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# EPIDEMIOLOGICAL EVOLUTION OF SKIN MELANOMA IN THE POPULATION OF CIRCUMPOLAR REGION (ON THE EXAMPLE OF ARKHANGELSK REGION)

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The deterioration of the epidemic situation with the incidence of skin neoplasms (including melanoma) actualizes the task of identifying the sex and age characteristics of the population at risk of cancer, intra-and intergenerational features of the evolution of its incidence. Aim: to establish the features of primary incidence of melanoma evolution in the population of circumpolar region of the Russian Federation (on the example of the Arkhangelsk Oblast) in 2007 – 2017. Materials and methods. A retrospective observational register-based study was performed. The data from the Arkhangelsk Regional Cancer Register were used to calculate the actual and standardized (direct method) values of indicators of incidence rates of melanoma. Age-Cohort-Period analysis was used to determine intra-and intergenerational features of the dynamics (evolution) of incidence rate coefficients. Results. In 2007-2017, incidence rate of a skin melanoma in the male population of the Arkhangelsk Oblast increased by 103.1% (from 3.2 to 6.5 cases per 100.000 population); in the female population – by 33.3% (from 8.7 to 11.6 cases per 100.000 population). Women were in the gender group at risk of developing this kind of neoplasms; older and elderly people were in the age group at risk. Cohort (intra-generational) and period (inter-generational) effects in the dynamic of age-specific indicators of the incidence rate of skin melanoma were revealed. Conclusion. Further evolution of the "cohort" and "period" effects in the dynamics of age-specific indicators of incidence rate of skin melanoma in the Arkhangelsk Oblast will lead to a dramatic changes in the characteristics of the gender and age group at risk of this neoplasm: an outstripping increase of the incidence rates among men; citizens of working age (30-49 years).

**Keywords:** melanoma, primary morbidity, circumpolar regions, Arkhangelsk Oblast, cohort effect, period effect.

**Background.** Skin melanoma (C43.0-9) is a malignant neoplasm of neuroectodermal origin, coming from melanocytes; the skin accounts for up to 95% of all localizations of this type of tumor. The incidence of the condition on a global scale tends to increase; in the group of special risk (up to 80% of all new cases) – representatives of the European race living in Northern Europe, North America, Australia and New Zealand [16].

The highest primary incidence of skin melanoma was noted among the descendants of European migrants of Oceania (62.7 cases per 100 thousand population in 2015), the United States (up to 40-50 cases per 100 thousand population) [15]. In the Russian Federation, at the beginning of the XXI century, the incidence of neoplasm also tends to increase; in the period from 2006 to 2015, the value of the indicator increased by 34.6% (from 5.2 to 7.0 per 100 thousand population). According to experts, by 2020 the primary incidence of melanoma of the skin will increase by 20-25% [1,4].

The etiological factor in the formation of melanoma is not installed. Experts of the world health organization (WHO) argue that up to 80% of all new cases of tumors are the result of damage to sensitive areas of the skin by ultraviolet radiation [16]. The risk of the latter is especially high among the representatives of the European race, constantly living in the Northern (including polar) regions, but periodically resting in the South. Taking into account the fact that the number of Russians, including residents of the Northern (circumpolar) regions, making trips to the countries of the "far" abroad, is constantly growing (in 2017 compared to 2016 – by 31.6%) [3], the probability of deterioration of the epidemic situation with the incidence of skin tumors, including melanoma, is quite high [7,8,9]. In this regard, it seems appropriate to solve the problem of identification of sex and age characteristics of the population risk group of cancer pathology, which requires to establish intra-and intergenerational features of the evolution of its incidence.

**Aim of the study:** to characterize the evolution of primary morbidity of population of the circumpolar region of the Russian Federation (on the example of Arkhangelsk region) melanoma of skin (C43.0-9) in 2007 – 2017.

**Materials and methods.** A complete retrospective observational register-based study was performed. Anonymous information on all cases of primary diagnosis of skin melanoma (C43) has been extracted from the database of the Arkhangelsk regional cancer registry (ARKR) on all cases of primary diagnosis of skin melanoma (C43.0-9) medical workers of the Arkhangelsk region in 2007-2017 (n = 1044) [2]. The formed database contained the following variables: sex of the patient, date of diagnosis, age (years) at the time of diagnosis, place of residence (urban / rural settlements), clinical diagnosis (with ICD-10 code). Repeated records on the treatment of relapses and progression of

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the disease (n = 223) were excluded from the subsequent analysis. Data on the population dynamics of the Arkhangelsk region in 2007-2017 were provided by the Territorial Body of the Federal State Statistics Service (Archangelskstat); on the age and gender structure of the population of the Russian Federation in 2017 - by the Federal state statistics service (Rosstat) [5].

Based on the data obtained, the actual values of the indicators of primary morbidity of the population of skin melanoma (including in the age and sex groups) were calculated. The corresponding standardized values were calculated by the direct method (according to W. Oglu) taking into account the age structure of the male and female population of Russia on 01.01.2017. The Age-Period-Cohort (APC) analysis [17] was used to determine the intra-and intergenerational features of the dynamics (evolution) of indicators of primary morbidity in the region of melanoma of the skin. The STATA 12.0 application package was used for statistical data processing. The calculation of the limits of the 95% confidence interval (95% CI) of rates by Fisher's method was performed using the WinPepi program.

**Results.** In 2007-2017, 1044 new cases of skin melanoma were registered in the Arkhangelsk region, including 323 cases among men (30.9%) and 721 cases among women (69.1%). The incidence of neoplasm among the male and female population of the Arkhangelsk region increased significantly during the study period (the growth rate of the indicator values was +103.1% and +33.3%, respectively) (Fig. 1).

The primary incidence of melanoma in the rural population of the region was 1.4 – 1.8 times lower than in the urban population until 2015 (Fig. 2). In 2015, the indicator values in the population groups were equalized.

For the analysis of intra-and intergenerational dynamics of indicators of primary morbidity of the population of the Arkhangelsk region, skin melanoma data for 2007 and 2017 were used. The gender risk group for the development of tumors in the study period were women; age - the elderly population, as evidenced by the pronounced age (age effect, change in the frequency of occurrence of the condition, correlated with the age of the respondents at the time of the study) effect in the dynamics of the values of the incidence of the state in 2017 compared with 2007 (table 1).

Attention is drawn to the positive intra-generational (cohort, birth cohort effect) effect in the dynamics of the values of age-related indicators of primary morbidity in the region of melanoma of the skin (for example, the rate of increase in the values of the indicator in the group of women who in 2007 were 40-49 years old, and in 2017 – 50-59 years, was [per decade] +107.7%). Among the younger generations of northerners cohort effect was more pronounced.

The positive intergenerational (period, period effect) effect (increase in the frequency of occurrence of the condition to a certain age in representatives of subsequent generations of citizens) in the dynamics of the incidence of melanoma of the skin also indicates the aggravation of the epidemic situation with neoplasm in the Arkhangelsk region. Thus, in the generation of women born in the 1980s, by the time they reached the age of 20-29 (in 2007), the incidence of the condition was 2.9 cases per 100,000 of us.; in the next generation of women born in the 1990s, by the time they reach the age of 20-29 years (in 2017) - already 6.5 cases per 100,000 of us. (growth rate: + 124.1%). In General, the positive intergenerational effect in the group of men in the study period was more pronounced than in the group of women.

**Discussion**. The high level of morbidity of the Russian population with malignant neoplasms is recognized as one of the leading risk factors for public health, a threat to the national security of the country at the beginning of the XXI century [10, 12]. Search conditions accompanying increase in the cancer burden, development of measures aimed at reducing its size, has acquired a high relevance in connection with the approval of decrees of the President of the Russian Federation No. 598 dated 07.05.2012 "On improving state policy in the sphere of health protection" and No. 214 dated 07.05.2018 "On national goals and strategic objectives of the development of the Russian Federation for the period up to 2024", the beginning of the implementation of the new national project "Health" from 2019, an important element of which is the Federal project "Fight against cancer" [11,13].

The epidemic situation with malignant neoplasms in the Northern regions of the country, including the Arkhangelsk region, remains quite complex. Indicators of primary disease of the population of the region melanoma of the skin in 2007-2017 years, the rate of increase of their values was higher than in the whole country (in the Arkhangelsk region of 6.2 in 2007 and 9.2 per 100 thousand population in 2017 growth rate: +48,4% per decade; in the Russian Federation: 5.2, 2007 and 7.0 per 100 thousand population in 2016, the growth rate: +34,6% per decade). It should be noted that the beginning of the program of clinical examination of the adult population in 2013 had almost no impact on the detection of malignant tumors, which indirectly indicates a low level of cancer care of medical workers in the region.

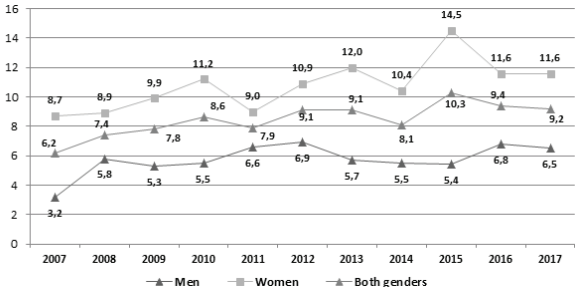


**Fig. 1.** Standardized values of the coefficient of primary morbidity of the population of the Arkhangelsk region of skin melanoma in 2007-2017 (per 100 000. population)

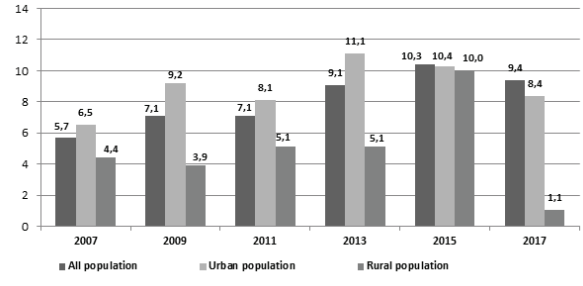


**Fig. 2.** Actual values of incidence rates of the skin melanoma in urban and rural populations of the Arkhangelsk region in 2007-2017 (per 100,000 population)

Globally, the incidence of neoplasms in the group of men and women is almost identical [1]. In the Russian Federation, by contrast, the gender structure of patients is significantly dominated by women (for example, in 2016 – they accounted for 61.0% of the total number of newly diagnosed cases) [6]. In the Arkhangelsk region in 2007-2017 the primary incidence of melanoma in the group of women was 1.6–1.8 times higher than in the group of men. The causes of these features

of the epidemic process are not reliably established. Experts determine the use of cosmetic services (including solarium) as an additional risk factor, causing a higher probability of developing tumors in women [1].

The incidence of malignancy among residents of rural settlements in the region was significantly lower than among residents of cities until 2015 (Fig. 2). We believe that this is due to the varying degree of exposure to the influence of the leading risk factor - excessive insolation (due to the higher solvency of citizens often use cosmetic services, spend holidays abroad in tropical, sub-Equatorial countries), the effectiveness of diagnostic work (cancer) of health workers [2,4,9,14]. At the same time, the degree of influence of each of these factors on the dynamics of the indicators of the identified primary incidence of melanoma remains unknown.

At the national level, the highest incidence of neoplasm is traditionally recorded in the group of elderly and senile citizens [15]. A similar situation is noted in male and female populations of the Arkhangelsk region (Table 1). However, this feature is not sufficient evidence of the etiological role of age in the pathogenesis of tumors. It should be taken into account the low value of the indicator of active detection of patients with melanoma in the Russian Federation (estimated N.P.Malishevskaya et all.: +25.8% in 2016), as well as the unsatisfactory quality of self-preservation behavior of citizens [6,7,9].

Reliable evidence of the influence of the age factor on the incidence of tumors are the results of APC-analysis, in particular, - a positive intra-generational (cohort) effect in the dynamics of values of age-specific indicators (table. 1). To a greater extent, it was expressed among the younger generations of northerners (born in the 1980s – 1990s) - exposed to excessive exposure to leading risk factors for the disease. The reasons for the reduction of the registered primary incidence of melanoma in the generation of men born in the 1980s should be studied in subsequent studies, but, according to the authors, there is a hypodiagnosis of the condition due to the above circumstances.

The progressive deterioration of the epidemic situation with the incidence of skin melanoma in the population of the Arkhangelsk region is evidenced by the positive intergenerational effect in the dynamics of age-specific indicators of its incidence (Table 1, 2). In the study period (2007-2017) it was more pronounced in the group of men. In the world population, the same trend was noted, which is explained by the experts of the progressive gender unification of risk factors for the development of neoplasm [15].

Summing up the revealed sex and age features of dynamics of primary incidence of melanoma of the population of the Arkhangelsk region, the authors determine the following vectors of its evolution in the next decade:

1. Further steady increase in the incidence of gender and age groups in the region;

2. Changes in the gender structure of the incidence of the condition, - gradual equalization of the values of the primary incidence of neoplasm among women and men;

3. Changing the characteristics of the age group at risk of neoplasm, - outstripping the growth of incidence in the group of citizens of working age (30-49 years).

**Conclusion.** 1. The primary incidence of male and female population of the Arkhangelsk region with melanoma of the skin in 2007-2017 had a tendency to increase; the rate of increase in the incidence of the condition in the group of men was +103.1%; in the group of women +33.3%. Women were the gender risk group for the development of neoplasm; the age group was the elderly population.

2. Positive intra-generational (cohort) effect in the dynamics of values of indicators of the primary morbidity of male and female population of the Arkhangelsk region melanoma of the skin proves the influence of age factor on the risk of developing the disease.

3. The positive intergenerational (periodic) effect in the dynamics of skin melanoma incidence rates, more pronounced in the group of men, allows us to expect in the near future changes in the gender structure of the incidence of the condition, an outstripping increase in the incidence of the condition in the group of citizens of working age (30-49 years).

**Intra-and intergenerational effects in the dynamics of the actual values of the incidence rates of the skin melanoma in male and female sub-populations of the Arkhangelsk region in 2007 and 2017 (per 100.000 of the respective population)**

| Age group. in years | Пол | Incidence rate in 2007 (95% CI) | | Growth rate (cohort effect). % |
|---|---|---|---|---|
| | | 2007 г. | 2017 г. | |
| 0-19 | муж. | 0.7 (0.0 – 3.8) | 0.0 (0.0 – 2.9) | |
| | жен. | 0.7 (0.0 – 4.0) | 0.8 (0.0 – 4.6) | |
| 20-29 | муж. | 1.8 (0.2 – 6.7) | 2.8 (0.3 – 10.3) | +300.0 |
| | жен. | 2.9 (0.6 – 8.5) | 6.5 (1.8 – 16.5) | +828.6 |
| 30-39 | муж. | 2.3 (0.3 – 8.4) | 1.1 (0.0 – 6.0) | -38.9 |
| | жен. | 4.7 (1.3 – 12.1) | 5.8 (1.9 – 13.4) | +100.0 |
| 40-49 | муж. | 0.0 (0.0 – 3.9) | 4.1 (0.8 – 12.0) | +78.3 |
| | жен. | 13.0 (6.9 – 22.2) | 16.8 (8.9 – 28.7) | +257.4 |
| 50-59 | муж. | 7.4 (2.7 – 16.2) | 17.2 (9.2 – 29.4) | + ∞ |
| | жен. | 9.8 (4.7 – 18.0) | 14.4 (7.7 – 24.7) | +107.7 |
| 60-69 | муж. | 5.6 (0.7 – 20.0) | 15.8 (7.2 – 30.0) | +113.5 |
| | жен. | 16.8 (8.0 – 30.8) | 27.2 (17.1 – 39.7) | +177.6 |
| > 70 | муж. | 11.4 (2.4 – 33.4) | 22.5 (8.3 – 49.0) | +301.8 |
| | жен. | 18.2 (9.7 – 31.1) | 16.6 (8.6 – 29.0) | -1.2 |

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# MINERAL DENSITY OF BONE TISSUE OF THE AXIAL SKELETON IN POSTMENOPAUSAL WOMEN WITH OVERWEIGHT

The study evaluated the relationship between obesity and mineral bone density (BMD) of the axial skeleton in postmenopausal period of women living in the conditions of Yakutia. It was revealed that the body mass index statistically significantly affects the mineral density of bone tissue, while the ratio of muscle tissue to adipose tissue is very important. The increased mineralization of the bone tissue of the axial skeleton in postmenopausal women directly depends on the degree of obesity.

**Keywords:** bone density, obesity, composite body composition.

**Introduction.** The postmenopausal period is characterized by a decrease in female sex hormones, leading to a change in metabolic processes in the body, which in further causes the occurrence of metabolic disorders and may become the basis of metabolic diseases, such as osteoporosis, obesity [3]. Both diseases can be present simultaneously in one patient, repeatedly enhancing its pathological effect, which is one of the reasons for the highlevel morbidity and mortality [8].

Osteoporosis (OD) refers to multifactorial metabolic diseases. a skeleton characterized by a decrease in bone mineral density (BMD) and violation of its microarchitectonics, causing deterioration of bone strength and high risk of fractures [5]. Currently, OP is one of the main reasons of disability, reduced quality of life and premature mortality of the elderly people [1]. The main risk factors and causes of metabolic disorders in the bone tissues are: a decrease in the level of sex hormones, female gender, insufficient body weight, fractures in parents, insufficient or excessive physical activity, the presence of concomitant diseases and the use of drugs that affect bone the cloth. Female gender is one of the risk factors for osteoporosis, since onset of menopause, they lose bone mass from 0.86 to 1.21% per year, unlikemales from 0.04 to 0.90% [5]. Adipose tissue consists of adipocytes, is a variety of connective tissue and performs heat-insulating in the body, energy, endocrine function [4]. With obesity, excessive accumulation of subcutaneous and visceral fat. In the postmenopausal period, more than 50% of women begin to develop obesity or it progresses [7,9,22]. After menopause, as a result of decrease in female sex hormones becomes most noticeable accumulation of visceral fat (abdominal obesity). Also during this period 25–40% of women develop OP [9.27]. Adipose tissue performing endocrine function, may affect bone tissue alone or through adipokine production [9]. Using the dual-energy X-ray method absorptiometry has made it possible to selectively measure the amount of mineral, fat and lean mass and explore the relationship between body componentsin recent years [2].