



THE SIGNIFICANCE OF A TUMOR MARKER IN THE SCREENING EXAMINATION OF CHILDREN LIVING IN UNFAVORABLE REGIONS

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SUMMARY

This article presents an analysis of the structural characteristics of malignant neoplasms in children and investigates the influence of environmental factors originating from the Aral Sea region on the adaptive mechanisms of the body. Notably, there has been a significant rise in the incidence of oncological diseases among children and adolescents, which, according to researchers, may be attributed to the exposure to salt-pesticidal mixtures. These observations highlight the potential use of HE4 as a novel oncomarker in screening studies, providing a rationale for conducting comprehensive examinations of organs or organ systems that are at risk of cancer.

KEYWORDS: tumor marker, incidence, children, risk factors, Aral Sea region.

Relevance. The Aral region is currently facing one of the largest environmental issues on the planet. In the Aral Sea area, desertification of territories, increased salt extraction from the dried bottom of the sea, and chemical pollution of water, air, and plants are among the environmental factors of concern. The primary drivers of the loss of resource potential in this region are the excessive concentrations of pollutants in the environment (such as atmosphere, water, and soil), which threaten the lives of the population.^[2] The combined negative impact of these environmental factors leads to a disruption of the biogeochemical composition of the environment, which adversely affects the health of children. Specifically, otherwise healthy children may experience functional system stress, disturbances in homeostasis, and the engagement of compensatory (reserve) mechanisms of adaptation to living conditions.^[1] Researchers suggest that the recent increase in oncological diseases among children and adolescents in the region may be due to exposure to salt-pesticidal mixtures.^[3]

The aim of this study is to identify the primary patterns in the overall and newly recorded incidence rates of oncological diseases in children aged 0-14 years in the Republic of Karakalpakstan.

Material and research methods. The study was conducted based on data obtained from the statistical observation form entitled "Information on the number of registered oncological morbidity in children aged 0-14 in

the Republic of Karakalpakstan." The primary objective was to analyze the changes in morbidity rates between 2009 and 2020. Results revealed that in the Republic of Karakalpakstan, more than 50 children were diagnosed with malignant neoplasms for the first time, indicating an incidence rate of 3 per 100,000 children aged 0-17 years. The incidence of neoplasms has doubled over the past decade among children aged 0 to 18, from 34 cases in 2009 to 54 cases in 2019. Moreover, the study investigated the distribution of serum concentrations of the oncomarker HE4 (Human Epididymis Protein 4) in children living in this region.

Research results. Hemoblastoses, or tumors of the hematopoietic or lymphatic tissue, constitute the leading position in the structure of malignant neoplasms in children, followed by brain and spinal cord tumors, bone and soft tissue tumors, kidney tumors, eye tumors, and liver tumors. Over the past decade, the annual number of primary patients has increased by 27%, and the number of children registered with dispensaries has increased by 34%. However, the fact that the world average incidence rates range from 8-15 cases per 100,000 of the child population suggests that approximately 18% of primary patients remain unaccounted for annually. Consequently, it is anticipated that the incidence (detection rate) in Karakalpakstan will continue to rise, with an estimated 60 primary patients being diagnosed each year (Figure - 1).

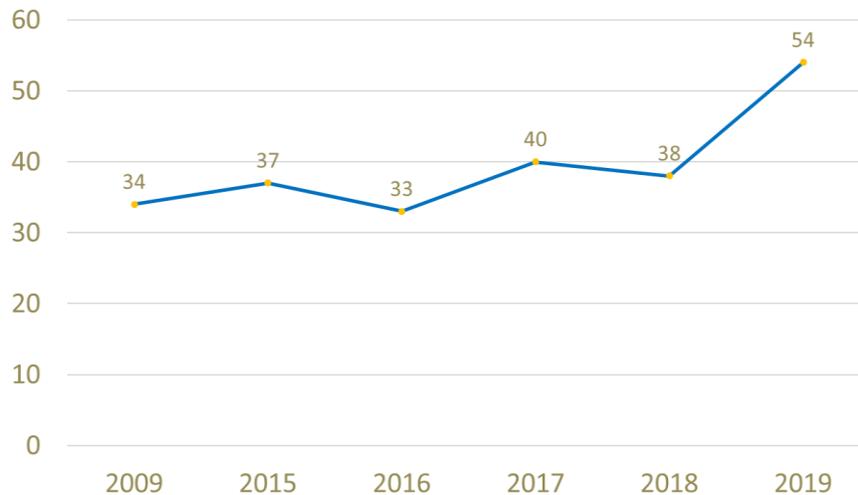


Fig.1. General incidence of malignant neoplasms in children under 18 years of age.

In the structure of malignant neoplasms in children, the first place is occupied by hemoblastoses (tumors of the hematopoietic or lymphatic tissue), the second - tumors

of the brain and spinal cord, then - neuroblastomas, tumors of bones and soft tissues, kidneys, eyes, liver (Fig. 2).

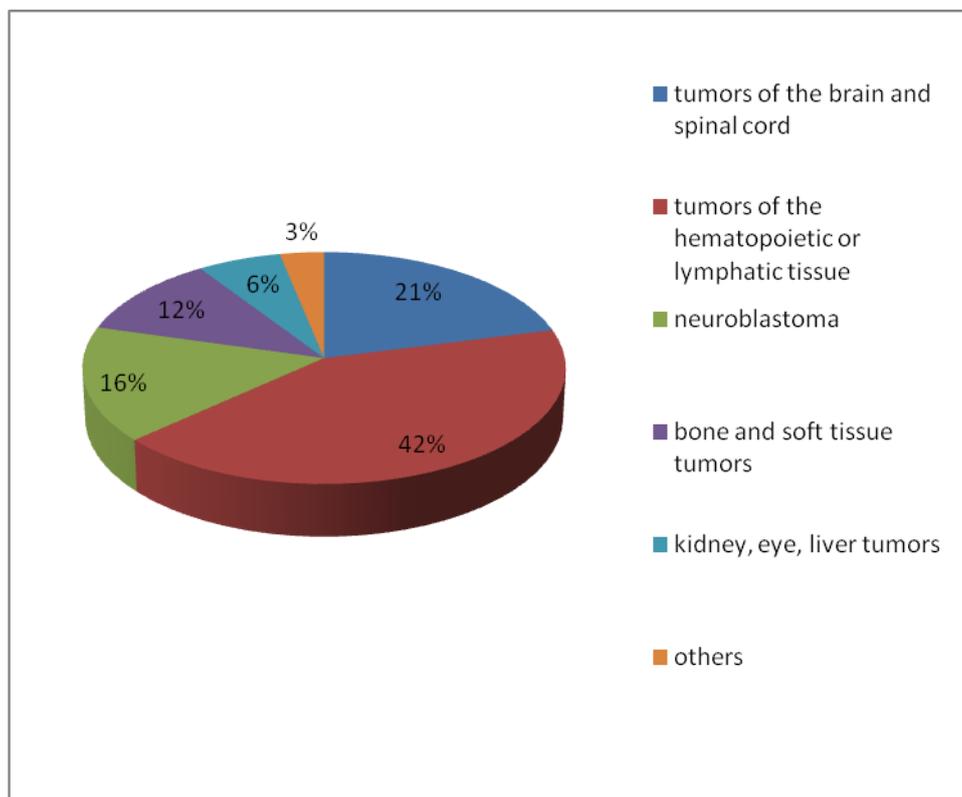


Fig 2: Morbidity structure (%) of the child population (0–17 years old) with malignant neoplasms.

The peak incidence of malignant neoplasms in children occurs at ages 0-4 years, which suggests that prenatal factors may be involved in the development of the disease.^[4] Possible cancer risk factors in children include hereditary predisposition, pregnancy disorders, environmental and occupational factors that may have affected the parents before the child was conceived, among others. Among the various nosologies, leukemia,

brain and spinal cord tumors, as well as sarcomas of inert tissues are prominent.^[7]

The distribution of serum concentrations of the oncomarker HE4 was analyzed in a group of children living in the Aral Sea region. Results showed that the most frequently recorded serum concentrations of HE4 were within the upper limit range, accounting for 60% of all values in the study group. There was a trend towards

an increase in HE4 concentration in older children compared to younger children, and in girls compared to boys, although these differences did not reach statistical significance ($p = 0.10$).

HE4 is a tumor marker used for screening studies, providing grounds for further examinations of organs or organ systems that are at risk of cancer. The results of this study suggest that HE4 could potentially be used as a new oncomarker not only for ovarian cancer screening and prevention, but also for tumors of other localizations. However, individual factors that can affect the concentration of HE4 in serum must be taken into account.^[5,6,8]

CONCLUSION

A regional approach to the study of childhood cancer incidence allows for a more detailed analysis of the situation in a particular area, taking into account the specific environmental and social factors that may contribute to the development of the disease. This approach can help identify patterns and trends in childhood cancer incidence within a given region and provide valuable information for developing effective prevention and control strategies.

It is important to note that the regional approach should be complemented by a broader national and international perspective in order to fully understand the factors that contribute to childhood cancer incidence. International cooperation and exchange of data and knowledge can lead to a better understanding of the complex interactions between genetic, environmental, and lifestyle factors that contribute to the development of childhood cancer.

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