

## ESTIMATION OF INFLUENCE OF RADIOACTIVE FACTOR ON CANCER RISK AMONG INDUSTRIAL CITY DWELLERS

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The estimation of the role of chronic radioactive exposure (ChRE) in development of malignant neoplasms under the conditions of constant exposure of population along with radiation to other carcinogenic factors is a complex epidemiological problem. Such situation is typical for city Kamensk-Uralsky (Middle Urals, Russia), where some enterprises intensively polluting the environment with carcinogenic substances are located (i.e. the aluminium-smelting plant). In 1957 the city was subjected to the influence of radioactive fallout as a result of an accident at PA "Mayak" and forming the East Urals Radioactive Trace (EURT). The most contaminated was the north-western part of the city, where the contamination density was about 4 Ci/Sq.km by Sr-90, at the rest of the territory it was about 1 Ci per Sq.km. Cancer incidence in Kamensk-Uralsky during 1960-1994 has increased 1,8 fold, but it can hardly be connected only with the influence of radiation.

The city has a population of 210 000, which is served by oncological centre. The materials of this centre made it possible to form sufficient groups of cases for our study and to obtain all the necessary information about each of them. The base cohort for the information of control groups was the part of the population that had never had any neoplasms diagnosed.

Many cancer risk factors are well known. That's why the influence of one of them (in this particular study - radioactive exposure) may be estimated only in the result of multifactorial analysis. For this analysis we used the pattern recognition methods, that have proved their effectiveness in many other medico-ecological studies(1,2,etc.).

Some investigations were held aiming at estimation the role of radioactive factor in development of cancers of three most widespread sites: lung, stomach and breast. Information about all known cancer risk factors for both "case" and "control" groups was collected. The information included data concerning age, sex, nationality, smoking habit, alcohol abuse, diet, residing in one of the 4 areas differing in intensity of non-radiational ecological contamination, residing close to a major industrial atmospheric polluter, occupation, duration of occupational exposure to carcinogens, characteristic of housing conditions (building materials, plastic flooring in the house, gas stove), chronic diseases, family cancer history, predisposition phenotype evaluated by the peculiarities of dermatoglyphic pattern (palm and finger prints) on the basis of previously elaborated criteria, length and strength of radioactive exposure.

Diversity and lack of reliable information on radiological situation in EURT zone in Sverdlovsk region after the accident gave no opportunity to obtain the reliable retrospective data concerning the individual radiation doses for the dwellers of this zone. ChRE is estimated by two indirect parameters: (a) the fact of residing in the north-western (most contaminated) part of the city during the years of maximal radioactivity of the territory (1957-62) and (b) total length of residing in the EURT zone.

In our breast cancer studies the information of risk factors was completed by the data about gynecological status of women. In lung cancer studies the analysis embraced in total 18 factors. Basing on this results it was shown that this information

is sufficient enough to reliable discrimination between the "case" and "control" patterns. Along with this the quantitative estimation of each factor influence was given (Table 1). The results of similar analysis of complex of 22 risk factors for breast cancer and 20 risk factors for gastric cancer are shown in Tables 2 and 3.

At analysis of studied cancer risk factors we noted first of all the expected character of their interrelation with the disease. For example, risk of cancer development was higher in smokers, in workers of aluminium smelting plant, it has increased with age, etc. This particular coincidence of obtained results with the already proved influence of some biological and environmental factors on malignant neoplasms development made it possible to estimate adequately the role of ChRE, that proved to be quite sufficient. Moreover, it was noted, that risk of development of cancer of all three studied sites increases with both duration of residing at the EURT territory and, particularly, with residing in the most radioactively contaminated zone during the years of maximal intensity of radioactive contamination (1957-62). Thus, applying the special methods of analytical epidemiology and multifactorial analysis gave us an opportunity to receive the proofs of the chronic radioactive exposure influence on cancer incidence among the dwellers of EURT zone.

Table I

**COMPARATIVE DEGREE OF INFLUENCE OF THE MOST SIGNIFICANT LUNG CANCER RISK FACTORS (for population of Kamensk-Uralsky)**

Rank	Name of the feature	Comparative informativity (relative units)
1	Sex	1.000
2	Smoking	0.749
3	Occupation	0.360
4	Building material	0.319
5	Residing in the zone of maximal radioactive contamination in 1957-1962	0.247
6	Age	0.245
7	Alcohol abuse	0.207
8	Genetic predisposition	0.152
9	Chronic obstructive lung disease	0.152
10	Residing close to a major industrial atmospheric polluter	0.136
11	Plastic flooring in the house	0.098
12	Total length of residence in EURT zone	0.087

Table 2.

**COMPARATIVE DEGREE OF INFLUENCE OF THE MOST SIGNIFICANT BREAST CANCER RISK FACTORS (for population of Kamensk-Uralsky)**

Rank	Name of the feature	Comparative informativity (relative units)
1	Menopause	1.000
2	Alcohol abuse	0.844
3	Residing in the of zone of maximal radioactive contamination in 1957-62	0.676
4	Building material	0.581
5	Residing in the zones of various degrees of non-radioactive technogenous pollution	0.516
6	Total length of living in the EURT zone	0.491
7	Genetic predisposition	0.339
8	Gas-stove	0.339
9	Occupation	0.248
10	Age	0.245
11	Family cancer history	0.216
12	Plastic flooring in house	0.175

Table 3

**COMPARATIVE DEGREE OF INFLUENCE OF THE MOST SIGNIFICANT GASTRIC CANCER RISK FACTORS (for population of Kamensk-Uralsky)**

Rank	Name of the feature	Comparative informativity (relative units)
1	Sex	1.000
2	Occupation	0.498
3	Gastric diseases (gastritis, ulcer)	0.460
4	Smoking	0.451
5	Genetic predisposition	0.364
6	Alcohol abuse	0.326
7	Age	0.249
8	Residing close to a major industrial atmospheric polluter	0.231
9	Residing in the zones with various degrees of non-radioactive technogenic pollution	0.211
10	Gas-stove	0.195
11	Total length of living in the EURT zone	0.185
12	Residing in the of zone of maximal radioactive contamination in 1957-1962	0.139

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