**D.R. KAIDAROVA^{1,2}, O.V. SHATKOVSKAYA¹, Zh.Zh. ZHOLDYBAY^{1,2},
A.Zh. ZHYL-KAIDAROVA¹, A.S. PANINA^{1,2}**

¹Kazakh Institute of Oncology and Radiology, Almaty, Kazakhstan;
²S.D. Asfendiyarov Kazakh National Medical University, Almaty, Kazakhstan

Lung cancer in Kazakhstan: age-gender features

Relevance: Over the years, lung cancer (LC) remains the leading cause of cancer deaths in Kazakhstan. In 2018, LC was diagnosed in 3741 people in the RK, and 2377 dies from LC.

The purpose of this study was to assess the age-gender characteristics of morbidity and mortality from LC in Kazakhstan based on statistical and literature data.

Results: The conducted analysis by gender and age showed a consistent and significant increase in LC mortality in the RK, starting from the age of 40-44 years. The highest incidence and mortality were registered in the age groups of 65-69 years and 70+ years. In general, in all age categories, the incidence and mortality in men exceeded the incidence and mortality in women by 4.5–5.3 times. The highest mortality in men and women of all ages was registered in 2009 (34.3‰ and 6.9‰, respectively), the lowest – in 2019 (20.8‰ in men and 4.6‰ in women).

Conclusions: The results of the assessment can be used to improve early diagnosis of LC and in the preparation of national screening programs and regional pilot projects for LC prevention and the identification of risk groups. The use of the results will contribute to increasing the effectiveness of treatment, improving the five-year survival of patients, reducing the level of neglect and mortality from LC.

Keywords: incidence, mortality, lung cancer, age-gender features.

Introduction: For many years, lung cancer has been the leading cause of death from malignant tumors in the Republic of Kazakhstan (RK) (Figure 1). The impact of new etiological factors, an increase in the life expectancy of the population, as well as modern opportunities for lung cancer diagnostics have contributed to the fact that since 1985 this disease has become the most common and detectable disease in oncology and has been recognized as a pandemic of the 20th and 21st centuries [1-2].

Figure 1 – The structure of mortality from malignant neoplasms in the RK, 2018

Lung cancer remains an acute problem in Kazakhstan due to the morbidity of the working-age population, a high level of neglect of the disease at detection, which worsens the results of treatment, and high mortality rates.

In Kazakhstan, lung cancer ranks second in the total structure of cancer incidence in both genders after breast cancer (figure 2) [3].

Figure 2 – The structure of incidence of malignant neoplasms in the RK, 2018 (both genders, in %) [3]

The structure of cancer incidence by nosology is gender-specific in Kazakhstan as well as in the whole world. Lung cancer ranks second in the structure of cancer incidence in the Republic of Kazakhstan in both genders (11.6%); at that, it leads the structure of cancer incidence in men (20.8%) and ranks 7th in women (4.3 %) (figure 3).

Materials and Methods: The subject of the survey was the information from statistical collections of the RK, papers by Kazakhstani authors. Data for Kazakhstan took into

account the administrative-territorial division into 16 regions and 3 cities of republican significance: Nur-Sultan, Almaty, and Shymkent. Traditional statistical processing

methods and IARC-recommended techniques were used to calculate extensive, intensive, standardized incidence and mortality rates per 100 000 population.

Figure 3 – The structure of incidence of malignant neoplasms in the RK (except for skin cancer)

Results and Discussion: The analysis of age- and gender-specificity and structure of lung cancer incidence in

the population of the country in 2009-2019 has revealed the following patterns (table 1).

Table 1 – The number of lung cancer cases, newly diagnosed in the RK in 2009-2019, by age and gender (abs. figures)

Years	Gender	Age categories															Total
		0-4	5-9	10-14	15-19	20-24	25-28	29-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70+	
2009	M	1				4	7	9	19	58	168	362	496	453	461	878	2916
	W					2	1	5	8	15	31	60	91	84	104	256	657
2010	M	1			1	1	6	10	21	47	162	349	532	548	381	882	2941
	W					1	3	8	8	20	33	51	81	81	78	230	594
2011	M						5	8	12	42	135	319	483	600	357	863	2824
	W	1	1	1		1	6	4	8	14	40	57	94	91	66	255	639
2012	M		1			2	5	4	21	37	138	329	490	673	408	838	2946
	W						5	10	11	25	47	65	81	117	64	293	718
2013	M				2	2	3	7	18	44	131	316	527	663	425	856	2994
	W					1	2	6	14	26	39	74	90	116	78	316	762
2014	M					1	3	10	18	33	115	301	508	668	475	824	2956
	W					1	1	7	9	26	35	65	81	88	98	302	713
2015	M		1		1		6	8	18	58	113	293	560	695	592	812	3157
	W				2		5	6	10	25	36	80	96	136	122	265	783
2016	M				1		4	5	15	41	94	258	490	646	621	771	2946
	W					2	4	3	10	18	35	56	84	121	129	227	689
2017	M	1			2	1	4	8	15	35	113	264	540	624	636	765	3008
	W				1	3	4	8	9	20	29	55	105	123	138	267	762
2018	M				1	4	1	17	15	46	109	237	482	668	630	764	2974
	W					3	3	9	8	25	44	71	82	145	119	258	767
2019	M					1	1	10	17	40	86	206	497	686	631	783	2958
	W				1	3	2	4	12	19	38	67	102	137	131	268	784

In the age categories of 0 to 4, 5 to 9, and 10 to 14 years, only single cases of lung cancer were registered in some years during the whole period of study. In the age categories of 15 to 19 and 20 to 24 years, lung cancer cases were more common and frequent. From the age of 25-28 years and above, lung cancer was registered each year in both genders, but more often in men. The incidence increased with age, reaching the maximum at the age of 70 and above.

The highest share of new cases in both genders in the total structure of incidence by years was registered in the

age categories of 55 to 59, 60 to 64, 65 to 69 years, and 70 years and above (table 2).

At that, the proportion of men diagnosed with lung cancer during the whole period of study was higher than women in the age categories of 55 to 59, 60 to 64, and 65 to 69 years (except for the age category of 65 to 69 years in 2009 and 2010), while at the age of 70 and above the proportion of women diagnosed with lung cancer has always prevailed. This could be due to a longer life expectancy of the female population of the country. According to the Committee for Statistics of the Ministry of National

Economy of the RK, the life expectancy of the female population is always 8-9 and more years longer than the life expectancy of the male population. Based on that, one can expect that with the same life expectancy of the male and

female population of the country the proportion of men and women diagnosed with lung cancer at the age of 70 and above would be the same, or the proportion in men would even exceed the one in women.

Table 2 – The structure of patients newly diagnosed with lung cancer in the RK in 2009-2019, by age and gender (in %)

Years	Gender	Age categories															Total
		0-4	5-9	10-14	15-17	20-24	25-28	29-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70+	
2009	M	0.03	0	0	0	0.14	0.2	0.3	0.7	2.0	5.8	12.4	17.0	15.5	15.8	30.1	100
2009	W	0	0	0	0	0.3	0.2	0.8	1.2	2.3	4.7	9.1	13.9	12.8	15.8	39.0	100
2010	M	0.03	0	0	0	0.03	0.2	0.3	0.7	1.6	5.5	11.9	18.1	18.6	13.0	30.0	100
2010	W	0	0	0	0	0.17	0.5	1.3	1.3	3.4	5.6	8.6	13.6	13.6	13.1	38.7	100
2011	M	0	0	0	0	0	0.2	0.3	0.4	1.5	4.8	11.3	17.1	21.2	12.6	30.6	100
2011	W	0	0	0.16	0	0.16	0.9	0.6	1.3	2.2	6.3	8.9	14.7	14.2	10.3	39.9	100
2012	M	0	0	0	0	0	0.2	0.1	0.7	1.3	4.7	11.2	16.6	22.8	13.8	28.4	100
2012	W	0	0	0	0	0	0.7	1.4	1.5	3.5	6.5	9.1	11.3	16.3	8.9	40.8	100
2013	M	0	0	0	0	0	0.1	0.2	0.6	1.5	4.4	10.6	17.6	22.1	14.2	28.6	100
2013	W	0	0	0	0	0.13	0.3	0.8	1.8	3.4	5.1	9.7	11.8	15.2	10.2	41.5	100
2014	M	0	0	0	0	0	0.1	0.3	0.6	1.1	3.9	10.2	17.2	22.6	16.1	27.9	100
2014	W	0	0	0	0	0.14	0.1	1.0	1.3	3.6	4.9	9.1	11.4	12.3	13.7	42.4	100
2015	M	0	0	0	0.03	0	0.2	0.3	0.6	1.8	3.6	9.3	17.7	22.0	18.8	25.7	100
2015	W	0	0	0	0.26	0.0	0.6	0.8	1.3	3.2	4.6	10.2	12.3	17.4	15.6	33.8	100
2016	M	0	0	0	0.03	0	0.1	0.2	0.5	1.4	3.2	8.8	16.6	21.9	21.1	26.2	100
2016	W	0	0	0	0	0.3	0.6	0.4	1.5	2.6	5.1	8.1	12.2	17.6	18.7	32.9	100
2017	M	0	0	0	0.07	0	0.1	0.3	0.5	1.2	3.8	8.8	18.0	20.7	21.1	25.4	100
2017	W	0	0	0	0.13	0.4	0.5	1.0	1.2	2.6	3.8	7.2	13.8	16.1	18.1	35.0	100
2018	M	0	0	0	0.03	0	0.0	0.6	0.5	1.5	3.7	8.0	16.2	22.5	21.2	25.7	100
2018	W	0	0	0	0	0.4	0.4	1.2	1.0	3.3	5.7	9.3	10.7	18.9	15.5	33.6	100
2019	M	0	0	0	0	0	0.03	0.3	0.6	1.4	2.9	7.0	16.8	23.2	21.3	26.5	100
2019	W	0	0	0	0	0.4	0.3	0.5	1.5	2.4	4.8	8.5	13.0	17.5	16.7	34.2	100

NB: The color indicates the age categories with the highest prevalence of lung cancer

The lung cancer incidence was not stable in the study period in both genders, with no clear trends; the decline in one year could be followed with growth next year. However, in general, the lung cancer incidence has decreased in

the study period by 9.8%, from 22.4‰ in 2009 to 20.2‰ in 2019. The standardized incidence in 2019 has preliminary amounted to 18.5‰, with a reduction of 5.1% in the last four years (table 3).

Table 3 – Lung cancer incidence in the RK in 2009-2019 (crude and standardized rates, in ‰)

Years	Both genders			Men			Women		
	Abs. cases	Crude incidence	Standardized incidence	Abs. cases	Crude incidence	Standardized incidence	Abs. cases	Crude incidence	Standardized incidence
2009	3573	22.4		2916	38.0		657	8.0	
2010	3535	21.7		2941	37.4		594	7.0	
2011	3463	20.9		2824	35.4		639	7.5	
2012	3664	21.8		2946	36.4		718	8.3	
2013	3756	22		2994	36.4		762	8.6	
2014	3669	21.2		2956	35.4		713	8	
2015	3940	22.5		3157	37.2		783	8.6	
2016	3635	20.4	19.5	2946	34.2	39.7	689	7.5	6.2
2017	3770	21.0	19.8	3008	34.7	39.8	762	8.2	6.7
2018	3741	20.3	18.6	2974	33.4	36.8	767	8.1	6.5
2019	3742	20.2*	18.5*	2958	33.2*	36.6*	784	8.3*	6.5*

NB: * means the rates for 2019 calculated based on the preliminary data on the average annual population of the Republic of Kazakhstan; updated data will be published only in April 2020

The proportion of women in the gender structure of lung cancer incidence is increasing: from 18.4% of women vs. 81.6% of men in 2009 to 21% of women vs. 78% of men in 2019.

Crude lung cancer incidence in men exceeds the incidence in women: from the minimum 4-times' excess in 2019 (33.2‰ vs. 8.3‰) to the maximum 5.3-times' excess in 2010 (37.4‰ vs. 7‰), with an average excess of 4.5 times.

The incidence in men also did not show a clear trend, but in general, this rate has decreased by 12.6% by 2019 – from 38.0 to 33.2‰. In the study period, the incidence was maxed in 2009 and min in 2019. In 2019, the standardized incidence in men amounted to 36.6‰, having lost 7.8% in the last four years.

The incidence in women in the study period has increased by 3.8%, from 8‰ to 8.3‰, but without a steady trend. Its level reached the maximum in 2013 and 2015 (8.6‰), and the minimum – in 2010 (7‰). In 2019, the standardized incidence in women amounted to 6.5‰ (5.6 times lower than in men), adding 4.8% since 2016.

The analysis of age specificity showed a significant (2 and more times) increase in lung cancer incidence in both genders, starting from the age of 55-59 years and on. In the age category of 70 years and above, the incidence reached the maximum in the whole period of study in women, and in 2009-2011, 2013, 2014, and 2019 – in men. In 2012 and 2015-2018, the incidence was maximum in men in the age category of 65-69 years (table 4).

Table 4 – Lung cancer incidence in the RK in 2009-2019, by age and gender (crude rate, in ‰)

Years	Gender	Age categories															Total
		0-4	5-9	10-14	15-17	20-24	25-28	29-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70+	
2009	M	0.1	0	0	0	0.50	1.0	1.5	3.5	11.6	32.6	85.3	156.1	240.6	323.4	337.1	38.0
2009	W	0	0	0	0	0.26	0.2	0.8	1.4	2.8	5.3	11.9	22.3	32.1	44.9	48.6	8.0
2010	M	0.1	0	0	0	0.12	0.9	1.6	3.7	9.1	31.0	79.9	167.0	253.8	304.3	333.9	37.4
2010	W	0	0	0	0	0.12	0.4	1.3	1.3	3.6	5.7	10.1	20.1	27.3	40.6	44.5	7.0
2011	M	0	0	0	0	0	0.7	1.3	2.1	8.1	26.3	69.4	147.0	253.3	310.1	318.8	35.4
2011	W	0.1	0.2	0.18	0	0.12	0.8	0.6	1.3	2.5	7.0	10.7	22.8	27.9	37.8	48.0	7.5
2012	M	0	0.1	0	0	0.25	0.7	0.6	3.7	7.0	27.3	69.2	143.3	270.5	342.2	308.2	36.4
2012	W	0	0	0	0	0	0.7	1.5	1.8	4.4	8.4	11.9	19.0	34.0	35.9	54.5	8.3
2013	M	0	0	0	0	0.25	0.4	1.1	3.1	8.2	26.3	64.9	146.6	256.8	318.1	320.1	36.4
2013	W	0	0	0	0	0.13	0.3	0.9	2.3	4.5	7.1	13.2	20.2	32.5	39.1	59.3	8.6
2014	M	0	0	0	0	0.13	0.4	1.5	3.1	6.1	23.3	60.9	134.6	248.5	306.9	318.5	35.4
2014	W	0	0	0	0	0.13	0.1	1.0	1.5	4.5	6.4	11.5	17.4	23.8	41.9	58.0	8.0
2015	M	0	0.1	0	0.17	0.0	0.7	1.2	3.0	10.6	22.8	59.5	140.2	249.4	332.5	322.6	37.2
2015	W	0	0	0	0.36	0.0	0.6	0.9	1.6	4.3	6.6	14.2	19.7	35.7	44.9	52.0	8.6
2016	M	0	0	0	0.17	0.0	0.5	0.7	2.5	7.5	18.8	53.2	116.1	223.2	315.8	304.3	34.2
2016	W	0	0	0	0	0.29	0.5	0.4	1.6	3.1	6.4	10.1	16.4	30.9	42.9	44.2	7.5
2017	M	0.1	0	0	0.35	0.14	0.5	1.1	2.5	6.3	22.4	54.7	125.2	211.2	313.9	302.7	34.7
2017	W	0	0	0	0.18	0.45	0.5	1.1	1.4	3.4	5.3	10.0	20.2	30.9	44.4	52.0	8.2
2018	M	0	0	0	0.17	0.64	0.1	2.2	2.4	8.2	21.1	50.4	105.8	203.1	284.8	281.6	33.4
2018	W	0	0	0	0	0.5	0.4	1.1	1.2	4.2	7.8	13.3	15.1	33.3	35.3	47.1	8.1
2019*	M	0	0	0	0	0.16	0.1	1.3	2.7	7.1	16.7	43.8	109.1	208.6	285.3	288.6	33.2
2019*	W	0	0	0	0.18	0.5	0.3	0.5	1.8	3.2	6.7	12.6	18.7	31.5	38.9	48.9	8.3

NB: * the incidence rates for 2019 were calculated based on the preliminary data on the average annual population of the Republic of Kazakhstan. The color indicates the age categories with the highest incidence of lung cancer

At that, the incidence in men has decreased significantly in all troubled age categories in the period of 2009 to 2019. The incidence in women has decreased in the age categories of 55-59, 60-64, and 65-69 years but remained high in the age category of 70 years and above and continued to grow by 2019.

The highest lung cancer incidence in the study period was registered in men aged 65-69 years in 2012 (342.2‰), in women – in the age category of 70 years and above in 2013 (59.3‰).

That is, lung cancer incidence in the population of the country is directly age- and gender-dependent. It is much higher in men than in women, in total and by

age categories, and increases with age. The exception was the women aged 25-28 in 2011, 2018, and 2019, and aged 29-34 – in 2012, when their incidence rates exceeded the ones in men.

Every year, women died of lung cancer, starting from the age of 25-28 vs. the age of 29-34 in men. The number of deaths from lung cancer was increasing with age and reached the absolute maximum in both genders at the age of 70 years and above. At that, the number of deaths from lung cancer was evidently decreasing year by year in both genders (table 5) due to early detection of lung cancer, clinical examination of patients, and the use of new methods of therapy.

Table 5 – The number of deaths from lung cancer cases in the RK in 2009-2019, by age and gender

Years	Gender	Age categories															Total
		0-4	5-9	10-14	15-17	20-24	25-28	29-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70+	
2009	M				1	1	8	12	13	47	132	272	471	425	437	811	2630
2009	W				1	1	5	6	11	23	40	46	74	89	95	175	566
2010	M				1	1	5	8	24	36	121	287	444	474	360	763	2524
2010	W				1	1	2	9	6	8	30	44	75	69	64	207	516
2011	M				1	2	4	5	12	42	106	284	407	517	299	720	2399
2011	W				1	1	2	5	6	21	34	38	69	85	53	225	540
2012	M				3	1	4	3	16	29	124	271	410	557	337	696	2451
2012	W						5	5	9	15	33	53	77	87	59	210	553
2013	M				1	4	5	6	20	43	102	263	413	552	368	719	2496
2013	W				1		5	5	2	17	24	38	73	85	57	214	521
2014	M					2	1	9	15	33	91	239	382	489	378	564	2203
2014	W					1	1	5	8	22	25	45	69	48	70	227	521
2015	M				1	1	3	6	7	30	83	203	388	503	412	565	2202
2015	W						2	3	10	13	24	49	66	87	75	186	515
2016	M				2	1	9	5	8	38	69	184	336	486	446	533	2117
2016	W				1	1	2	1	6	11	21	42	67	81	90	175	498
2017	M	1					2	9	11	28	70	180	350	456	427	477	2011
2017	W						2	5	10	11	20	28	54	75	68	164	437
2018	M					2	2	7	8	19	73	177	335	418	433	480	1954
2018	W					2	1	4	3	11	20	39	54	78	66	145	423
2019	M					1		6	10	31	61	133	296	442	399	472	1851
2019	W					2	3	2	6	12	15	31	59	83	76	144	433

The analysis of lung cancer mortality showed a significant increase in the proportion of the dead starting from the age category of 40-44; at that, the proportion of women in this and subsequent categories (45-49 years) exceeded the proportion of men in those ages (table 6).

The same as in the analysis of the structure of lung cancer incidence by age and gender, in the structure of deaths from this localization of cancer, the proportion of women was higher than men in the age categories of 20 to 49 and 70 years and above, while in the categories of 50 to 69 years the proportion of men was higher in nearly all years.

Table 6 – The structure of lung cancer mortality in the RK in 2009-2019, by age and gender (in %)

Years	Gender	Age categories															Total
		0-4	5-9	10-14	15-17	20-24	25-28	29-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70+	
2009	M	0	0	0	0	0.04	0.3	0.5	0.5	1.8	5.0	10.3	17.9	16.2	16.6	30.8	100
2009	W	0	0	0	0	0.18	0.9	1.1	1.9	4.1	7.1	8.1	13.1	15.7	16.8	30.9	100
2010	M	0	0	0	0	0.04	0.2	0.3	1.0	1.4	4.8	11.4	17.6	18.8	14.3	30.2	100
2010	W	0	0	0	0	0.19	0.4	1.7	1.2	1.6	5.8	8.5	14.5	13.4	12.4	40.1	100
2011	M	0	0	0	0	0.08	0.2	0.2	0.5	1.8	4.4	11.8	17.0	21.6	12.5	30.0	100
2011	W	0	0	0	0	0.19	0.4	0.9	1.1	3.9	6.3	7.0	12.8	15.7	9.8	41.7	100
2012	M	0	0	0	0	0.04	0.2	0.1	0.7	1.2	5.1	11.1	16.7	22.7	13.7	28.4	100
2012	W	0	0	0	0	0	0.9	0.9	1.6	2.7	6.0	9.6	13.9	15.7	10.7	38.0	100
2013	M	0	0	0	0	0.16	0.2	0.2	0.8	1.7	4.1	10.5	16.5	22.1	14.7	28.8	100
2013	W	0	0	0	0	0	0.96	1.0	0.4	3.3	4.6	7.3	14.0	16.3	10.9	41.1	100
2014	M	0	0	0	0	0.09	0.05	0.4	0.7	1.5	4.1	10.8	17.3	22.2	17.2	25.6	100
2014	W	0	0	0	0	0.19	0.2	1.0	1.5	4.2	4.8	8.6	13.2	9.2	13.4	43.6	100
2015	M	0	0	0	0	0.05	0.14	0.3	0.3	1.4	3.8	9.2	17.6	22.8	18.7	25.7	100
2015	W	0	0	0	0	0	0.4	0.6	1.9	2.5	4.7	9.5	12.8	16.9	14.6	36.1	100
2016	M	0	0	0	0	0.05	0.43	0.2	0.4	1.8	3.3	8.7	15.9	23.0	21.1	25.2	100
2016	W	0	0	0	0	0.2	0.4	0.2	1.2	2.2	4.2	8.4	13.5	16.3	18.1	35.1	100
2017	M	0.05	0	0	0	0	0.1	0.4	0.5	1.4	3.5	9.0	17.4	22.7	21.2	23.7	100
2017	W	0	0	0	0	0	0.46	1.1	2.3	2.5	4.6	6.4	12.4	17.2	15.6	37.5	100
2018	M	0	0	0	0	0.1	0.1	0.4	0.4	1.0	3.7	9.1	17.1	21.4	22.2	24.6	100
2018	W	0	0	0	0	0.47	0.24	0.9	0.7	2.6	4.7	9.2	12.8	18.4	15.6	34.3	100
2019	M	0	0	0	0	0.1	0	0.3	0.5	1.7	3.3	7.2	16.0	23.9	21.6	25.5	100
2019	W	0	0	0	0	0.46	0.7	0.5	1.4	2.8	3.5	7.2	13.6	19.2	17.6	33.3	100

NB: The color indicates the age categories with the highest specific mortality from lung cancer

Over the years, the lung cancer mortality has significantly decreased in both genders – by 38.8%, from 20.1‰ in 2009 to 12.3‰ in 2019. The decrease was nearly consistent, that is, year to year, except for 2012. The standardized mortality rate in both genders has decreased by 12.2% in the last three years (from 13.1‰ to 11.5‰). In the general structure of patients who died

of lung cancer in 2019, men made 81% vs. 19% of women (table 7).

The mortality in men exceeded the one in women by 5 times in 2009 and 4.5 times in 2019. In total, during the study period, the mortality has decreased by 39.4% (from 34.3‰ to 20.8‰) in men and by 33.3% (from 6.9‰ to 4.6‰) – in women.

Table 7 – The mortality from lung cancer in the RK in 2009-2019 (crude and standardized rates, in ‰)

Years	Both genders			Men			Women		
	Abs. no. of deaths from lung, bronchogenic, or tracheal cancer	Crude mortality rates	Standardized mortality rates	Abs. no. of deaths from lung, bronchogenic, or tracheal cancer	Crude mortality rates	Standardized mortality rates	Abs. no. of deaths from lung, bronchogenic, or tracheal cancer	Crude mortality rates	Standardized mortality rates
2009	3196	20.1		2630	34.3		566	6.9	
2010	3040	18.6		2524	32.1		516	6.1	
2011	2939	17.7		2399	30.0		540	6.3	
2012	3004	17.9		2451	30.3		553	6.4	
2013	3017	17.7		2496	30.4		521	5.9	
2014	2724	15.8		2203	26.4		521	5.8	
2015	2717	15.5		2202	26.0		515	5.7	
2016	2615	14.7		2117	24.6		498	5.4	
2017	2448	13.7	13.1	2011	23.2	26.7	437	4.7	3.9
2018	2377	12.9	11.9	1954	22	24.2	423	4.5	3.5
2019	2284	12.3*	11.5*	1851	20.8*	23.2*	433	4.6*	3.6*

The standardized mortality rate has decreased by 13.1% in the last three years (from 26.7 to 23.2‰) in men and by 7.7% (from 3.9 to 3.6‰) in women.

The analysis of age- and gender-specific mortality of the population of the country from lung cancer showed a regular and significant increase in the rates, starting from

the age group of 40-44 years. As the incidence rates, the highest mortality was registered in the age groups of 65-69 years and 70 years and above (table 8).

In general, over the years, in all age categories, the mortality and incidence in men exceeded the mortality and incidence in women by 4.5-5.3 times. The highest mortality

ty in men and women of all ages was registered in 2009 (34.3‰ and 6.9‰, respectively), the lowest – in 2019 (20.8‰ in men and 4.6‰ in women).

By age, the maximum mortality in men was registered in 2009 in the age group of 70 years and above (311.3‰), in women – in 2014 in the same age category (43.6‰) [4].

Table 8 – The structure of lung cancer mortality in the RK in 2009-2019, by age and gender (crude rate, in ‰)

Years	Gender	Age categories															Total
		0-4	5-9	10-14	15-17	20-24	25-28	29-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70+	
2009	M	0	0	0	0.14	0.13	1.2	2.0	2.4	9.4	25.6	64.1	148.2	225.7	306.6	311.3	34.3
	W	0	0	0	0.14	0.13	0.8	1.0	1.9	4.3	6.9	9.1	18.1	34.0	41.0	33.2	6.85
2010	M	0	0	0	0.13	0.12	0.7	1.3	4.3	7.0	23.2	65.7	139.4	219.5	287.5	288.9	32.1
	W	0	0	0	0.14	0.12	0.3	1.4	1.0	1.5	5.2	8.7	18.6	23.3	33.3	40.0	6.10
2011	M	0	0	0	0.14	0.25	0.6	0.8	2.1	8.1	20.6	61.8	123.9	218.3	259.8	266.0	30.0
	W	0	0	0	0.15	0.12	0.3	0.8	1.0	3.8	6.0	7.2	16.7	26.0	30.4	42.3	6.30
2012	M	0	0	0	0.44	0.12	0.5	0.5	2.8	5.5	24.5	57.0	119.9	223.9	282.6	256.0	30.3
	W	0	0	0	0	0	0.7	0.8	1.5	2.7	5.9	9.7	18.0	25.3	33.1	39.1	6.36
2013	M	0	0	0	0.16	0.51	0.6	0.9	3.5	8.0	20.5	54.0	114.9	213.8	275.5	268.9	30.4
	W	0	0	0	0.16	0	0.6	0.8	0.3	3.0	4.4	6.8	16.4	23.8	28.5	40.1	5.91
2014	M	0	0	0	0	0	0	1.4	2.6	6.1	18.4	48.4	101.2	181.9	244.2	218.0	26.4
	W	0	0	0	0	0	0	0.7	1.3	3.8	4.6	8.0	14.8	13.0	29.9	43.6	5.8
2015	M	0	0	0	0.17	0.14	0.4	0.9	1.2	5.5	16.8	41.2	97.2	180.5	231.4	224.4	26.0
	W	0	0	0	0	0	0	0.4	1.6	2.2	4.4	8.7	13.5	22.9	27.6	36.5	5.7
2016	M	0	0	0	0.35	0.14	1.1	0.7	1.3	6.9	13.8	37.9	79.6	167.9	226.8	210.4	24.6
	W	0	0	0	0.18	0.15	0.24	0.1	1.0	1.9	3.8	7.6	13.1	20.7	30.0	34.1	5.42
2017	M	0.1	0	0	0	0	0	1.2	1.8	5.1	13.9	37.3	81.2	154.3	210.7	188.8	23.2
	W	0	0	0	0	0	0	0.7	1.6	1.9	3.6	5.1	10.4	18.8	21.9	31.9	4.7
2018	M	0	0	0	0	0	0	0.9	1.3	3.4	14.2	37.6	73.6	127.1	195.8	176.9	21.9
	W	0	0	0	0	0	0	0.5	0.5	1.8	3.5	7.3	9.9	17.9	19.6	26.5	4.5
2019*	M	0	0	0	0	0.16	0	0.8	1.6	5.5	11.8	28.3	65.0	134.4	180.4	174.0	20.8
	W	0	0	0	0	0.3	0.4	0.3	0.9	2.0	2.7	5.8	10.8	19.1	22.6	26.3	4.6

NB: * the mortality rates were calculated based on the preliminary data on the average annual population of the Republic of Kazakhstan. The color indicates the age categories with the highest mortality from lung cancer

Conclusions: The conducted analysis of lung cancer statistics in the Republic of Kazakhstan has revealed the existing patterns of incidence and mortality depending on the patient age and gender. This data is essential for the formation of risk groups in the programs of early lung cancer detection.

References:

1. Garin A.M. «Pandemiya» raka logkogo prodolzhaet terzat' naseleniye mira, Yevropy i drugikh stran [The "pandemic" of lung cancer continues to torment the population of the world, Europe and

other countries] // www.myshared.ru/slide/406000/. 19.03.2020 [in Russian];

2. GLOBOCAN 2018 database // www.uicc.org/new-global-cancer-data-globocan-2018. 19.03.2020;

3. Kaidarova D.R., Shatkovskaya O.V., Zholdybay Zh.Zh., Panina A.S. Lung cancer epidemiology in the Republic of Kazakhstan // *Oncology and Radiology of Kazakhstan*. – 2019. – №2 (52). – P. 8–14;

4. Pokazateli onkologicheskoy sluzhby Respubliki Kazakhstan za 2009-2019 gg. (statisticheskiye materialy) [Indicators of the Cancer Service of the Republic of Kazakhstan for 2009-2019 (statistical materials)]. – Almaty: Kazakh Institute of Oncology and Radiology, 2020 [in Russian].