

**THE INCREASE IN FREQUENCY OF THYROID CARCINOMA  
AFTER THE CHERNOBYL NUCLEAR ACCIDENT. A STUDY  
CONDUCTED IN THE ONCOLOGY INSTITUTE OF  
CLUJ-NAPOCA, ROMANIA**

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**Abstract**

*The Chernobyl accident which occurred on the 26th April, 1986 had many consequences, both on short and long terms. Among the long-term effects, the increased incidence of thyroid cancer has been presented in several studies conducted in other affected countries. (Ivanov et al., 2012; news bbc.co.uk; UN Chernobyl Forum).*

*This study shows the differences in thyroid cancer frequency depending on age (date of birth) in 2948 patients who had thyroid surgery in The Oncology Institute of Cluj-Napoca, between 2008 and 2012. These patients were divided into three age groups, depending on their age at the moment of the incident: Group A (people > 18 years old), Group B (0-18) and Group C (unborn).*

*Compared with the frequency of thyroid cancer in group A, the percentage of thyroid cancer began to grow in group B, reaching 41.4 % in group C.*

*Similar to the research made in countries which were also affected by radiation released during the accident, this study aimed at demonstrating a significant increase in the incidence of various forms of thyroid cancer, both in people who were either children or adolescents at the time, and in those born after the nuclear accident. (Boice, 2005; Cardis et al., 2005; Kopecky et al., 2006).*

**Keywords:** Thyroid carcinoma, Chernobyl, Age group.

**INTRODUCTION**

The appearance of “aggressive thyroid carcinomas” in children and adolescents is known to be one of the first major health consequences of the Chernobyl accident. The two major radioisotopes that were released were <sup>131</sup>Iodine, which has a half-life of 8 days, and <sup>137</sup>Cesium, which has a half-life of 30 years. The main source of radiation responsible for the thyroid cancers seems to be the first one. Between 1992-2002, WHO (World Health Organization) reported around 5.000 cases of thyroid carcinomas in people who were between the ages of 0-18 in 1986, that have a confirmed connection to the Chernobyl incident (news.bbc.co.uk). A significant number of such cases appear to belong to Romania.

Numerous studies throughout Eastern Europe show an increased incidence of thyroid cancer after exposure to radiation resulting from the Chernobyl incident. A map of irradiated Europe can be seen in Figure 1. Fuzik conducted a research in 2011 that showed a significant increase of thyroid cancer in the patients born between 1982 and 1986, compared with those born between 1987-1991 (Boice, 2005; Cardis et al, 2005; Kopecky et al, 2006; Ron, 2007; Horner et al, 2009; Zablotska et al, 2008).

This study compares the frequency of thyroid cancer in patients undergoing thyroid surgery (between 2008 and 2012) in The Oncology Institute “Prof. Dr. Ion Chiricuta”, Cluj-Napoca, sorted by age group, in relationship with the Chernobyl incident.

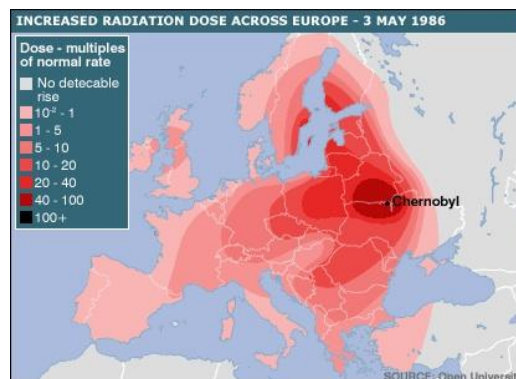


Fig.1. Radiation map of Europe in May 1986 (news.bbc.co.uk)

## MATERIALS AND METHODS

A total of 2948 patients with thyroid pathology who were operated in The Oncology Institute “Prof. Dr. Ion Chiricuță”, Cluj-Napoca over a 5-year period (between January, 2008 and December, 2012) took part in this study.

The patients were divided into 3 groups, depending on their age at the moment of the Chernobyl incident (26<sup>th</sup> April, 1986), as follows:

- Group A – patients over the age of 18;
- Group B – patients between the age of 0 to 18;
- Group C – patients who were born after the moment of the incident.

The total number of patients with benign and malignant pathology, confirmed by the histopathology exam, was calculated for each age group. The patients’ list was extracted from the Institute’s DRG (Diagnosis-Related Group) list, sorted by “Date of birth”. In the malignant tumor group,

all forms of carcinoma (papillary, follicular, Hurthle cell, medullary and anaplastic) were taken into consideration.

This study aimed at finding a connection between the age of the patients at the moment of the Chernobyl incident and the frequency of thyroid cancer.

The null hypothesis was: there is no statistically significant difference between the frequencies of thyroid cancer between groups A, B and C. (i.e. The exposure to radiation during childhood and in the prenatal period does not increase the frequency of thyroid carcinoma in said patients).

The statistical test used was chi-square median test, with a p value considered statistically acceptable if lower than 0.05.

## RESULTS AND DISCUSSION

From a total of 2948 of patients undergoing surgery, 2122 were over the age of 18 (Group A), 727 were between 0 to 18 years old (Group B), and 99 had not been born yet (Group C) at the moment of the Chernobyl incident. The distribution of patients in age groups can be seen in Figure 2.

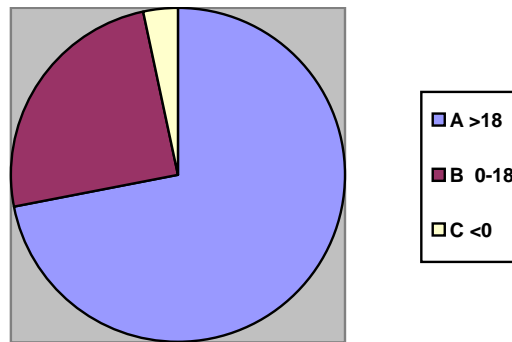


Fig. 2. The age groups diagram

Table 1

Distribution of thyroid pathology

HP \ Age group	Benign	Malignant	Total	Malignant /Total
a. >18 years old	1482	640	2122	30.1%
b. 0-18 years old	470	257	727	35.3%
c. <0 years old	58	41	99	41.4%
	2010	938	2948	

In group A, there were 640 patients with different forms of thyroid cancer, representing 30.1% of the total number of patients. In group B, there were 257 malignant cases, representing 35.3% of the total number. Group C had 41.4% (41 cases) malignant results. The results are shown in Figure 3.

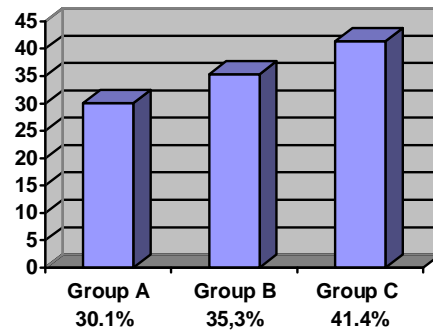


Fig. 3. Frequency of thyroid cancer in different age groups

The null hypothesis was proven wrong, confirming that a statistically significant correlation can be made between the patients' age at the moment of the Chernobyl accident and the frequency of thyroid cancer, with a p value of 0.0039 that is considered statistically significant, as can be seen in Figure 4.

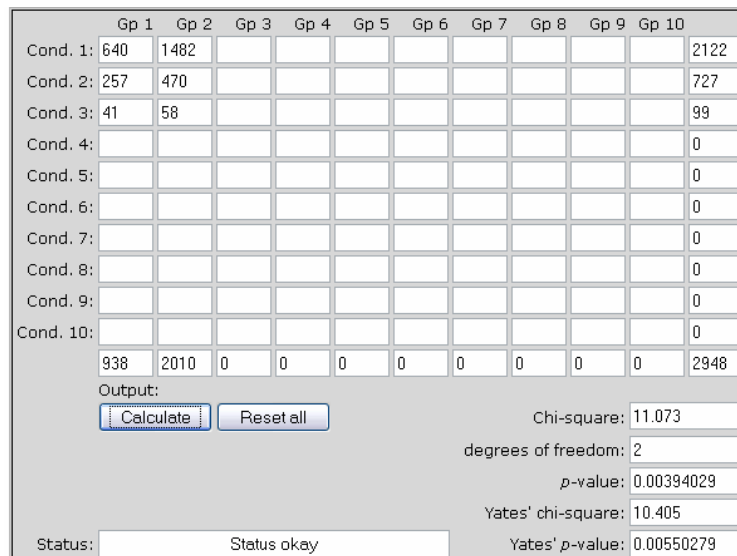


Fig. 4. Chi-squared test applied for group A, B and C

The difference in carcinoma frequency between the age groups proves the theory that radiation (especially the <sup>131</sup>Iodine) increases the risk of thyroid cancer in young patients. The same observations are now being made related to the Fukushima nuclear accident in Japan.

The 41.4% of patients with thyroid cancer in group C can also be attributed to the fact that nodular thyroid goiter, thyroid cysts and other benign thyroid pathology is less frequent in young patients. (5)

## CONCLUSIONS

In conclusion, the appearance of “aggressive thyroid carcinomas” in children and adolescents was proven to be a major health consequence of the Chernobyl accident.

In Romania, as numerous other studies throughout Eastern Europe show, an increased incidence of thyroid cancer have appeared after exposure to radiation resulting from the Chernobyl accident.

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