SOCIAL AND PSYCHOLOGICAL RISKS ARISED IN POPULATION AND CLEANERS AS A RESULT OF THE CHERNOBYL ACCIDENT

Inga URYADNIKOVA, Vasyl ZAPLATYNSKYI

Abstracts: The analysis of social and psychological risks arise among the population as a result of nuclear accidents was made. Shown that depressed and stress state due to human perception of threat to the health explains the growing number of somatic diseases and can be regarded as adaptive behavior of people in these circumstances. To reduce the risk of mental illnesses requires a number of educational and general preventive measures to reduce the accumulation of radionuclides in the contaminated areas, as well as for constant radiation, medical and genetic monitoring of the population.

Keywords: risk, mental illnesses, radionuclide.

Currently in the European community rather is an issue of energy and nuclear safety. The tragedy at Chernobyl gave impetus to the work of medical and psychological direction. Many from the research findings support the previously established laws for toxic and nuclear disasters. In this connection, we can predict the social and psychological risks that arise from the population as a result of nuclear accidents. This question is especially relevant after the recent accident in Japan at the nuclear power station Fokusima 1, whose effects are comparable with the Chernobyl disaster. In addition, this disaster appeals the urgent need for more thorough review and forecast of both natural and man-made risks and deciding on the economic costs associated with decreased risk (adverse event of natural or man-made, entailing disastrous consequences).

The salvation of the problem should still be in the direction of higher costs, as the consequences of these accidents is much more expensive, but human life for present and future generations, simply inhumane and unethical to consider in terms of money. Among the risks in the construction of a nuclear power plant, Fukushima 1, here there is a neglect of high risk of natural disaster - an earthquake. It was necessary to examine carefully the statistics of the frequency of earthquakes, at least for the past century.

Due to an accident at the Chernobyl nuclear power plant were exposed to radiation as a nuclear power plant workers and the general population, causing risk of adverse effects on their health. Among these populations, exposed to radiation:
1. Employees who are directly involved in an accident, or during the emergency, or during periods of cleaning;
2. The population of the contaminated zones, which was evacuated in 1986;
3. The population of the contaminated zones, which had not been evacuated [1,2].

As a result of environmental contamination by radioactive materials from the affected areas during 1986 was the forced evacuation of more than 100,000 people, and then after 1986 have settled out another 200,000 people from Belarus, the Russian Federation and Ukraine About five million people still live in areas contaminated by the accident. The consequences of the accident were not limited to the territories of Belarus, Russian Federation and Ukraine, as well as other European countries have been exposed as a result of atmospheric transport of radioactive material. These countries are also faced with problems of radiation protection of their people, but to a lesser extent than the three most affected countries [3].

More than 200 000 km² were contaminated, roughly 70 % - on the territory of Belarus, Russia and Ukraine. Radioactive materials were distributed in the form of aerosols, which are gradually deposited on the surface of the earth. Noble gases dispersed into the atmosphere and do not contribute to contamination of adjacent regions to the station. Contamination was very uneven, it depended on the direction of the wind in the first days after the accident. The most severely affected areas were those in which at that time was a shower of rain. Most of the strontium and plutonium fell within 100 km from the station, as they were held primarily in larger particles. Iodine and cesium have spread over a wider area [4].

In terms of the population exposure in the first weeks after the accident, the most dangerous was the radioactive iodine, which has a relatively short half-life (eight days) and tellurium. Currently (and in the next decade of years) the most dangerous isotopes are of strontium and cesium with a half life of 30 years. The highest concentrations of cesium-137 found in the surface layer of soil, from where it enters into the plants and fungi. Pollution are also subject the insects and animals that feed on them. Radioactive isotopes of plutonium and americium persist in soil for hundreds and possibly thousands of years, but their number is small [4]. Nevertheless, some experts believe that the problems associated with pollution by transuranic elements, require further study. As a result, of the beta decay of Pu-239 at contaminated areas goes the formation of americium-241. At present, the contribution of Am-241 in a total alpha activity is of 50 %. Increased activity of soil contaminated with transuranic
isotopes, due to Am-241 will continue until 2060 and his contribution will be 66.8 %. In particular, in 2086 the alpha activity of soil contaminated with plutonium at the territories of the Republic of Belarus will be 2.4 times higher than in the initial post-accident period [2-4].

Incompleteness and inconsistency of official information about the disaster gave rise to a number of independent interpretations. According to WHO, presented in 2005 as a result of the Chernobyl accident, in the long run, may be lost to a total of 4,000 people [5]. Scatter in the official estimates is less, although the number of victims of the Chernobyl accident can be determined only approximately. In addition to the dead plant employees and firemen, they are: sick soldiers and civilians were brought to disaster recovery, and residents of areas affected by radioactive contamination. Determining which part of the disease was the result of an accident - a very big challenge for medicine and statistics. It is believed [4] that most of the deaths associated with exposure to radiation, was or will be caused by cancer.

Usually at the mentioning of the health consequences of the Chernobyl disaster one have in mind the appearance of cancer. However, cancers, no matter how serious they are, do not exhaust the medical consequences of nuclear accidents. We should not forget about another aspect - it's frequency of occurrence of certain mental illnesses of patients who were in the area of disaster. In a study of patients with acute radiation sickness developed after the events at Chernobyl, there were:
- increase personal anxiety;
- some signs of internal tension;
- malfunction as a result of the continuing psychological and emotional tension;
- pronounced neurotic conflict;
- pronounced fixation of attention on the health status, chaos and lack of proper systems to analyze events.

The most important factor influencing health status, is not the disease itself but its perception. And by the way we relate to it, and understand human anxiety for survival. This factor and the Chernobyl accident has provided a psychological impact that goes beyond the injury.

The main causes of psychological stress in humans lie in:
- Socio-economic difficulties;
- Biomedical incompetence;
- Ill-conceived actions of the media.

In addition to the factors of psychological stress associated with the accident, it be range of physical diseases, of each of the liquidator is steadily increasing. Depressed mood and stress as a result of the perception of health risks may explain the increase in the number of somatic diseases, and may be an important aspect of pathological behavior, which varies under the influence of the nuclear threat to health. Even a small change in a sick human behavior can lead to awareness of the presence of symptoms and can be viewed as an adaptive behavior in these circumstances.

The slightest tendency to attribute everyday illness or disease with a possible effect of radiation was observed in people - atomic bomb survivors in Hiroshima and Nagasaki [5].

Waiting for the extremely negative consequences of the disaster and perceiving threat to health due to exposure to radiation make people more attentive to their physical sensations, which may be the first signs of disease associated with radiation. A specific focus of attention is characterized by the search due to the existing threat, was observed in humans in situations of deep stress [4].

Taking into account the chronic nature of stress, psychosomatic illness after technological and nuclear disasters can occur for a long time. For people affected by severe nuclear accident, even after some years we can expect serious stress effects on health. 20 years after the Chernobyl disaster, there are many evidence that relatively low-level ionizing radiation not only leads to stochastic but also to deterministic changes of the central and autonomic nervous systems - radiation encephalopathy [4,5].

In the first six years after the disaster the adults of the contaminated areas had experienced rapid growth in the number of cases of diseases of the nervous system, particularly important after 1990 [2, 5-7]

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In the study, 80 Ukrainian men - the liquidators in 1986, suffering from encephalopathy, was found structurally functional disability of frontal lobes and left temporal region [8,9].

The liquidators and the population, who was in the radiation area are characterized by structural and functional brain damage involving the frontal and left temporal lobe with cortical-subcortical connections, as well as deep brain structures. Among the pathological changes in the structure of the brain - atrophy and ventricular enlargement, hypertensive type of vascular tone, focal changes of the brain [10]. Also observed that the liquidators of male (150 men, 44,5 ± 3 years) showed an increase in expression of the slow forms of activity and a decrease in inter-hemispheric asymmetry reduction in quality performance of all cognitive tests, memory disorders and other disorders of higher mental functions. In people with psychosomatic disorders (400 men, 24-59 years) found irreversible destruction of brain structures: the restructuring of frontal lobes and left temporal region and their cortical-subcortical connections [6,8,9,11].

Typical complaints of them are complaints of severe headache, that are not removed by analgesics loss of memory on current events, general weakness, fatigue, decreased ability to work, sweating, palpitations, pains and aches in bones and joints that interfere with sleep at night, attacks with disconnect consciousness, seizures, with the heartbeat, feeling chills or fever, blackouts, sleep disturbance, numbness of hands and feet [12]. The neurological status of liquidators characterized by symptoms expressed vegetatively - vascular dysfunction, asthenia, hypochondriac and depressive symptoms, as well as other signs of organic lesions of the nervous system. Reduced mental capacity, namely the reduction of the total functions of attention, short-term memory and operational thinking. These characteristics correspond to the norms of the liquidators for children 10-11 years old and can not be due to exposure to any social factors - they attest to a certain organic brain damage as a consequence suffered in 1986-1987 irradiation [12].

The average age of Ukrainian liquidators (males and females) with encephalopathy, 41,2 ± 0,83 years [6,13], in the general population this figure below. Numerous disappointing data on diseases of the nervous system in the affected areas, as well as liquidators, led to the following conclusions:
- preconceived notions about the stability of the nervous system to radiation exposure are incorrect;
- radiation exposure of relatively small (on the same standards of radiation safety) level, which exists in the affected areas, leads to profound systemic disturbances of the central nervous system [6];
- many residents in the affected areas, as well as liquidators, have the violated functions of the nervous system: features of perception, short-term memory, attention, rapid thinking, sleep
- radiation exposure in some way disrupts the autonomic nervous system;
- mental retardation is seen in 45% of children born to atomic-bomb survivors [14].

Analyzing this situation one can give the following recommendations:
1. Educational and preventive measures are necessary to prevent internal contamination with radionuclides, and to rid the body of inhabitants of the Chernobyl regions of radionuclides originating from contaminated food.
2. Elaboration and continuous improvement measures are necessary that are aimed at reducing the accumulation of cesium-137 in the body of inhabitants of contaminated areas, to relatively safe levels.
3. Organization free of radionuclides day meals in schools and kindergartens, special programs for the rehabilitation and treatment of children with periodic departures from the affected areas.
4. Organization of constant radiation monitoring, as local food, and individual accumulation of radionuclides in the body of inhabitants and, above all, children.
5. To reduce the accumulation of dose load of irradiated critical group in each locality necessary:
   - making at least once in three years of mineral fertilizers on all agricultural lands and home gardens;
   - to reduce the cesium-137 contamination of mushrooms and berries effective is the introduction of potassium and lignin in forest ecosystems in a radius of 10 km from the villages [6];
   - to remove radionuclides from the body it is necessary to provide an individual receiving natural pectin-containing enterosorbents (based on apples, currants, etc.);
   - to reduce the intake of radionuclides in the human body with meat, mushrooms, fish and vegetables it is important to respect a number of preventive measures when using these products (maceration products, separation of milk) [3,6];
   - to reduce the level of radionuclides in animal products, it is advisable to use enterosorbents (ferrocyanides) during the growth of farm animals;
   - in the contaminated areas to establish an annual (for children - quarterly), the individual determination of the actual levels of radionuclides;
- to provide compulsory medical and genetic counseling for marriages residing in contaminated areas (and voluntary - for all citizens who want child-bearing age) on the risk of severe genetic disorders in future progenys [3,6];
- to extend the program for cancer screening and clinical examination of the entire population of the contaminated areas.
6. Necessary in all countries to establish a permanent reserve of potassium iodate and ensure that the iodine prophylaxis in the event of new nuclear power plant accidents.
7. Necessary in all countries to establish the structure and organization independent of the official system of radiation control of foodstuffs.
8. Required independent from the nuclear industry monitoring of the accumulation of radionuclides in humans, especially children, and organization of the active radiation protection.
9. Develop international cooperation in scientific research and nuclear safety with the support of government agencies, the IAEA, the UN and other organizations associated with the nuclear industry.

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