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SCREENING OF MALIGNANT NEOPLASMS IN THE POPULATION OF THE REPUBLIC OF SAKHA (YAKUTIA)

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This article describes the incidence of malignant neoplasms in the Sakha Republic's population selected for screening studies and presents an assessment of the results of the Onkopoisk. Sakha (mass screening tests) pilot project. Screening is carried out for six types of malignant neoplasms that are an important problem for regional healthcare. In the course of screening, we carried out 12,826 tests and identified 21 cases of malignant neoplasms and 51 cases of precancerous conditions. The proportion of patients with stage 0-2 malignant processes was 62%.

Preliminary results of Onkopoisk.Sakha demonstrated how it can be useful in screening and early diagnosis of cancer in the Sakha Republic. This screening program using online platforms complements other activities of medical examinations and preventive examinations and is in demand because it meets the requirements of sanitary and epidemiological safety and saves resources.

Keywords: malignant neoplasms, morbidity, mortality, cancer screening, liver cancer, breast cancer, prostate cancer, lung cancer, colorectal cancer, cervical cancer.

Introduction. Cancer screening is an important component of comprehensive cancer control measures aimed at the early detection of asymptomatic malignant tumors or precancerous conditions by inviting patients who correspond to a practically healthy target population but can be classified as risk groups according to certain characteristics [2].

According to Global Burden of Diseases Cancer Collaboration, from 2007 to 2017, the incidence of oncology in the world increased by 33%, and for DALYs oncology has moved from sixth to second place after cardiovascular diseases as the most common cause of death in patients [6]. According to the WHO forecast, by 2050, cancer incidence worldwide will increase to 54 million, and mortality to 16 million cases per year [10]. Global society suffers significant productivity losses due to cancer deaths. Investing in programs targeting high-morbidity cancers that occur in young people can reduce productivity losses for society the most [8, 9].

Introducing new, more effective methods of early diagnosis, treatment, and prevention of cancer in economically developed countries helps reduce mortality and increase life expectancy. For example, in the United States from 1991 to 2017, a continuous decrease in deaths from malignant neoplasms led to an overall decrease in mortality by 29% [3]. Another example demonstrating the possibilities of modern medicine is the widely-adopted 2020 WHO global strategy to accelerate the elimination of cervical cancer as a public health problem [5].

As a process, screening includes a whole system of activities from informing and inviting the target population to providing treatment and evaluating the process to improve it [7]. This process is complex and costly but screening for breast, cervical, and colon cancer is now proven effective in terms of balancing benefit and risk; screening can also be effective for long-term smokers to identify lung cancer, as well as patients with viral hepatitis and cirrhosis of the liver to identify liver cancer, and in people with a positive PSA test to identify prostate cancer.

The Sakha Republic is the largest subject of the Russian Federation in terms of area (3 million sq. km) with a population of 972 thousand people as of early 2020 (population density — 0.31 people per 1 sq. km). There has been a steady increase in the incidence of malignant among the population in recent years. According to Rosstat (Russia's Federal State Statistics Service), for the period from 2010 to 2019 in the Republic, the increase in malignant neoplasms (MN) was 31.3% (from 213.8 to 280.7 per 100,000 people). When implementing the Zdravookhranenie (Healthcare) National Project of the Yakut Republican Oncological Dispensary (Yakutsk, Russia), the project's team developed the Onkopoisk. Sakha online project, and since August 11, 2020, it has been implemented in test mode, aimed at screening and early cancer diagnostics in the Sakha Republic (онкопоисксаха.рф).

Purpose of the Study: providing an up-to-date description of the incidence

of malignant neoplasms (MN) in the Sakha Republic's population selected for screening studies and evaluating the results of the Onkopoisk.Sakha pilot project.

Materials and Research Methods. The study used data published by the P. Herzen Moscow Oncology Research Institute — a branch of the National Medical Research Radiological Center of the Ministry of Health of the Russian Federation [1]. The results of the Onkopoisk. Sakha pilot project for screening MNs based using the database at YROD are provided as of September 15, 2022. The project's questionnaire includes six cancer locations: prostate, lung, breast, liver, colon and rectum, and cervix. By having personal accounts for the patients, we were able to provide convenient registration and store the results in an online database.

During the first stage, the patients use a web app at a convenient time to register their personal account and complete the questionnaire; if there's a high risk of developing oncopathology identified, they are invited to undergo an additional examination at the medical facility. Meanwhile, in patients with an increased risk of developing cancer or signs of cancer, an additional comprehensive examination is performed.

It is important to note that the research did not set the task of completing controlled studies to evaluate the effectiveness of the screening methods or the sensitivity of the tests.

Results and Discussion. Analyzing the average values of age-standardized incidence ratios (SIR) of incidence over a 10-year period showed that, in general, the incidence of malignant neoplasms in the Sakha Republic was lower than the average for the Russian Federation, both in men and women (Table 1). We observe a relatively stable situation in dynamics for men in the Sakha Republic and the Russian Federation as a whole from 2010 to 2019 (+4 and +2.8%, respectively), while for women we see a moderate growth trend (+11.3 and +12, 2%). At the same time, when considering the localizations of MNs included in the screening programs in the population of both the Sakha Republic and the Russian Federation, there are significant differences in the levels of SR depending on gender.

For instance, the incidence of liver cancer (C22) in the Sakha Republic's male population was 3.8 times higher than in the Russian Federation as a whole. There is also a slight excess of lung cancer SIR (C33, 34) by 8.2%. While the dynamics of lung and liver cancer in the Sakha Republic's SIR from 2010 to 2019 are relatively stable, despite their wave-like movement (-8.2% and +3.9%, respectively), in the Russian Federation as a whole, there is both a decrease and increase depending on the localization (-15.9% and +25.6% respectively). Meanwhile, the SIR of prostate cancer (C61) and colorectal cancer (C19-21)

Table 1

Comparison of Standardized Cancer Incidence Rates Per 100,000 Population (World Population Standard) [1]
SR — Sakha Republic, RF — Russian Federation

Localization	Territory	Years										M (95% CI)
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
Men												
All neoplasms (C00-97)	РС (Я)	250.1	255.8	249.0	228.6	248.9	270.9	245.3	255.2	247.4	260.0	251 (243-258)
	РФ	279.6	273.5	270.7	271.3	277.6	284.0	283.1	286.7	286.5	286.8	280 (275-285)
Trachea, bronchi, lung (C33, 34)	РС (Я)	58.7	54.0	49.3	49.2	54.1	50.1	59.3	49.0	48.0	53.9	53 (50-56)
	РФ	54.0	51.1	50.0	49.2	48.8	49.9	48.9	49.0	47.5	45.4	49 (48-51)
Liver and intrahepatic bile ducts (C22)	РС (Я)	18.1	17.6	18.6	20.2	18.2	21.1	18.0	19.8	20.2	18.8	19 (18-20)
	РФ	4.3	4.1	3.9	4.1	4.3	4.8	4.9	5.2	5.1	5.4	5 (4-5)
Prostate gland (C61)	РС (Я)	14.8	13.3	12.9	14.3	18.9	33.7	19.1	24.3	21.8	25.6	20 (15-25)
	РФ	30.6	32.3	32.5	34.6	39.4	40.2	39.0	40.5	41.5	43.5	37 (34-41)
Rectum, rectosigmoid junction, anus (C19-21)	РС (Я)	11.0	12.9	10.9	9.8	10.6	13.6	12.1	9.1	10.0	12.2	11 (10-12)
	РФ	14.6	14.1	14.3	13.9	14.3	14.9	14.9	15.1	15.4	15.8	15 (14-15)
Women												
All neoplasms (C00-97)	РС (Я)	179.6	186.5	183.8	187.1	185.8	207.1	184.7	191.8	194.0	199.9	190 (184-196)
	РФ	209.0	207.9	208.5	210.7	216.9	223.0	225.6	229.6	230.2	234.5	220 (212-227)
Trachea, bronchi, lung (C33, 34)	РС (Я)	15.4	16.7	13.4	13.8	13.1	14.2	14.7	15.0	13.2	15.1	15 (14-15)
	РФ	7.1	7.0	6.8	7.2	7.3	7.7	7.7	8.1	8.3	8.0	8 (7-8)
Liver and intrahepatic bile ducts (C22)	РС (Я)	10.5	10.9	9.9	9.0	10.8	12.0	9.6	7.1	11.4	10.2	10 (9-11)
	РФ	1.9	1.9	1.8	1.9	2.0	2.1	2.1	2.2	2.1	2.1	2 (2-2)
Mammary gland (C50)	РС (Я)	25.2	34.4	35.3	38.9	37.3	38.6	35.5	37.7	34.9	38.9	36 (33-39)
	РФ	45.8	45.2	46.2	47.1	48.9	49.8	50.9	52.0	51.6	53.3	49 (47-51)
Rectum, rectosigmoid junction, anus (C19-21)	РС (Я)	7.5	8.0	9.5	8.6	8.2	8.0	7.5	7.3	10.4	9.2	8 (8-9)
	РФ	8.9	8.9	8.8	8.9	9.1	9.3	9.2	9.2	9.4	9.4	9 (9-9)
Cervix (C53)	РС (Я)	13.4	16.7	16.6	20.3	19.6	19.2	22.9	20.2	21.6	18.4	19 (17-21)
	РФ	13.7	13.7	13.9	14.2	14.5	15.0	15.5	15.8	15.8	15.4	15 (14-15)

Note: 1 — Malignant Neoplasms in Russia in 2007-2019 (Morbidity and Mortality). Moscow: P. Herzen Moscow Oncology Research Institute, Branch of the National Medical Research Radiological Center of the Ministry of Health of the Russian Federation; M (95% CI) — average value for the 2010-2019 period (95% confidence interval).

were lower than in the Russian Federation by 1.9 and 1.4 times, respectively. However, in the dynamics of prostate cancer, the SIR tends to increase both in men in the Sakha Republic by 1.7 times, and by 1.4 times in the Russian Federation. The incidence of colorectal cancer in dynamics is stable with a slight increase (+10.9% in the RS (Y), +8.2% in the Russian Federation as a whole).

In the female population in the Sakha Republic, the SIR of lung cancer (C33, 34) was 1.9 times higher than the national average, liver (C22) — 5 times, and cervical (C53) — 1.3 times. The risk factors for breast cancer (C50) and colorectal cancer (C19-21) were 1.4 times and 12.5% lower than the Russian average, respectively. Additionally, in dynamics over a 10-year period, the SIR of breast cancer in women in the Sakha Republic increased by 1.5 times, colorectal cancer — by 1.2 times, and cervical cancer — by 1.4 times, while lung and liver cancer SIR remained practically unchanged. In women in the Russian Federation, there is a moderate increase in most SIRs covered in this article (with the exception of the practically unchanged SIR of colorectal cancer): breast cancer — increased by 16.4%, lung cancer — by 12.7%, cervix — by 12.4%, liver cancer — by 10.5%, and colorectal cancer — by 5.6%.

Hence, screening for six cancer types has an important place in the fight against cancer in the Republic of Sakha (Yakutia). The high incidence of liver cancer (C22) and lung cancer (C33, 34) among the population of both sexes, cervical cancer (C53) among the female population all with mortality higher than the national average (with the exception of lung cancer in men) should be treated as regional features in the epidemiological situation.

15,521 people who have filled out a total of 18,202 questionnaires (Table 2) took part in the pilot project for screening MNs using the YROD database (as of September 15, 2022). The largest number of completed questionnaires has been for screening of liver cancer (31.3%), as well as lung and breast cancer, which is explained by the greater awareness of the population regarding cancer developing in these localizations. 21 patients had MN of the total completing the questionnaires, that is, the overall detection rate was 1.4 cases per 1,000 respondents.

In the course of screening, we have completed a total of 12,826 studies (Table 3) where we have detected 21 cases of malignant neoplasms and 51 cases of precancerous conditions, including 9 patients with precancer according to Lung-RADS (LDCT control after 1-3-6 months) and 9 more patients with precancer according to BI-RADS (mammography control after 6 months). The screening excluded 12,410 people with 11,059 healthy patients, 73 patients refusing further examination, and 1,207 patients sent

Table 2

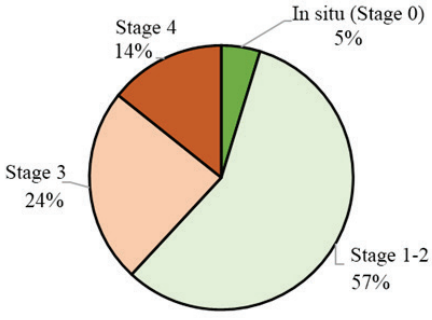
Detection of Malignant Neoplasms Among Screening Patients (n = 15521)

Questionnaires	Total		MN Detected	
	Number	%	People	Per 1000
Number of people who have completed questionnaires	15521	100	21	1.4
Total number of completed questionnaires	18202	100	21	1.2
Including screening for				
Lung cancer	3978	25.6	4	1.0
Liver cancer	4855	31.3	2	0.4
Breast cancer	4380	28.2	5	1.1
Prostate cancer	464	3.0	1	2.2
Colon and rectal cancer	2965	19.1	3	1.0
Cervical cancer	1560	10.1	2	1.3

Table 3

Results of Additional Comprehensive Examinations to Detect Malignant Neoplasms

Examination		Total	Revealed		Continuing examination	Причины отсева		
			MN	Other conditions subject to remote control		No pathology detected	Other pathology identified	Refusing further testing
NDCT	n	2045	4	9	6	1742	282	2
	%	100	0.2	0.4	0.3	85.2	13.8	0.1
Liver ultrasound	n	2200	2	4	11	1450	719	14
	%	100	0.1	0.2	0.5	65.9	32.7	0.6
Mammography (women >40 years old)	n	926	3	0	7	809	106	1
	%	100	0.3	0	0.8	87.4	11.4	0.1
Breast ultrasound (women <40 years)	n	480	2	9	11	357	96	5
	%	100	0.4	1.9	2.3	74.4	20.0	1.0
IHA stool for occult blood	n	1679	3	8	19	1583	37	29
	%	100	0.2	0.5	1.1	94.3	2.2	1.7
Tumor markers	n	4363	3	11	11	4325		13
	%	100	0.1	0.3	0.3	99.1		0.3
PSA for prostate cancer	n	173	1			170		2
	%	100	0.6			98.3		1.2
Cervical screening (smear test)	n	932	2	10	7	600	294	6
	%	100	0.2	1.1	0.8	64.4	31.5	0.6
Thyroid ultrasound	n	28	1			23	3	1
	%	100	3.6			82.1	10.7	3.6
Total	n	12483	21	51	72	11059	1207	73
		100	0.2	0.4	0.6	88.6	9.7	0.6



Malignant neoplasms detection stages during the Onkopoisk.Sakha screenings

to polyclinics at their places of residence with other pathologies. We have examined 511 patients at YROD, with 72 patients continuing with their examinations, while 73 patients have refused further examination.

As a result of screening, patients at risk of having or developing the discussed diseases in the future are singled out from an apparently healthy population for an earlier intervention to improve their health [4]. In the pilot project and out of 21 cases of malignant neoplasms identified during screening studies, 1 case was detected at stage 0 (in situ), 12 — at stages 1-2, 5 cases — at stage 3, and 3 cases — at stage 4 of disease (Fig. 1). The proportion of patients with a malignant process of stage 0-2 was 62%. Additionally, we have taken 51 patients under dispensary observation.

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HYGIENE, SANITATION, EPIDEMIOLOGY AND MEDICAL ECOLOGY

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CHARACTERISTICS OF PATHOLOGICAL LESION OF THE WORKING POPULATION OF THE SOUTHERN ZONE OF YAKUTIA

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A comprehensive survey of the working population of the Aldan district of the Republic of Sakha (Yakutia) was conducted. A total of 175 people of working age of non-indigenous nationality were examined. A high frequency of pathology on the part of the digestive, cardiovascular and endocrine systems, including the first identified, was revealed. Overweight and obesity had a high incidence, being a risk factor for the development of cardiovascular diseases. Every 10 respondents have registered oncopathology, 3 participants of the study were sent for further examination with suspicion of malignant neoplasms. The role of primary health care, including shop doctors, is of great importance in the early detection and prevention of risk factors for the most common chronic non-communicable diseases and timely effective medical care, as well as health schools for patients with hypertension, coronary heart disease, diabetes mellitus, gastritis, cancer, etc.

Keywords: pathological lesion, working population, South Yakutia.

The development of the socio-economic sphere of any country is largely determined by labor resources dependent on the health of the able-bodied population, which directly or indirectly depends on a number of factors. Considering that the Aldan district of the Republic of Sakha (Yakutia) is located on the territory of the Elkon uranium ore industry with a possible technogenic effect of uranium decay products, the relevance of the study of the working and living population is undeniable. The medical and demographic analysis according to the official data of the Federal State Social Service for the Republic of Sakha for 2000-2020 showed high mortality rates of the population of the Aldan district in comparison with the national indicators (13.4-15.3 versus 8.6-9.3 per 1000 people). In 2020, the mortality rate from diseases of the circulatory system (DCS) exceeded the national data by more than 2 times (815.8 vs. 404.9 per 100 thousand people). Mortality from neoplasms in the Aldan district in 2020 also exceeded by more than 1.5 times in comparison with the national data (215.5 and 131.6 per 100 thousand people, respectively). The indicators for the incidence of DCS in this area in 2020 were almost 2 times higher than the national ones (328.1 vs. 186.6 per 1000 people), and malignant neoplasms (MNP) by 32.2% (337.5 vs. 255.2 per 100 thousand people) [1].

Objective: To assess the health status of the working population of the Aldan district of the Republic of Sakha (Yakutia)

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