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MONITORING OF INCREASE IN LEUKEMIA PREVALENCE FOR THE LAST TWO QUINQUENNIUMS IN KARAKALPAKSTAN

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227 cases of hemoblastoses were identified in all 16 regions of the Republic of Karakalpakstan. 152 (67%) patients were in the following 6 districts: Shimbay, Tahtakupir, Amu Darya, Tahiyatash town, Hojeyli region, and Nukus city. The frequency of leukemia incidence in the selected places was slightly higher compared with all other 10 districts where only 75 (33%) patients were identified. Dynamics of frequency of leukemia incidence shows comparative increase in the frequency of leukemia occurrence (n=130; 57.3%) in 2006-2010, compared with those (n=97, 42.7%) in the previous quinquennium (2001-2005), indicating to deterioration of ecological balance.

Keywords: Leukemia, morbidity rate, epidemiology, ecological imbalance.

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Introduction

Acute and chronic leukemias which incidence tends to increase are one of the urgent problems of modern medical science (Dvoyrin et al., 1997; Zaridze, 1997; Kobets et al., 2001). Bondar (2001) and McKinney et al. (1999) noted the necessity to conduct epidemiological studies of disease across a large region and the areas in the comprehensive planning of complex treatment-preventive measures for patients with hemoblastoses in order to determine the prevalence, morbidity and mortality rate of disease, as well as overall survival among different groups in different time intervals.

The study deliberates on dynamics of increase in leukemia prevalence among population of the Republic of Karakalpakstan for the last two quinquenniums, 2001-2005 and 2006-2010, depending on regional characteristics.

Materials and methods

The materials of study were retrospectively analyzed cards, registration journals, and medical records of outpatient patients with established clinical diagnosis of leukemia. The diagnosis of leukemia was made on the basis of generally accepted criteria (Makhmudova, 2004). To determine whether the differences are statistically significant, we used t-test.

227 first registered patients with leukemia at the age from 15 to 70 years have been identified in Department of Hematology of the Multidisciplinary Regional Pediatric Hospital of Nukus city (Karakalpakstan) for the period of 2000-2010. The incidence of leukemia was relatively more frequently among males (n=116; 51.1%) than females (n=111; 49.9%), although this difference was insignificant.

Results and discussion

Depending on cytomorphological variants there were revealed 131 (57.7%) patients with chronic myeloid leukemia (CML), 76 (33.5%) - acute lymphoblastic leukemia (ALL), 12 (5.3%) - acute myeloblastic leukemia (AML), 5 (2.2%) - chronic lymphocytic leukemia (CLL), and only 3 (1.3%) patients with undifferentiated variant of acute leukemia (AUL). These data are consistent with those of other authors (Omarova, 2005).

Table 1 demonstrates monitoring of growth of leukemia prevalence in Department of Hematology of the Republican hospital in Nukus for the last two quinquenniums.

TABLE 1. DYNAMICS OF INCREASE IN LEUKEMIA PREVALENCE FOR THE LAST TWO QUINQUENNIUMS (2001-2005 AND 2006-2010) IN DEPARTMENT OF HEMATOLOGY OF THE REPUBLICAN MULTIDISCIPLINARY CLINIC IN NUKUS CITY

Region	2001	2002	2003	2004	2005	First fifth anniversary		2006	2007	2008	2009	2010	Second fifth anniversary		Tenth anniversary	
						abs	%						abs	%	abs	%
Nukus	4	1	-	-	-	5	5.2	1	-	-	1	1	3			
Nukus city	4	2	5	4	2	17	17.5	6	3	6	8	9	32			
Hojeyli	5	5	1	1	4	16	16.5	4	4	2	3	4	17			
Shymbay	2	2	-	3	1	8	8.2	2	-	1	-	5	8			
Tahiyatash	1	2	1	1	2	6	6.2	2	2	3	3	-	10			
Kungurad	1	2	-	2	1	6	6.2	3	2	1	1	1	8			
Korauzak	2	-	1	-	-	3	3.1	-	-	-	1	1	2			
Chimbay	1	-	-	-	-	1	1.0	-	-	-	-	-	0			
Amu Darya	-	1	2	1	2	6	6.2	2	-	2	1	5	10			
Tahtakupir	2	3	1	1	1	8	8.2	-	-	3	2	4	9			
Ellikkalyn	1	1	-	-	1	4	4.1	-	-	-	-	1	1			
Kegeyli	1	2	1	2	1	7	7.2	1	2	-	2	1	6			
Kanley Kul	-	1	-	-	2	3	3.1	4	2	-	-	1	7			
Shumanay	-	1	1	1	2	5	5.2	1	-	2	1	3	7			
Muynak	-	-	-	1	-	1	1.0	-	-	2	-	1	3			
Turtkul	-	-	-	-	1	1	1.0	2	-	2	1	3	8			
Karakalpakstan	24	22	13	17	21			28	15	24	24	39	130			
For the fifth anniversaries	97=42.9%					97	100	130=57.1%						100	227	100

The table clearly shows that leukemia incidence is not similar, depending on the regions and cities of the Republic. High incidence of leukemia was marked in 2 regions of 16. 49 (21.6%) patients of 227 were identified in Nukus city, and 33 (14.7%) patients - in Hojeyli district. Morbidity rate was 2.5 times more likely in these regions than in the Republic with an average index of patients 14 (5.2%). Leukemia incidence was also relatively higher in 4 districts of 16, compared to the other. These were Tahtakupir district (n=17; 7.5%), Amu Darya (n=16; 7.1%), Shymbay (n=16; 7.1%), and Tahiyatash town (n=16; 7.1%), compared to 10 other regions with an average index 7 (3.1%).

It should be noted that 6 regions of 16 districts and towns have significantly higher incidence of leukemia. These figures and facts argued indicate to ecological imbalance there. With regard to Nukus index 49 (21.6%) and Hojeyli district index 33 (14.7%), this is very high frequency compared to the average index 7 (3.1%) of remaining 10 districts, i.e. 7 times higher incidence in Nukus and more than 6.1 times higher incidence in Hojeyli district are evidence of gross violations of ecological balance, or so-called high risk of developing of leukemia.

An analysis of increase in leukemia incidence for the last two fifth quinquenniums showed dynamics of significant increase in leukemia incidence (n=130; 57.3%) in the second fifth anniversary (2006-2011), compared with those (n=97; 42.7%) in the previous fifth anniversary (2001-2005). The differences between the first and second fifth anniversaries amounted 14.5%. This testifies to significant increase in leukemia prevalence among population of the Republic of Karakalpakstan, indicating to ecological imbalance in recent years, which could be considered as etiologic risk factor for leukemia and all new cases or foci of hemoblastoses in surveyed areas of the Republic of Karakalpakstan.

After studying and establishing the incidence of acute leukemia among children in Kazakhstan which was a mean 2.6 patients per 100.000 of pediatric population, Omarova (2005) has concluded that leukemia occurrence of is not a random process, it is a natural result of the summation of adverse epidemiological factors which consist of factors of environment, heredity, contacts of children's parents with the chemical and physical carcinogens, etc.

Experimental studies conducted by Karimov et al. (2009) showed that low doses and prolonged use of benzol had mutagenic effect on hematopoietic bone marrow cells in rats, disrupting kariokinesis and functions of the chromosomal apparatus, and caused leukemia in experimental animals.

In 2000, employee of our department Akhmedov carried out research work on the subject "The state of erythropoiesis in inhabitants of rural areas in Andizhan region after use of pesticides". To establish a carriage of pesticides among unorganized rural population, he analyzed residues amount of chlorine-organic pesticides (COP) in Andizhan soil. Andizhan region was the most suitable for this study due to high contents of COP in soils and plants which exceeded the maximum permissible level, as well as the majority of population is employed with agricultural work. 100% carriages of various types of COP were revealed in whole blood of rural population of this region. Mean concentrations of α-HCH and γ-HCH were higher in women (0.010±0.007 pg/ml) than in men (0.008±0.001 pg/ml), respectively. On the contrary, the concentrations of DDE and DDT were higher in males (0.022±0.002 pg/ml) than in females (0.020±0.002 pg/ml).

In the literature, there are reports of occurrence of lipoma and sarcoma in people exposed to effects of pesticides in industrial environment conditions. Also there is information about mutagenic and carcinogenic effects of many pesticides. Pesticides can cross placenta into fetus and manifest mutagenic, embryotoxic, and teratogenic actions (Badaeva, 1986; Ulanova, 1990).

According to Nikolaev et al. (1988) the content of COP in subcutaneous fat was detected in 96%, and in liver - in 80% of cases. The highest concentrations were determined in bone marrow, lymph nodes and spleen (Yudanova, 1989).

Epidemiological study by Vorobyov et al. (1992) has found significant increase in leukemia incidence, especially lymphosarcoma, among people in rural areas which associated with intensive use of pesticides.

Summary

Thus, clonality lies in the basis of tumor growth and development: each leukemia, each hematosarkoma, and each lymphocytoma with whole mass of their cells due to mutation of their only primordial cell. The role of ionizing radiation in increased frequency of acute and chronic leukemias, lymphosarcoma, and myeloid disease has been proven in the studies of consequences of explosion of the atomic bomb in Hiroshima and Nagasaki, as well as the nuclear accident at Chernobyl. Chemical mutagen factors, notably the toxic chemical poisonings - pesticides, including COP, play the similar role in the emergence of leukemia genesis.

We identified 227 patients with hemoblastoses in all 16 regions of Karakalpakstan; 152 (67%) patients of them were in the following 6 districts: Shimbay, Tahtakupir, Amu Darya, Tahiyatash town, especially Hojeyli, and Nukus city where frequency of leukemia incidence was slightly higher compared with all other 10 districts, representing only 33% (75 patients) of leukemia cases.

According to two recent fifth anniversaries, dynamics of frequency of leukemia incidence shows the comparative increase in the frequency of leukemia occurrence (n=130; 57.3%) in the second fifth anniversary (2006-2010), compared with those (n=97, 42.7%) in the previous fifth anniversary (2001-2005), indicating to deterioration of ecological balance.

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