



Research Article

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# Delayed Pathology of the Nervous System in Women Exposed to Radioactive Iodine During Pregnancy and their Children

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## Abstract

Exposure of the thyroid gland to radioactive iodine in pregnant women, which occurred as a result of the accident at the Chernobyl nuclear power plant, is subsequently accompanied by an increase in the number of diseases of the nervous system (Chapter V, International Classification of Diseases) compared with unexposed individuals. The incidence of this pathology among the victims who received intrauterine irradiation has a high rate. These data may indicate both the role of the radiation itself and the role of the psychogenic factor in the subsequent occurrence of the pathology of the nervous system.

**Keywords:** Radioactive iodine, I-131, Morbidity, Incidence, Nervous system

**Abbreviations:** PTSD: Post-Traumatic Stress Disorder; UNSCEAR: United Nation Scientific Committee on the Effect of Atomic Radiation; ICD-10: International Classification of Diseases

## Introduction

By now, it is well known that the main probabilistic effect of radiation exposure on a person is the occurrence of malignant neoplasms after a certain period of time [1]. Other effects of radiation exposure are relatively poorly understood. The issues of the occurrence of non-oncological pathology after radiation exposure are a priority and one of the most promising directions in the scientific research of the UN Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) [2].

Taking this into account, we made an attempt to compare the occurrence of pathology of nervous system in the long-term period

in women exposed to radioactive iodine (I-131) during pregnancy, as well as in their children who received intrauterine exposure.

## Materials and Methods

The following groups of individuals were taken into the study. The main group of women (221 women) who were exposed to radioactive iodine because of the accident at the Chernobyl nuclear power plant (April-May 1986) and were at various stages of pregnancy during this period, was formed from residents of the Stolin district of the Brest region. The average age at the time of the accident at the Chernobyl nuclear power plant was 25 years.



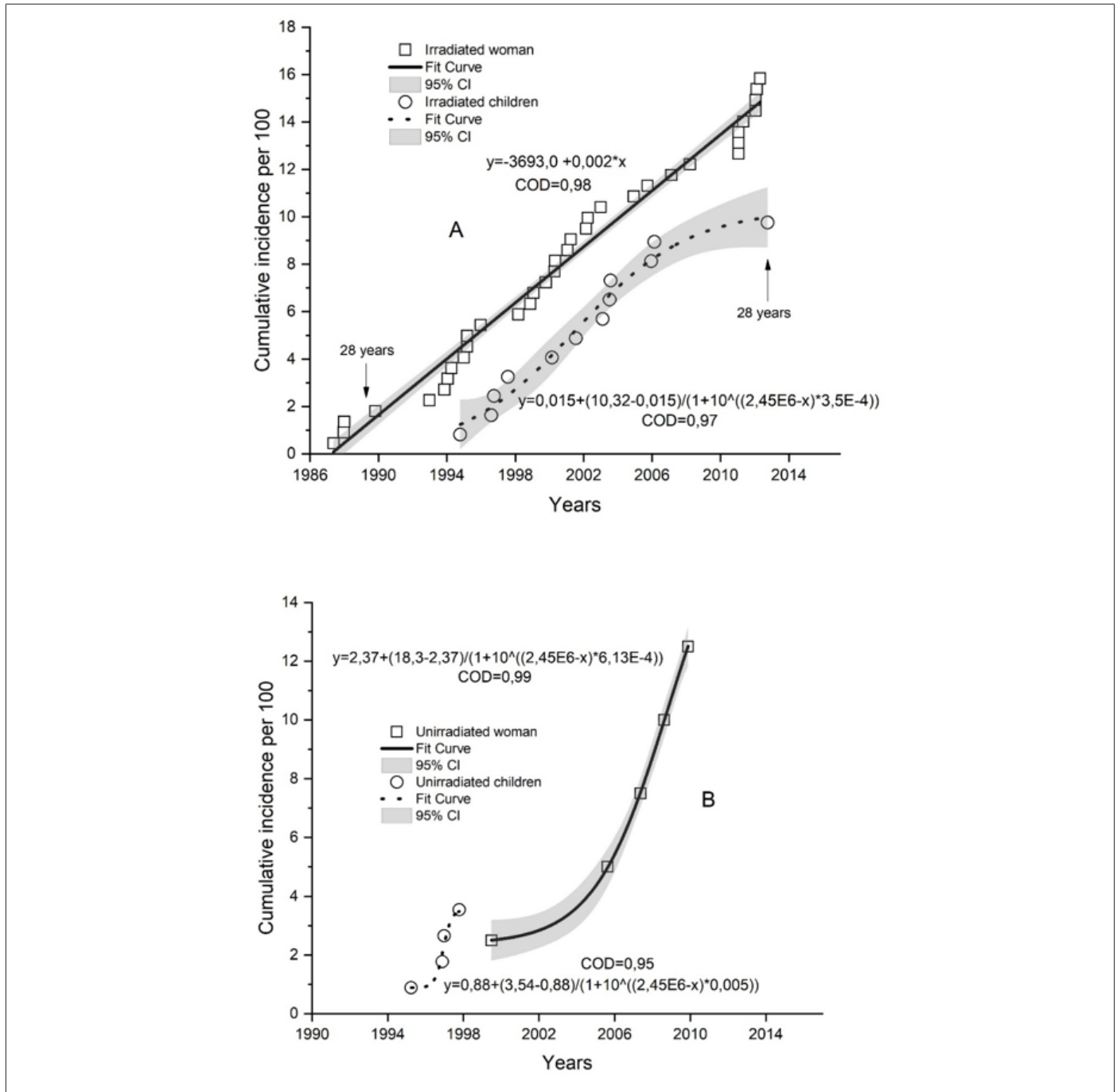
As a comparison group, the study included women from the same Stolín district of the Brest region (40 women), whose pregnancy occurred later, i.e., in 1987. Due to the short half-life of I-131 (8 days), after a year, i.e., in 1987, there was almost no iodine in the environment, and it did not affect pregnant women.

The main cohort of children irradiated *in utero* included 123 individuals. The comparison group also included residents of the

Stolín district of the Brest region, who were born later (113 individuals).

### Results and Discussion

Figures 1A and B show the cumulative incidence of diseases of the nervous system (Chapter V, International Classification of Diseases, ICD-10) in exposed and non-exposed women and children.



**Figure 1:** Cumulative morbidity with diseases of nervous system for irradiated (1A) and non-irradiated (1B) pregnant women and their children.

Morbidity among exposed women differs sharply, both for non-exposed individuals and for children who have been exposed *in utero*. The nature of the approximation curves also differs in affected women, the incidence is characterized by a linear dependence, while in the group of women who were not exposed to radiation, the curve is fitted better to an exponential dependence. The same dependence is typical for groups of their children.

It is obvious from the presented figures that in the group of irradiated pregnant women 20 years after the accident at the Chernobyl nuclear power plant, the incidence of nervous system diseases is approximately 2 times higher than in the group of Belarusian residents who were not exposed to radiation. Another fact is also interesting. If we take the age of 28 years for the starting point (the database is limited by this age in children irradiated *in utero*), then the group of subjects who were irradiated *in utero* is characterized by an almost 10 times higher incidence of nervous system diseases than their mothers at the same age.

Of interest is the interpretation of the obtained data. It is known that the psychosomatic component can have an impact on morbidity, especially on the pathology of the nervous system [3]. However, our earlier psychometric analysis of the survey data of the studied women showed the absence of a correlation between the factors of post-traumatic stress disorder (PTSD) and their psychological distress [4]. On this basis, the leading role of the psychogenic factor in the increased morbidity of the nervous system in the post-accident period can be excluded, and exposure can be considered the active factor.

A completely different picture emerges with regard to individuals who were irradiated *in utero*, i.e., children. The abovementioned psychometric analysis carried out on these subjects showed a clear possibility of the influence of psychological distress on PTSD [5]. These data can be explained by the good information supply of the younger generation (Internet, social networks) regarding the negative effects of radiation. This may be confirmed by the social status

of the victims. The subjects exposed *in utero* overwhelmingly had a secondary or higher education and, therefore, could be active Internet users. From this it becomes clear that they were somehow frightened by the possible consequences of irradiation that in its turn had some impact on their morbidity. This informational factor was not so strong for the older generation, namely, for the mothers of these children, especially in rural areas, and so the impact of the psychological factor was reduced in them.

## Conclusion

Thus, the radiation factor itself can be the cause of the pathology of the nervous system, which can be aggravated by the influence of a psychogenic factor.

## Conflict of Interest

There is no conflict of interest. The authors received no specific funding for this work.

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