced tendency towards the gracilization of children of the main group: at any studied age, the circumference of the chest, head, thigh, lower leg, shoulder, forearm and waist by $(1.8-2.6 \pm 0.4-0.7)$ see was lower than that of the comparison group ($p < 0.01$). A study of the muscle strength of children during hand dynamometry revealed a decrease in its indicators in children of the main group in each age period relative to the comparison group: from 2.2-3.4 times in 3-4-year-old children ($p < 0.01$) to 1, 2-1.3 times in 5-7-year-olds ($p < 0.01$).

Conclusion

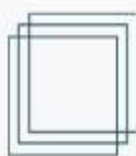
The results of the studies carried out indicate that children living in conditions of constant air pollution with dust, hydrogen sulfide and formaldehyde (with an excess of non-standard samples up to 16.7%), and drinking water - with hyperchlorination products (p-xylene, caprolactam, benzene and its derivatives, phthalic anhydride) leads to the contamination of children's biological media with chloroform, carbon



tetrachloride, to an increase in the concentration of formaldehyde in the blood (up to 2.1 times) and in the urine of phenol (up to 1.1 times). At the same time, the level of appeal of the child population for medical care for diseases of the gastrointestinal tract increases by 4.6 times, immunodeficiencies - by 4.0 times, eye diseases - by 8.6 times, disorders of the autonomic nervous system - by 7.2 times. Under the conditions of the combined effect of chemical factors of environmental pollution, the number of absolutely healthy children decreases 5.1 times, and the frequency of detection of diseases of the respiratory system and gastrointestinal tract increases 2.9-2.2 times, in addition, the processes of deceleration and gracilization children are more pronounced and, as a result, are accompanied in every third child by restrictive respiratory disorders, and in 2/3 of children - by morphological changes in the gastrointestinal tract against the background of vegetative disorders occurring 2.5 times more often.

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