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APPROACHES TO THE CREATION OF A BIOINFORMATION SYSTEM FOR DIAGNOSING FORMS OF ACUTE LEUKEMIA BASED ON THE ANALYSIS OF BIOMEDICAL INFORMATION

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Abstract. *The goal and objectives of the research are to provide a quick and reliable method of detecting acute leukemias, as well as forecasting through the creation of information technology using computer processing methods of biomedical information with subsequent effective treatment.*
Key word: *bioinformation system for diagnosing, acute leukemia, biomedical information*

Introduction. The incidence of all types of leukemia is 13 cases per 100,000 population per year. Acute leukemias make up 1-2% of all cases of malignant neoplasms annually. In general, men get sick more often than women. Among ethnic groups, Caucasians are the most frequently affected. There are certain differences between the types of leukemia depending on the age of the patients. The average age of patients with acute lymphocytic leukemia is 10 years. In adulthood, this disease occurs in only 20% of patients. Acute lymphocytic leukemia is the most common malignant tumor in pediatric practice and accounts for 1/3 of all malignant tumors in childhood. With acute lymphocytic leukemia, the 5-year survival rate in childhood is 80%, in adulthood - 40%. The average age of patients with acute myeloid leukemia is 65 years.

The incidence of acute myeloid leukemia increases from 1.8 cases per 100,000 population in childhood to 17.7 per 100,000 population over the age of 65. With acute myeloid leukemia, the 5-year survival rate in people younger than 20 years is 50%, in people older than 60 years – less than 20%. The incidence of chronic myelogenous leukemia is 1-1.7 per 100,000 population, and it is the fifth most common leukemia among adults. The peak incidence is observed at the age of 40-50. Chronic lymphocytic leukemia is the most common type of leukemia diagnosed in adults. The incidence of chronic lymphocytic leukemia averages 3.3 per 100,000 of the population, and increases to 20 per 100,000 in people over 65 years of age. The average age of patients at the time of diagnosis is 64 years.

The relevance of timely diagnosis and treatment of leukemias stems from difficulties in medical management and psychological support of patients with these diseases.

Method. Instrumental and informational research base

Most environmental risk factors were found to be inconsistently associated with any form of acute leukemia.

Thus, in addition to ionizing radiation, they can include:

- genetic predisposition;
- adverse environmental factors;
- a significant amount of carcinogens in everyday life (in particular, pesticides, benzene)
- medicinal products (for example, chlorambucil, cyclophosphamide, etc.);
- use of alcohol and illegal drugs;
- smoking cigarettes;
- other hematological diseases.

Also, scientists do not exclude the possibility of infectious risk factors (Epstein-Barr virus, Retrovirus HTLV), reproductive history of the mother, course of pregnancy, genetic defects and chromosomal abnormalities.

Laboratory data in acute leukemia.

Clinical blood analysis:

1. Normochromic normocytic anemia.
2. Reticulocytopenia.
3. Thrombocytopenia.
4. Changes in the total number of leukocytes (increase or decrease).
5. Blasthemia.
6. Decrease in the number of mature neutrophils.
7. The "failure" phenomenon.
8. Disappearance of eosinophils and basophils.
9. Increase in ESR.

Biochemical blood analysis: possible increases in γ-globulins, seromucoid, fibrin, ALT, AST, alkaline phosphatase, bilirubin, urea and creatinine, decrease in albumin.

Myelogram:

1. The number of blasts has been increased to 30% or more;
2. Significant reduction of erythroid, granulocytic and megakaryocytic sprouts.

Cytochemical and immunological studies allow differentiation of variants of acute leukemia. During cytochemical examination, acute lymphoblastic leukemia is characterized by a positive reaction to glycogen, and acute myeloblastic leukemia is characterized by a positive reaction to myeloperoxidase. Immunological analysis - detection of lymphoblastic leukemia antigen, B- and T-cell markers in acute lymphoblastic leukemia on the surface of blasts.

Cytogenetic analysis allows to assess the prognosis of the disease.

Instrumental studies in acute leukemias.

• X-ray and tomography of the lungs: leukemic pneumonitis, enlarged mediastinal lymph nodes, pleural effusion may be detected.

• ECG: non-specific changes in connection with leukemic infiltration, as well as myocardiodystrophy in tumor intoxication, anemia and toxic effects of cytostatic therapy.

• Ultrasound: expansion of the heart cavity, decrease in contractility of the myocardium, increase and heterogeneity of the structure of the liver and spleen.

• Radioisotope scan of the liver: an uneven decrease in the accumulation of the radiopharmaceutical is determined.

• Spinal puncture: detection of blast cells in neuroleukemia.

Conclusion. The goal and objectives of the research are to provide a quick and reliable method of detecting acute leukemias, as well as forecasting through the creation of information technology using computer processing methods of biomedical information with subsequent effective treatment.

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ПІДХОДИ ДО СТВОРЕННЯ БІОІНФОРМАЦІЙНОЇ СИСТЕМИ ДІАГНОСТИКИ ФОРМ ГОСТРОГО ЛЕЙКОЗУ НА ОСНОВІ АНАЛІЗУ БІОМЕДИЧНОЇ ІНФОРМАЦІЇ

Анотація. Метою та завданнями дослідження є створення швидкого та надійного методу виявлення гострих лейкозів, а також прогнозування шляхом створення інформаційних технологій з використанням методів комп'ютерної обробки біомедичної інформації з подальшим ефективним лікуванням.

Ключові слова: біоінформаційна система діагностики, гострий лейкоз, біомедична інформація

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