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DEVELOPING OF METHODOLOGIES FOR PREDICTING, EARLY DIAGNOSIS, TREATMENT AND PREVENTION OF CARDIOVASCULAR DISEASES IN THE POPULATION EXPOSED TO RADIATION

Abstrakt

In the paper we have presented the developed algorithm for prognosis, earl diagnostics, treatment and prevention of cardiovascular diseases in the population of East-Kazakhstan area exposed to ionizing radiation in results of nuclear tests. For every group of radiation risk we have developed the list of necessary measures aimed to prognosis, treatment, primary and secondary prophylactics and monitoring of the effectiveness of done measures.

Key words: forecasting, prenosological diagnosis, treatment, primary or secondary prevention, monitoring activities.

Despite the considerable progress of clinical medicine, cardiovascular diseases are still dominant in the structure of morbidity and mortality in developed countries. Their percentage in the structure of mortality in Kazakhstan is49-52%.Societyhas significant economic losses due to increased morbidity and mortality from cardiovascular disease. This problem is particularly actual in the East Kazakhstan region where the large population has been exposed to long term combined internal and external irradiation in result of nuclear tests at the Semipalatinsk test site. The incidence rate for cardiovascular diseases in Abay district of East Kazakhstan Area adjacent to the former test site, reached a critical value3993.7per 100,000 people in 2008 in comparison with average national index 1906.2per 100,000population [1].

After the cessation of atmospheric nuclear tests at the Semipalatinsk test site the population living in adjacent territories in subsequent years continued to be irradiated by the long-lived fission products from food and water. The current radiation-hygienic and demographic situation contributed additional exposure of the population, including directly exposed persons during nuclear weapons tests, and their descendants in the second and third generations [2].

The aim of our research is to develop the methodology for selection the study groups, methods of prognosis, early diagnosis, treatment and prevention of cardiovascular disease in the population of the East Kazakhstan region exposed to radiation in the result of nuclear weapons tests.

This study was conducted as a part of the scientific program" Development of science based technologies to minimize environmental risk of adverse effects to human health."

To achieve this goal we have developed the algorithm for selection of study groups from the population living in ecologically unfavorable areas which has high risk of developing cardiovascular diseases.

The first study group composed of persons exposed to the direct effects of radiation during the main dose-forming air and ground tests. The present time this strata includes the population of age 60 years and older. In this group of the population there is the high level of spontaneous circulatory diseases, age-related atherosclerotic changes, and therefore it is enough difficult to determine the contribution of radiation risk factor in this population.

Our attention should be focused on the descendants of persons exposed to direct radiation, included to the second group of the study. They are the offspring of II generation in the age stratum 40-50 years, who were born from exposed parents and contemporary were the subject for internal and external irradiation in infancy and childhood. In this group we can expect the maximum risk of the realization of post-radiation effects such as different forms of multifactorial diseases, which primarily include cardiovascular diseases such as hypertension and coronary heart disease.

The aim of investigation in this group is to determine the risk of cardiovascular diseases based on the selection of radiation and non-radiation risk factors, early prenosological diagnosis, assessment of clinical and epidemiological features of the development and course of cardiovascular diseases, followed by the primary and secondary prevention as well as treatment and rehabilitation.

This group also includes the descendants of III and IV generations of persons exposed to the direct radiation. In this case our goal is to determine the risk and genetic predisposition to cardiovascular diseases, followed by preventive measures.

These activities are carried out in two stages:

Stage 1 - clinical screening - on-site study of radiation risk groups with different radiation doses;

Stage 2 - in-depth clinical study in ambulatory and hospital conditions.

The first phase of a cardiologic examination includes therapeutic examination, filling the screening questionnaire with the definition of the radiation route of the patient, his parents, grandparents, registration of risk factors for cardiovascular disease (smoking, obesity, alcohol use, family history and other.), ECG recording at rest, ophthalmologic examination, biochemical blood analyses.

In the second stage a person with a high risk of developing CVD or defined form of CVD is under monitoring of cardiologist and could be sent for further examination, including ultrasound of the heart (EchoCG) and peripheral vessels, ambulatory daily blood pressure monitoring, Holter monitoring of ECG, biochemical blood analyses (triglycerides, HDL cholesterol and LDL cholesterol, creatinine, bilirubin, ALT, AST). At this stage for the patient with established nosological form the patient CVD card is filled with detailing of radiological and non-radiological risk factors, complaints, clinical data, medical history.

The third phase of the program provides ambulatory follow-up for the patients with CVD and persons who have high or moderate risk of CVD appearance (dyslipidemia, obesity and metabolic syndrome, family history), appointment of effective modern medicines or inclusion in the clinical study group for therapeutic management and secondary prevention.

For the population with high risk factors, but no clinical form CVD we developed a questionnaire to determine coronary risk, including issues of passport data, radiation route, medical history, anthropometric data, smoking, blood pressure and cholesterol, family history, lifestyle. To determine the overall risk of atherosclerotic disease, the tactics of non-drug and medication management we use computer program HeartScore ® - electronic analog of the paper version of SCORE, recommended by the international Society of Cardiology.

HeartScore is a convenient and useful tool for cardiologists and other physicians wishing to assess cardiovascular risk, plan and evaluate tailored risk factor intervention in high CVD risk subjects HeartScore ® is designed to assess the cardiovascular risk of those people who are not ill, but has risk factors for CVD, to create a database for each of the examined patients, presents a graphic picture of the absolute risk of CVD, helps optimize the potential benefits of the intervention, assessing the relative importance of correctable risk factors, offers direct access to the relevant information from the new recommendations, gives expert advice about healthy living based on the actual risk profile of the patient, promotes a healthy lifestyle and adherence to medical treatment.

To determine the susceptibility to the development of cardiovascular diseases among the offspring of exposed persons, determine the relationship of CVD with radiation exposure, their early diagnosis and development of prevention program, we have been conducting the clinical and genetic monitoring in order to search for polymorphic markers in candidate genes which are responsible for the development of cardiovascular and atherosclerotic diseases.

Using method of polymerase chain reaction we have been carried out the study of the association of polymorphic markers of several candidate genes responsible for the regulation of blood pressure (AGT), lipid metabolism (PON 1), the exchange of homocysteine (MTHFR), apolipoprotein E (APOE).

Blood samples for the analysis of the polymorphism of candidate genes is carried by different generations of a family that has been living in the contaminated territories, including older people who are directly exposed to radiation, their descendants of II generation with the established forms CVD or high risk of its development and offspring of III generation with possible susceptibility to cardiovascular disease.

Figure 1 presents thedevelopedalgorithm for prediction, early diagnosis, treatment and prevention of cardiovascular diseases in the population exposed to radiation. For each group of radiation risk including people exposed to direct radiation during the air and ground nuclear weapons testing and their descendants in the second, third and fourth generation we have developed a list of the necessary measures to prognosis, prenosological diagnostics, treatment, primary or secondary prevention, as well as monitoring of the effectiveness of the measures.

Carrying out these measures allows us reducing the incidence, morbidity and mortality from cardiovascular diseases, increasing the treatmentcosts and manifest rehabilitation of their complications.

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Резюме

РАЗРАБОТКА МЕТОДОВ ПРОГНОЗИРОВАНИЯ, РАННЕЙ ДИАГНОСТИКИ, ЛЕЧЕНИЯ И ПРОФИЛАКТИКИ БОЛЕЗНЕЙ СИСТЕМЫ КРОВООБРАЩЕНИЯ СРЕДИ ЛИЦ, ПОДВЕРГШИХСЯ РАДИАЦИОННОМУ ВОЗДЕЙСТВИЮ

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В статье приведен разработанный алгоритм прогнозирования, ранней диагностики, лечения и профилактики болезней системы кровообращения у населения Восточно-Казахстанской области, длительное время подвергавшегося радиационному воздействию в результате испытаний ядерного оружия. Для каждой из групп радиационного риска разработан перечень необходимых мероприятий, направленных на прогнозирование, донозологическую диагностику, лечение, первичную или вторичную профилактику, а также мониторирование эффективности проведенных мероприятий.

Тұжырым

РАДИАЦИЯЛЫҚ ӘСЕРГЕ ТАП БОЛҒАН АДАМДАРДЫҢ ІШІНДЕ, ҚАН АЙНАЛЫМ ЖҮЙЕСІ АУРУЛАРЫН БОЛЖАУ ТӘСІЛДЕРІ, ЕРТЕ ДИАГНОСТИКАЛАУ, ЕМДЕУ ЖӘНЕ ПРОФИЛАКТИКА

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Бұл мақалада Шығыс Қазақстан облысындағы ұзақ уақыт, яғни ол қаруды қолдану нәтижесіндегі ұзақ уақыт радиациялық әсерге ұшырағандарға болжау, ерте диагностикалау, емдеу және қан айналым жүйесінің ауруларының алдын алу алгоритмі жасалған. Әрбір радиациялық қауіп топтарға қажет шаралардың тізімі жасалған. Олар болжауға, нозологияға дейінгі диагностикаға, емдеуге, біріншілік немесе екіншілік тип профилактикаға, сонымен қатар жасалған шаралардың эффективтілігін мониторлауға бағытталған.