

ACTUAL TOPIC

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REGIONAL FEATURES OF MORBIDITY AND MORTALITY FROM MALIGNANT NEOPLASMS IN THE REPUBLIC SAKHA (YAKUTIA)

Abstract

We have completed an analysis of the dynamics of morbidity and mortality from malignant neoplasms (C00-97) among the population of the Sakha (Yakutia) Republic for the period of 2008-2017. In these dynamics, there is an increase in standardized indicators (world standard) of incidence from 203 to 213 per 100,000 population (average growth rate of 0.6). At the same time, mortality rates continue to decline with an average decline rate of -1.7. Regional features of cancer pathology are high – compared with the average in the Russian Federation – morbidity rates (3.6 times) and mortality (3.8 times) of the population of both sexes from malignant neoplasms of the liver and intrahepatic ducts (C 22) and of the female population from malignant tumors of the trachea, bronchi, and lung (1.9 times higher than in the Russian Federation).

Keywords: malignant neoplasms, morbidity, mortality, ratio of mortality and morbidity, Sakha (Yakutia) Republic, regional characteristics.

Introduction. Malignant neoplasms (MNP) are one of the leading causes of death in the world. The increase in incidence is associated with the aging of the population, and methods of treatment, despite the achievements of modern medicine, are not always effective or fully developed. In the Russian Federation, along with the trend of increasing morbidity, a high mortality rate from cancer still remains. The main reason for this is the late diagnosis of the disease. At the same time, morbidity and mortality rates in the regions of the Russian Federation have significant differences, including those concerning main localizations of malignant tumors.

The Sakha (Yakutia) Republic is the largest subject of the Russian Federation with a population (as of January 1st, 2017) of 962.8 thousand people living in an area of 3.1 million square km [7]. The vast territory determines the remoteness of many settlements from the center, the differences in transport accessibility, socio-economic level, including access to diagnostic and therapeutic assistance. The harsh climate and the features of demographic processes also change the structure of morbidity and mortality of the population. Thus, life expectancy in 2017 in the Republic was below the national average by 1 year. At the same time, Yakutia is one of the few regions of the Russian Federation with a positive natural population growth, which affects the average age of the population (34.1 years) [7].

Aim of the study was to analyze the dynamics and structure of morbidity and mortality from malignant neoplasms

(MNP) in the population of the Sakha (Yakutia) Republic for the period of 2008-2017.

Materials and Methods. We have carried out a retrospective epidemiological analysis of morbidity and mortality of the population of the Sakha (Yakutia) Republic from malignant neoplasms for the period of 2008-2017 using statistical data from Territorial Body of the Federal State Statistics Service for the Sakha (Yakutia) Republic and the Moscow P.A.

Herzen Oncologic Research Institute [3, 7]. For comparative analysis, we used indicators standardized according to the world standard for the age structure of the population [10]. When analyzing the dynamics of incidence, we determined the average existing growth rate.

Results and Discussion. The incidence of MNP in the Sakha (Yakutia) Republic in 2017 was 208.3 per 100,000 population (Table 1). The age-standardized (AS) incidence rate among

Table 1

Dynamics of morbidity and mortality from malignant neoplasms per 100,000 population (codes C00-97) for 2008-2017 [2]

Year	Sakha (Yakutia) Republic					Russian Federation				
	Morbidity		Mortality		K	Morbidity		Mortality		C
	esti- mate	AS	esti- mate	AS		esti- mate	AS	esti- mate	AS	
Men										
2008	210.6	242.9	137.7	167.7	0.65	347.4	271.7	233.9	180.4	0.67
2009	224.6	256.4	147.8	173.4	0.66	358.2	277.7	237.1	182.2	0.66
2010	216.5	250.1	134.0	159.0	0.62	362.6	279.6	236.2	180.2	0.65
2011	219.9	255.8	146.4	175.4	0.67	363.2	273.5	234.3	173.9	0.65
2012	226.1	249.0	147.3	164.1	0.65	363.6	270.7	231.3	169.3	0.64
2013	213.9	228.6	139.9	150	0.65	369.0	271.3	231.3	167.5	0.63
2014	234.3	248.9	138.4	151.7	0.59	383.3	277.6	229.3	164.2	0.60
2015	257.9	270.9	143.0	152.4	0.55	398.1	284.0	233.0	164.0	0.59
2016	242.5	245.3	154.2	160.0	0.64	402.5	283.1	234.3	162.1	0.58
2017	256.5	255.2	151.5	153.2	0.59	414.1	286.7	228.8	155.6	0.55
Women										
2008	206.1	177.4	113.7	100.7	0.55	344.2	200.3	174.3	91.4	0.51
2009	221.2	185.8	116.5	100.1	0.53	353.9	204.1	177.1	92.2	0.50
2010	211.3	179.6	107.5	90.6	0.51	365.6	208.9	177.2	91.4	0.48
2011	225.7	186.5	105.3	88.0	0.47	367.4	207.9	175.2	88.9	0.48
2012	224.7	183.8	109.1	88.6	0.49	370.5	208.5	174.8	87.5	0.47
2013	238.7	187.1	111.9	88.1	0.47	377.3	210.7	175.2	87.0	0.46
2014	238.1	185.8	116.1	87.7	0.49	392.1	216.9	173.7	85.4	0.44
2015	269.3	207.1	114.0	84.7	0.42	406.4	223.0	176.2	85.7	0.43
2016	247.9	184.7	112.9	82.9	0.46	413.9	225.6	173.4	83.6	0.42
2017	262.0	191.8	118.1	82.8	0.45	425.7	229.6	171.3	81.2	0.40

Note. In the Tables 1, 3 AS – age-standardized indicator (world standard); C – the ratio of “estimate” mortality and morbidity.

the male population was 25% higher than among the female population (255.2 and 191.8 0/0000, respectively). Over the 10-year period (2008-2017), there has been an increase in the AS indicator of the incidence of MNP from 203 to 213 0/0000 (with average growth rate of 0.6). In all analyzed years, the incidence of MNP in the Sakha (Yakutia) Republic among both sexes was slightly lower than in the Russian Federation.

In 2017, in the Sakha (Yakutia) Republic, 1,294 people have died (including 708 men and 586 women) from malignant neoplasms. The mortality rate from MNP (estimate) for the entire population of the republic was 134.3 0/0000 (SP 109.7 0/0000), the proportion of mortality from MNP in the structure of total mortality of the population is 16.5%. Mortality rate among the male population of the Republic was 1.9 times higher than that of the female population. In the course of 10 years, both in the Russian Federation as a whole and in the Sakha Republic, we have observed a decrease in mortality rates (the average rate of decline was -1.4 for the Russian Federation and -1.7 for the Sakha Republic).

Ratio of mortality and morbidity can indicate both the aggressiveness of the MNP and the accessibility and quality of diagnosis and treatment of patients [11]. For the analyzed period, the indicator dropped from 0.60 to 0.52 (in the Russian Federation from 0.58 to 0.47). At the same time, in all the years it was higher than in the Russian Federation as a whole (for both sexes).

In the structure of the incidence among male population in 2017, the main locations of MNP were the tracheal, bronchus, lung, stomach, prostate, liver, intrahepatic ducts, and skin. Among the female population, respectively, MNP were forming in the breasts, cervix, trachea, bronchi, lung, colon, and kidneys. The incidence rate among male population of MNP in the liver and intrahepatic ducts in the republic is 3.8, and the mortality rate is 3.4 times higher than in the Russian Federation as a whole (Table 2). The incidence of MNP in the esophagus, stomach, pancreas, bones and articular cartilage is slightly higher, against the background of higher mortality rates from esophageal MNP.

If we look at similar indicators among the female population (Table 2), then in the Republic there is a significantly higher AS of the incidence of women with MNP in the liver and intrahepatic ducts (7 and 2⁰/₀₀₀₀ respectively), trachea, bronchi, lung (15 and 8⁰/₀₀₀₀ respectively), cervix (20 and 16⁰/₀₀₀₀ respectively), esophagus (2.5 and 0.8⁰/₀₀₀₀ respectively), larynx (1.4 and 0.4⁰/₀₀₀₀ respectively). AS of mortality from MNP of the liver and intrahepatic ducts is 2.7 times higher than the average in the Russian Federation (6.2 and 2.3⁰/₀₀₀₀ respectively), similar differences are observed with esophageal MNP (1.5 and 0.8⁰/₀₀₀₀ respectively), trachea, bronchi, and lung (13 and 6⁰/₀₀₀₀ respectively).

To answer the question of whether the revealed differences in the incidence are regional features of cancer pathology, or are associated with changes in diagnostic capabilities in 2017, we conducted a study of indicators for the period of 2008-2017 (Table 3). Analysis of the dynamics showed that in the Republic there are stably high – compared with the Russian Federation – morbidity and mortality rates of both sexes from liver and intrahepatic

ducts MNP and among female population from MNP of the trachea, bronchi, and lung.

Significant differences in the incidence rates of liver and intrahepatic ducts MNP suggest the presence of a risk factor in the region that does not depend on gender. One of the possible factors is the prevalence of chronic viral hepatitis B and C in the region, as well as the carrier state of the hepatitis B virus [1, 4, 5, 8, 9]. According to the Sakha Republic's Rospotrebnadzor, the incidence of chronic viral hepatitis B and C in the Republic in recent decades has significantly exceeded similar figures for the Russian Federation as a whole (Table 4). Thus, the incidence of chronic viral hepatitis B in 2017 was 34.1 per 100,000 population (RF 9.6⁰/₀₀₀₀), chronic viral hepatitis C – 52 (RF 34.0⁰/₀₀₀₀), respectively [2]. At the same time, the rate of carriage of the hepatitis B virus is also significantly higher than in the Russian Federation as a whole. Researchers associate the high frequency and progression of chronic viral hepatitis among the population of Yakutia with a violation of the activity of

Table 2

Standardized morbidity and mortality rates of the population of the Sakha (Yakutia) Republic from certain types of malignant neoplasms in 2017 [2]

ICD code 10	Morbidity		Mortality	
	Republic	Russia	Republic	Russia
Men				
C00-97 Malignant neoplasms	255.2	286.7	153.2	155.6
C15 Esophagus	13.9	6.5	10.5	5.5
C16 Stomach	26.6	20.2	14	16.4
C18 Colon	13.4	17.9	9.3	9.5
C22 Liver and intrahepatic bile ducts	19.8	5.2	19.1	5.6
C33,34 Trachea, bronchi, lung	49.0	49.0	37.3	40.4
C44,46.0 Skin (without melanoma)	13.2	28.7	1.6	0.8
C61 Prostate gland	24.3	40.5	6.7	12
C64,65 Kidney	13.8	14	4.3	5.2
C81-96 Lymphatic and hematopoietic tissue	12.7	16.3	4.5	8.3
Women				
C00-97 Malignant neoplasms	191.8	229.6	82.8	81.2
C15 Esophagus	2.5	0.8	1.5	0.8
C16 Stomach	8.7	9.1	5.8	6.5
C17 Small intestine	0.6	0.5	0.1	0.3
C18 Colon	13.0	14.0	6.5	6.8
C22 Liver and intrahepatic bile ducts	7.1	2.2	6.2	2.3
C33,34 Trachea, bronchi, lung	15.0	8.1	13.3	5.6
C50 Breast	37.7	52.0	10.4	14.2
C53 Cervix	20.2	15.8	6.1	5.2
C64,65 Kidney	10.2	7.8	1.7	1.8
C81-96 Lymphatic and hematopoietic tissue	10.7	12.6	4.2	5.2

Table 3

Динамика показателей заболеваемости и смертности от некоторых форм ЗНО за 2008-2017 гг. в Республике Саха (Якутия) [2]

Year	Sakha (Yakutia) Republic					Russian Federation				
	Morbidity		Mortality		K	Morbidity		Mortality		C
	esti- mate	AS	esti- mate	AS		esti- mate	AS	esti- mate	AS	
Code C22 MNP of liver and intrahepatic ducts (both sexes)										
2008	14.4	15.2	12.9	13.9	0.9	4.6	2.8	5.9	3.6	1.28
2009	16.0	15.7	13.1	13.6	0.82	4.7	2.9	5.9	3.6	1.26
2010	13.6	13.6	11.7	11.8	0.86	4.6	2.8	5.9	3.6	1.28
2011	13.9	13.7	10.3	10.4	0.74	4.6	2.7	6.0	3.5	1.30
2012	14.7	13.7	12.5	11.9	0.85	4.4	2.6	6.0	3.5	1.36
2013	15.0	13.7	12.0	10.9	0.80	4.7	2.8	6.2	3.5	1.32
2014	15.0	13.8	12.1	11.0	0.81	5.0	2.9	6.4	3.6	1.28
2015	17.8	15.9	13.3	11.3	0.75	5.5	3.1	6.8	3.8	1.24
2016	15.2	13.2	13.9	12.1	0.91	5.7	3.2	6.7	3.7	1.18
2017	15.2	12.4	13.8	11.3	0.91	6.0	3.4	5.5	3.0	0.92
Code C33, 34 Tracheal, Bronchi, Lung MNP (female)										
2008	15.7	14.8	14.5	13.3	0.92	13.4	7.0	11.3	5.6	0.84
2009	22.5	18.1	18.6	16.0	0.83	13.6	7.0	11.4	5.6	0.84
2010	17.1	15.4	12.0	10.4	0.70	13.9	7.1	11.5	5.7	0.83
2011	20.5	16.7	14.4	11.6	0.70	13.8	7.0	11.3	5.5	0.82
2012	17.3	13.4	14.0	11.2	0.81	13.5	6.8	11.5	5.5	0.85
2013	18.9	13.8	13.0	10.3	0.69	14.2	7.2	11.6	5.7	0.82
2014	17.9	13.1	15.3	11.0	0.85	14.6	7.3	11.8	5.6	0.81
2015	20.1	14.2	12.7	9.4	0.63	15.5	7.7	12.0	5.6	0.77
2016	20.2	14.7	13.7	9.7	0.68	15.8	7.7	11.9	5.5	0.75
2017	21.4	15.0	19.8	13.3	0.93	16.7	8.1	12.2	5.6	0.73

Table 4

Incidence of chronic viral hepatitis B and C in the Sakha (Yakutia) Republic, 2001-2017 (per 100,000 population) [3]

Year	Chronic Hepatitis B				Chronic Hepatitis C	
	Morbidity		Mortality		Morbidity	
	Russia	Yakutia	Russia	Yakutia	Russia	Yakutia
2001	16.0	38.0	89.6	200.0	29.0	17.0
2002	15.0	46.1	74.1	190.0	30.0	29.0
2003	14.9	63.3	65.5	140.0	33.0	45.0
2004	15.5	57.9	61.9	131.0	34.0	35.0
2005	13.9	51.9	50.6	80.2	31.0	43.0
2006	14.0	43.9	47.7	82.2	35.0	39.0
2007	14.0	33.2	42.7	55.8	37.0	42.0
2008	14.2	34.7	36.3	51.0	39.0	42.0
2009	14.4	39.3	32.4	43.4	40.0	51.0
2010	13.3	35.7	25.6	39.5	40.0	51.0
2011	13.0	34.2	22.0	32.8	40.0	51.0
2012	12.6	30.4	21.1	24.3	39.0	40.0
2013	11.7	27.8	18.1	21.4	39.0	43.0
2014	11.3	27.8	15.9	23.3	39.0	39.0
2015	10.8	35.2	13.8	17.4	38.0	54.0
2016	10.1	37.1	11.7	16.9	36.0	51.0
2017	9.6	34.1	10.1	15.0	34.0	52.0

alcohol dehydrogenase and aldehyde dehydrogenase in the native inhabitants of the Republic [4, 5].

The reasons for the significant differences in the AS of the incidence among female population of Yakutia in tracheal, bronchus, and lung MNP also need additional research (incidence rate is 1.9 times higher than in the Russian Federation). Chronic respiratory diseases, tuberculosis (morbidity rates that exceed the average in Russia by 1.2 times), as well as smoking and environmental factors can be possible reasons contributing to the high incidence of women with tracheal, bronchus, and lung MNP.

Conclusion. Thus, the results of the study suggest that although the standardized incidence rates of MNP in the Sakha (Yakutia) Republic are slightly lower than in the Russian Federation as a whole, there are some regional characteristics, which include the high morbidity and mortality of both sexes from MNP of liver and intrahepatic ducts and among female population from the tracheal, bronchial, and lung MNP. More research is needed to clarify possible risk factors. Taking into account regional characteristics of morbidity and mortality can help determine the direction of measures to reduce them, helping to preserve lives and increase the life expectancy of the population.

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References

- Иванов П.М., Томский М.И., Чибыева Л.Г. [и др.]. Гепатология Севера. Якутск: ООО «Издательство Сфера». 2012: 304. [Ivanov PM, Tomsky MI, Chibiyeva LG et al. Hepatology of the North. Yakutsk: Sfera Publishing House; 2012: 304. (In Russ.).]
- Государственный доклад «О санитарно-эпидемиологической обстановке в Республике Саха (Якутия)» [Электронный ресурс]. Управление Роспотребнадзора по Республике Саха (Якутия); 2003, 2017 [Дата обращения 22.02.2019]. Режим доступа: <http://14.rosпотребнадзор.ru/275> [State Report "On the Sanitary-Epidemiological Situation in the Sakha (Yakutia) Republic" [Electronic resource]. Office of Rosпотребнадзор in the Sakha (Yakutia) Republic; 2003, 2017 [Access date: February 22, 2019]. Access link: <http://14.rosпотребнадзор.ru/275> (In Russ.).]
- Злокачественные новообразования в России (заболеваемость и смертность) [Электронный ресурс]. М.: МНИОИ им. П.А. Герцена - филиал ФГБУ «НМИРЦ»

Минздрава России; 2008-2017 [Дата обращения 22.02.2019]. Режим доступа: http://www.oncology.ru/service/statistics/malignant_tumors/ [Malignant Neoplasms in Russia (Morbidity and Mortality) [Electronic resource]. Moscow: Moscow Scientific and Research Oncological Institute – Branch of the Federal State Budgetary Institution “National Medical Research Center” of the Ministry of Health of Russia; 2008-2017 [Access date: February 22, 2019]. Access link: http://www.oncology.ru/service/statistics/malignant_tumors/ (In Russ.)]

4. Слепцова С.С., Билукина И.Ф. Предикторы развития гепатоцеллюлярной карциномы у больных хроническими вирусными гепатитами в Республике Саха (Якутия). *Инфекционные болезни: новости, мнения, обучение*. 2019; Т. 8, № 1; 28–33. DOI: 10.24411/2305-3496-2019-11003 [Sleptsova SS, Bilyukina IF. Predictors of Hepatocellular Carcinoma in Patients with Chronic Viral Hepatitis in the Sakha (Yakutia) Republic. *Infectious Diseases: News, Opinions, Training*. 2019; 1 (8): 28–33. (In Russ.)] DOI: 10.24411 / 2305-3496-2019-11003

5. Слепцова С.С., Рахманова А. Г., Шаройко В. В. Роль вирусных гепатитов в развитии первичного рака печени в Якутии. *Инфекционные болезни: новости, мнения, обучение*. 2015; 3; 76–82. [Sleptsova SS, Rakhmanova AG, Sharoyko VV. The Role of Viral Hepatitis in the Development of Primary Liver Cancer in Yakutia. *Infectious Diseases: News, Opinions, Training*. 2015; 3; 76–82. (In Russ.)]

6. Иванов П.М., Томский М.И., Мыреева С.А. [и др.]. Смертность населения Республики Саха (Якутия) от злокачественных новообразований в начале третьего тысячелетия и её социально-экономические последствия.

Якутский медицинский журнал. 2013; 2 (42):5-8. Ivanov PM, Tomsky MI, Myreeva SA [et al.] Mortality of the population of the Republic Sakha (Yakutia) from malignant neoplasms at the beginning of the third millennium and its socio-economic consequences. *Yakut medical journal*. 2013; 2 (42): 5–8. (In Russ.)]

7. Статистический ежегодник Республики Саха (Якутия) [Электронный ресурс]. 2017 [Дата обращения 22.02.2019]. Режим доступа: http://sakha.gks.ru/wps/wcm/connect/rosstat_ts/sakha/ru/publications/official_publications/electronic_versions/4272910047c730b98fa9afed3bc4492f [Statistical Yearbook of the Sakha (Yakutia) Republic [Electronic resource]. 2017 [Access date: February 22, 2019] Access link: http://sakha.gks.ru/wps/wcm/connect/rosstat_ts/sakha/ru/publications/official_publications/electronic_versions/4272910047c730b98fa9afed3bc4492f (In Russ.)]

8. Бугаева Т.Т., Иванов П.М., Алексеева М.Н. и др. Факторы, влияющие на частоту заболевания первичным раком печени в Якутии. *Якутский медицинский журнал*. 2009; 3 (27): 27–29. [Bugaeva TT, Ivanov PM, Alekseeva MN [et al.]. Factors affecting the incidence of primary liver cancer in Yakutia. *Yakut Medical Journal*. 2009; 3 (27):27–29. (In Russ.)]

9. Семенов С. И., Саввин Р.Г., Никитина С.Г., Максимова С.С., Кривошапкин В.Г., Слепцова С.С. Эпидемиологическая ситуация по вирусным гепатитам в Республике Саха (Якутия). *Российский журнал гастроэнтерологии, гепатологии, колопроктологии*. 2015; 25 (4); 53–58. [Seменов SI, Savvin RG, Nikitina SG, Maksimova SS, Krivoschapkin VG, Sleptsova SS. Epidemiological Situation of Viral Hepatitis in the Sakha (Yakutia) Republic. *Russian Journal of*

Gastroenterology, Hepatology, Coloproctology. 2015; 25 (4):53–58. (In Russ.)]

10. Ahmad OB, Boschi-Pinto C, Lopez AD, Murray CJL, Lozano R, Inoue M. Age standardization of Rates: a new WHO standard. GPE Discussion Paper series: no 31 [Internet]. WHO; 2001 [cited 28.07.2018]. Available from: <http://www.who.int/healthinfo/paper31.pdf> (Access date: July 28, 2018).

11. Choi E, Lee S, Nhung BC, Suh M, Park B, Jun JK, Choi KS. Cancer mortality-to-incidence ratio as an indicator of cancer management outcomes in Organization for Economic Cooperation and Development countries. *Epidemiol Health*. 2017 Feb 5; 39:e2017006. DOI: 10.4178/epih.e2017006. eCollection 2017.

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SCIENTIFIC REVIEWS AND LECTURES

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IMMUNOGENICITY INDICATORS OF VACCINES AGAINST THE HUMAN PAPILLOMA VIRUS IN FEMALES ACCORDING TO SCIENTIFIC DATA, PUBLISHED IN THE INTERNET SYSTEM

ABSTRACT

The article outlines the features of searching in the Internet system for scientific articles on the effectiveness of vaccination against human papillomavirus. Publications containing data on the immunogenicity of human papillomavirus vaccines in girls and young women in the long-term period are analyzed. The age of the patients, the principles of formation of comparison groups, materials and laboratory methods, the duration of the research, the name of the used vaccines were established.

In Internet the search for scientific publications on the vaccination efficacy against HPV is valid and based on matches of the user keywords with the article title words.

Internet provides equal opportunities for researchers the availability of sharing knowledge, regardless of the publisher's rating and the number of citations.

The vaccination efficacy against HPV includes an evaluation of the vaccines' immunogenicity. The HPV vaccine immunogenicity in girls and young women from 9 to 25 years old, in the long-term period from 3 to 7 years, is determined by the level of