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ФІЗІОЛОГІЯ – МЕДИЦИНІ, ФАРМАЦІЇ ТА ПЕДАГОГІЦІ: АКТУАЛЬНІ ПРОБЛЕМИ ТА СУЧАСНІ ДОСЯГНЕННЯ

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ACUTE MYELOID LEUKEMIA

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Background. Acute myeloid leukemia (AML) that is also known as non-lymphocytic anemia. Based on 2009–2013 cases and deaths analysis, the number of new cases of acute myeloid leukemia was 4.1 per 100,000 men and women per year and the number of deaths was 2.8 per 100,000 men and women per year. In 2016 AML constituted 19,950 from estimated new cases and 1.2 % of all new cancer cases with 10,430 of estimated deaths and 1.8 % of all cancer deaths. According to data review of 2006–2012, percent of patients surviving 5 years is 26.6 %. Based on 2011–2013 data, approximately 0.5 percent of men and women will be diagnosed with acute myeloid leukemia at some point during their lifetime, thus AML is the most common leukemia in adults, that proves the importance of its research.

AML is basically the abnormal rapid growth of white blood cells and increase of their number (proliferation) and elevation in number of myeloblasts in the bone marrow and blood more than 20 % (normal value is 1–2 %). AML is a representation of clonal hematopoietic stem cell disorders with block differentiation and unchecked proliferation resulting in this accumulation of myeloblasts.

The causative agents of AML are many, as in the most cancers, but few can be called the main. First is genetic predisposition, caused by chromosomal instability in several autosomal dominant chromosomes – translocation of chromosome 15 and 17, inversion of chromosome 16, translocation of 8 and 21 or all of them, mutation in gene AML-1. Second is environmental exposure to ionizing radiation and organic solvents such as benzene. There is a direct correlation between environmental factors intensity and AML cases – as the doze increases, the incidence of leukemia increases too. Third factor is the age – chances of AML development are remarkably higher after the age of 67. Bone marrow disorders and their therapy, especially therapy of alkylating agents during 5–7 years, may also lead to AML.

There are 2 types of WBC proliferation. Reactive proliferation with leukocytosis (increase in WBC number more than 11000/μL) or leukemoid reaction (WBC increase between 20000 to 50000 μL). It occurs due to injuries, infections, surgeries etc.

The second type is neoplastic or pathogenic proliferation of WBC is divided into 2 types – leukaemia and lymphoma, which can be either acute or chronic (for either type). Leukaemia is the deposition of malignant hematopoietic cells in bone marrow and spread of leukemic cells in blood circulation. Lymphoma is adhesion of the lymphocytes and hematopoietic cells in both of the bone marrow, lymph nodes and spleen, sometimes in liver, creating a tumour. Some cells escape to the blood circulation, but malignant cells count in blood isn't as high as in leukaemia. Further they are divided on one of three types depending on which cell is malignant – lymphoid neoplasm, myeloid neoplasm and histeocytic neoplasm (derived from macrophages and dendritic cell). Diagnosis of acute or chronic occurs the next way. Acute is diagnosed when the malignant cell is premature, high in proliferation stage and low in differentiation, so the person will develop the disease faster; in that case the gradient of the problem is steep and rapid and the malignant cells are unfunctional. Chronic type occurs when the malignant cell mutated at a late stage where the proliferation is lower, so the cells will divide less than in acute stage and the cells might be a bit functional. Excessive numver of abnormal cells and deficiency of normal cells is the whole reason of the clinical problems for the leukaemia and lymphoma. AML means that it`s aggressive, large, undifferentiated, made of the myeloid cell and located in bone marrow and blood. The result of increasing in number of leukemic malignant cells which impair the ability of bone morrow to produce RBC and platelets may lead to fatigue due to lack of oxygen and nutrition supple to body tissues, anemia or sometimes dyspnea on exertion, Leukemia cutis (neoplastic leukocytes attacks the skin leading to skin lesions) and also thrombopenia.

Signs and symptoms of AML include weakness, fatigue and dyspnea on exertion due to lack of RBC, infection can happen due to low functioning WBC, leukemia cutis (skin lesions), hyperleukocytosis that can lead to ocular, cardiac, pulmonary, or cerebral dysfunction, petechiae, gingival bleeding, ecchymosis, epistaxis, or menorrhagia due to low platelets count. Distinct entity of AML often manifests with hemorrhagic complications, including disseminated intravascular coagulation.

AML diagnosis is set with help of few main methods. In blood test the number of white blood cells is abnormal and the size of the white blood cells is increased. Changes in WBC help to differentiate acute myeloid leukaemia from acute lymphoid leukaemia. In AML there is presence of myeloperoxidase which is an enzyme produced by myeloid cells; it can be seen by cytoplasmic staining or looking for the crystalize of this enzyme which looks like an auer rod. Bone marrow aspiration and biopsy are used to analyze the percentage of hematopoietic cell precursors. From imaging tests computer tomography scan is used, but x-RAY is absolutely prohibited. Immunophenotyping, conventional cytogenetics analysis, molecular cytogenetics, molecular genetics and genome-wide studies are also used for AML diagnostics.

Treatment protocol usually includes the combination of high dose chemotherapy (using cytarabine and the anthracycline drugs) with or without radiation therapy (using radiation rays like x-ray to kill the malignant cells) and stem cells transplant using the patient stem cells.

Conclusion. Prevalence of AML and number of deaths caused by it prove the importance of its research. Considerable progress has been made in elucidating the molecular pathogenesis of the AML that has resulted in the identification of new diagnostic and prognostic markers. Furthermore, therapies are now being developed that target disease-associated molecular defects. However, for improvement of current situation with AML the continuation of its profound study is absolutely necessary.

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DYNAMICS OF CARDIOVASCULAR SYSTEM INDEXES IN YOUNG PEOPLE WITH ARTERIAL HYPOTENSION DURING PHYSICAL ACTIVITY

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According to WHO, there is now a tendency to increase in the incidence of primary hypotension. Given the high prevalence of hypotension among young people, and its ability to cause the development of coronary heart disease and disability disorders, it also appears to be a risk factor for the development of hypertension, and also what is currently in the literature does not have specific data on the effect of lowering blood pressure reduction processes in those student population, so this research is relevant.

Purpose: To investigate the prevalence of arterial hypotension and the level of adaptation abilities in young people, especially the state of fatigue and recovery time after exercise in patients with arterial hypotension.

Materials and methods. The study involved 98 young adults (18–20) years, including 48 – to hypotension and 50 – with normal blood pressure levels which belong to a comparison group. Physical exertion performed on the cycle ergometer, during a standard resistance. Vegetative indicators for studying were selected such as: systolic (SAP) and diastolic (DAP) arterial blood pressure which were studied by the method of Korotkov (mm. Hg); heart rate (HR) (bpm) which was calculated on the radial artery pulse; stroke volume (SV) (ml) and the cardiac output (CO) (l/min) were calculated using the standard formula; before physical exertion and in early recovery period (2 minutes after physical exertion).

Results and discussion. In the control group immediately after the exercise, the duration of which was on average 164.2 seconds., In 91.4 % of cases acceleration of heart rate, the average level of which was 142.3 beats / min. There was also a moderate recovery SAP, which on average amounted to – 144.5 mm. Hg. and average DAP to 63 mm. Hg. A corresponding increase in PP was observed in 85.7 % of cases. In the calculation of the SV and the CO was found a significant and adequate increase in CO of blood flow (11.7 L/min), which is the result of increase in heart rate and SV. Analyzing vegetative securing subjects, with values initially decreased blood pressure after exercise, the duration of which an average of 128.9 sec, which is much less than the duration of exercise in the controls, it was found that a significant increase in heart rate, an average of 166 beats / min was noted in 52.0 % of cases. In this case, the SAP slightly increased to 127.5 mm. Hg. In 52.0 % of the group surveyed. Moreover, the average DAP was increased to 80.7 mm. Hg. Pulse pressure in the majority of people in this group remained unchanged – 55.3 mm. Hg., also noted an increase in the CO, which is achieved mainly due to a significant increased frequency of heart rate than the rise in SV, which on average was 77.2 ml. Recovery period proceeded differently in the control group: 2 min after exercise all the indicators of heart nearer to the original level. In individuals of II, the duration of recovery was much higher: 2 min after exercise, all parameters remained virtually unchanged compared to the baseline.

Conclusions:

1. The results of our study during the period 2005–2012 points to a steady increase in number of cases among students 30–35 %, including boys – 34.6 %, girls – 65.4 %.

2. Young adults with initially reduced blood pressure levels adapted less to physical activity than those of the control group. In persons with arterial hypertension increased CO was achieved mainly through a significant increase in heart rate, but not stroke volume and heart rate, indicating that ineffective adaptation. In contrast to those with normal blood pressure values, which increase the CO was achieved by a parallel increase in heart rate and SV and suggests effective adaptation to exercise, due to a sufficient level of regulatory processes.

3. Shorter duration of exercise in people with low blood pressure shows the rapid onset of fatigue condition, which results in slowing the speed of execution of work.

4. Young adults with initially reduced blood pressure levels have lower levels of tolerance to physical stress than those of the control group.

5. Low efficiency of the processes of self-regulation of blood circulation in patients with hypotension seen longer recovery period after exercise, compared with the control group surveyed.