RESEARCH ARTICLE

Component Analysis of Laryngeal Cancer Incidence Dynamics in Kazakhstan from 1999 to 2014

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Abstract

Background: In this study, we examined epidemiological aspects of dynamic changes in incidences of laryngeal cancer in male and female populations in Kazakhstan. Materials and Methods: Primary data were for registered patients with malignant laryngeal tumors in the whole country during the period of 1999–2014. Evaluation of changes in laryngeal cancer incidence in the population of Kazakhstan was performed using component analysis. Results: It was determined that the number of patients with laryngeal cancer in the whole country is decreasing although with conflicting impacts of different factors. Despite population growth (all – Δ_P=+66.1%, men – Δ_P=+70.9% and women – Δ_P=+46.4%), and aging (all – Δ_A=+45.1%, men – Δ_A=+54.3 and women – Δ_A=+22.2), the reduction in risk of developing the disease (all – Δ_R=–165.6%, men – Δ_R=–170.9% and women – Δ_R=–141.0%) was overwhelming. Conclusions: This investigation was the first epidemiological study of dynamics of laryngeal cancer by component analysis in population of Kazakhstan. Implementation of the results of the study is recommended in management of anti–cancer activities for laryngeal cancer.

Keywords: Laryngeal cancer – incidence – gender groups – component analysis.

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Introduction

Even though cases of laryngeal cancer do not occur frequently, this disorder does not take the leading position in the structure of cancer pathology. However, it remains to be one of the unsolved problems of the medicine. According to the estimates of the International Agency of Cancer Research there are nearly 138,000 of new cases of laryngeal cancer registered annually in the world, and the standard incidence index equals to 1.9 per 100,000 of population (Ferlay et al., 2012). At the same time the increasing number of laryngeal cancer patients has been increasing in many countries in the last decades. Poor prognosis of the disease, despite the advances in diagnosis and treatment, causes a major medical and public health concern (Grant, 2012; Romanowicz et al., 2012; Vassileiou et al., 2012).

Epidemiological studies of laryngeal cancer conducted recently in Kazakhstan show that the dynamics of incidence indexes are decreasing. The higher incidence in men compared to women was evident in all age groups, the differences being statistically significant ($p<0.05$). At the same time revealed a unimodal growth with age, peaking at 70 years and older both sexes. In the dynamics, incidence rates of laryngeal cancer demonstrated a tendency to decrease, in women (T=–6.7%) this being more pronounced than in men (T=–3.3%) (Igissinov N et al., 2013a).

Patients of Kazakh (31.2%) and Russian (51.4%) ethnicity accounted for the vast majority (82.6%), with Russians predominating in both sexes, but particularly in females. Age peak in Kazakhs was 70 years and older (14.6±0.70/0000), and in Russians was 60–69 years (21.6±1.30/0000). In the dynamics, the rates had the tendency to decrease more markedly in Russian than Kazakh men, especially in the younger groups, while increase was noted in the youngest females of both ethnicities, but again greater in Russians, presumably reflecting change in underlying lifestyle factors (Igissinov et al., 2013b).

Though the component analysis particularly, the one taking into consideration gender characteristics, has never been conducted. Component analysis of the dynamics of malignant tumors in Kazakhstan has been performed generally in all localizations (Igissinov et al., 2012), with the cancer of the esophagus (Igissinov et al., 2013) and ovarian cancer (Kuanyshkalieva et al., 2016). malignant tumors of the CNS (Igissinov et al., 2015).

The study of the dynamics of malignant tumors is essential for planning and management of drug treatment for policy–makers. During this process difficult questions might occur. For example, to what extent the increase in

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incidence is associated with aging of the population, and to what extent – to an increased risk of developing the disease due to the emergence of new or intensification of existing epidemiological factors. Undoubtedly, identification and solution of such problems over the study period in this population are necessary, unless significant changes in registration and the quality of diagnosis could have occurred (Dvoyrin and Aksel, 1987).

Decline of incidence of the laryngeal cancer is the result of accumulation of elements of complex combinations of different component structures. Investigation of changes in the incidence of laryngeal cancer in dynamics represents scientific and practical interest, especially with the component analysis. Performance of such analysis for the study of individual components of the change in incidence, influencing its level, will allow oncology service management to identify the factors leading to the occurrence of laryngeal cancer, and to organize targeted cancer control.

The aim of the study was to perform component analysis of the dynamics of incidence of laryngeal cancer of the population of Kazakhstan from 1999 to 2014 taking into account their gender background.

Materials and Methods

The major source of the information on the incidence of the laryngeal cancer was primary data on registered patients with malignant tumors in the whole country. The data of the Committee of Statistics of the Ministry of National Economy of the Republic of Kazakhstan on the population was also used as the source of information (www.stat.gov.kz).

Retrospective study (1999–2014) Incidence rates were calculated according to generally accepted methods of health statistics (Merkov and Polyakov, 1974; Glanz, 1998; Tango, 2010) and are represented by 100,000 ($^0/_{0000}$) of the corresponding population.

The study was approved by the local ethical committee. The information may be shared for research purposes only if a requesting organization provides the data security and under takes all the necessary actions in making unable the identity of respondents, in concordance with the Principles of the World Medical Association (WMA) Declaration of Helsinki – Ethical Principles for Medical Research Involving Human Subjects, adopted by the 18th WMA General Assembly in Helsinki, Finland, in June 1964.

The dynamics of the laryngeal cancer in the population of Kazakhstan was studied based on the guidelines of Dvoyrin and Axel (1987). This method of analysis allows segmentation of growth of the number of the diseased belonging to the same population, but at different time periods. There are seven different components of growth of the number of patients. The first three components are related to the changes in population number, age structure of population, and the combined influence of these factors. The fourth component is determined only by the change of the risk index of the malignant laryngeal tumor and the other three components are related to the risk associated with the population growth, changes in its age structure and the resulting effect of all three factors. Many researchers understand the term «a disease risk» as the whole complex of reasons that can lead to increase, reduction or stabilization of morbidity indexes. Therefore, the increase of the disease risk corresponds to the last four components.

The component method used for analysis of the dynamics of the number of laryngeal cancer patients was performed on cases that occurred from 1999 to 2014 among the entire population, including male and female population, as the studied ethnic groups still take a leading position in both the number of the female population and among the laryngeal cancer patients. Mathematical calculations of the component analysis of the dynamics of morbidity of malignant laryngeal tumors in the population of Kazakhstan are presented in the relevant tables.

Mathematical calculations for component analysis of morbidity dynamics for malignant laryngeal tumor in population of Kazakhstan were produced using Microsoft Excel program and are presented in the relevant tables.

The following symbols and abbreviations were used in this article: P_{ij} – the incidence of laryngeal cancer at certain age in the *i*– th and in the *j*–th years, N_{ij} – population size at certain age in the *i*–th to *j*–th years, P_j and N_j – crude incidence rate and the total population size in the *j*–th year respectively, *j*=1 – the start year of observation , *j*=2 – the final year of observation, $\frac{N_{ij}}{N_j} = S_{ij}$ – the proportion of patients aged *i* in the total population size in the *j*–th year, ASP – the age structure of the population, SI – structural indexes, RP – risk of progressing, NLC – the number of laryngeal cancer cases, PN – population number, END – the expected number of diseased.

Results

Demographic change of the population is one of the most important epidemiological factors that influences the occurrence of cancers in the population, in particular laryngeal cancer. Thus, the number of total population of the country over the study period (1999–2014) increased from 14 955 106 (1999) up to 17 160 774 (2014), while the number of men and women increased.

The age structure of the population has changed over this period in the individual sex groups (Table 1). Thus, the proportion of people increased in general population for the 50–59 age group (+3.7%) and 70 years and older (+0.4%) years, men aged 40–49 (+0.1%), 50–59 (+3.6%), 70 years and older (+0.5%) and in women aged 50–59 (+3.8%) and 70 years and older (+1.4%).

The age type of the all population of Kazakhstan in 1999 was characterized as progressive, as the number of persons under 15 years of age (28.8%) was higher than in the group aged 50 and older (17.9%), and remained progressive by 2014. For men the age type of population was progressive, as in 1999, as in 2014. Age type for women was progressive in 1999 and changed towards stable in 2014 (Table 2).

The gender composition of the population over the study period has not undergone changes among the groups (Table 3). Thus, the proportion of males increased from 48.2 to 48.3% (by 0.1%), while the proportion of females – decreased by 0.1%, i.e., from 51.8% to 51.74%.

Table 1. Change in age Structure of the Population in Kazakhstan for 1999 to 2014 (%)

Age group	All			Male			Female		
	1999	2014	Change	1999	2014	Change	1999	2014	Change
< 30	54.0	51.5	–2.6	56.7	54.1	–2.6	51.5	49.0	–2.5
30–39	15.4	14.7	–0.7	15.7	15.0	–0.7	15.2	14.4	–0.8
40–49	12.6	12.6	–0.1	12.4	12.5	+0.1	12.8	12.6	–0.2
50–59	7.3	11.0	+3.7	6.8	10.4	+3.6	7.7	11.5	+3.8
60–69	6.4	5.7	–0.7	5.7	4.9	–0.8	7.1	6.5	–0.6
70+	4.2	4.6	+0.4	2.7	3.2	+0.5	5.7	5.9	+0.3
Total	100.0	100.0		100.0	100.0		100.0	100.0	

Table 2. Age Distribution of the Population of Kazakhstan for 1999 to 2014 (%)

Age group	All		Male		Female		Age type of the population (standard)		
	1999	2014	1999	2014	1999	2014	progressive	regressive	stable
<15	28.8	26.0	30.4	27.6	27.2	24.4	30	20	25
15–49	53.3	52.7	48.9	53.9	52.3	51.6	50	50	50
≥50	17.9	21.3	20.7	18.5	20.5	24.0	20	30	25

Table 3. Proportions of the Gender Groups in Kazakhstan in 1999 and 2014

Sex	Year		Change
	1999	2009	
Male	48.2%	48.3%	+0.1%
Female	51.8%	51.7%	–0.1%

Table 4. Component Analysis of Laryngeal Cancer Incidence Change in Kazakhstan

Age group (i)	ASP $S_{ij}=\frac{N_{ij}}{N_j}$		Growth of SI ($S_{i2}-S_{i1}$) (3)–(2)	Laryngeal cancer incidence, $^0/_{0000}$		Growth of incidence			
							Considering the changes		
	1999 (S_{i1})	2014 (S_{i2})		1999 (P_{i1})	2014 (P_{i2})	General ($P_{i2}-P_{i1}$)	ASP (4)×(5)	RP (2)×(7)	ASP and RP (4)×(7)
1	2	3	4	5	6	7	8	9	10
All									
<30	0.5402	0.5146	–0.0256	0.04	0.03	–0.003	–0.001	–0.002	0
30–39	0.1543	0.1468	–0.0075	0.48	0.44	–0.04	–0.004	–0.006	0
40–49	0.1262	0.1255	–0.0007	4.08	1.49	–2.59	–0.003	–0.327	0.002
50–59	0.0727	0.1096	0.0369	12.87	7.07	–5.80	0.475	–0.422	–0.214
60–69	0.0643	0.0574	–0.0069	22.68	17.67	–5.01	–0.156	–0.322	0.035
≥70	0.0423	0.0461	0.0038	18.99	11.26	–7.73	0.072	–0.327	–0.029
Total	$\sum S_{i1}=1.0$	$\sum S_{i2}=1.0$		$P_1=3.80$	$P_2=2.58$	–1.23	$\sum=\Delta_B=+0.38$	$\sum=\Delta_P=-1.41$	$\sum=\Delta_{BP}=-0.21$
Male									
<30	0.5673	0.5411	–0.0262	0.05	0.02	–0.03	–0.001	–0.015	0.001
30–39	0.1567	0.1496	–0.0071	0.89	0.56	–0.32	–0.006	–0.050	0.002
40–49	0.1242	0.1246	0.0004	7.04	2.52	–4.5	0.003	–0.562	–0.002
50–59	0.0679	0.1039	0.036	26.6	13.94	–12.7	0.959	–0.859	–0.456
60–69	0.0574	0.049	–0.0084	49.13	39.65	–9.5	–0.410	–0.544	0.079
≥70	0.0266	0.0318	0.0052	50.67	31.53	–19.1	0.263	–0.509	–0.099
Total	$\sum S_{i1}=1.0$	$\sum S_{i2}=1.0$		$P_1=7.01$	$P_2=4.80$	–2.21	$\sum=\Delta_B=+0.81$	$\sum=\Delta_P=-2.54$	$\sum=\Delta_{BP}=-0.48$
Female									
<30	0.515	0.4899	–0.0251	0.03	0.05	0.02	–0.001	0.011	–0.001
30–39	0.152	0.1442	–0.0078	0.08	0.31	0.23	–0.001	0.035	–0.002
40–49	0.1282	0.1263	–0.0018	1.41	0.54	–0.9	–0.003	–0.112	0.002
50–59	0.0773	0.115	0.0377	1.67	1.27	–0.4	0.063	–0.031	–0.015
60–69	0.0707	0.0652	–0.0055	2.74	2.25	–0.5	–0.015	–0.035	0.003
≥70	0.0568	0.0594	0.0026	5.22	1.14	–4.1	0.013	–0.232	–0.010
Total	$\sum S_{i1}=1.0$	$\sum S_{i2}=1.0$		$P_1=0.83$	$P_2=0.50$	–0.33	$\sum=\Delta_B=+0.06$	$\sum=\Delta_P=-0.36$	$\sum=\Delta_{BP}=-0.02$

These demographic characteristics of the population of Kazakhstan represent the mandatory minimum information which formed the basis for epidemiological studies of laryngeal cancer in the gender groups of the population. The demographic diversity of the population of Kazakhstan identified in this study is one of the important components of the demographic situation, which could have some impact on the incidence of malignant tumors, particularly laryngeal cancer.

The results of the component analysis of the dynamics in the number of laryngeal cancer patients in all, male and female population of Kazakhstan since 1999 to 2014 is presented in Tables 4 and 5.

The analysis of incidence of the laryngeal cancer in

Table 5. Component Analysis of the Dynamics of Laryngeal Cancer Incidence in Kazakhstan

Age group (i)	NLC (*nij*)		PN (*Nij*)		Incidence, $^0/_{0000}$				END in 2014 year
					Crude (*Pij*)		standardized ()		(P*ij*N*i*210^{-5})
	1999 (*j*=1)	2014 (*j*=2)	1999 (*j*=1)	2014 (*j*=2)	1999 (*j*=1)	2014 (*j*=2)	1999 (*j*=1)	2014 (*j*=2)	(6)×(5)×10^{-5}
1	2	3	4	5	6	7	8	9	10
All									
<30	3	3	8078765	8831354	0.04	0.03		0.018	3.28
30–39	11	11	2307181	2519444	0.48	0.44		0.067	12
40–49	77	32	1888024	2153827	4.08	1.49		0.188	87.8
50–59	140	133	1087780	1881066	12.87	7.07		0.514	242.1
60–69	218	174	961348	984718	22.68	17.67		1.136	223.3
≥70	120	89	632008	790365	18.99	11.26		0.476	150.1
Total	$_{n1}$=569	$_{n2}$=442	N_1=14945106	N_2=17160774	P_1=3.80	P_2=5.28	P_1^c 3.8	P_2^c 2.4	$E(_{n2})$=719
Growth	$\frac{n_1-n_2}{n_2}$ 100=–22.3		$\frac{N_1-N_2}{N_1}$ 100=+14.75		$\frac{P_1-P_2}{P_1}$ 100=–32.3		$\frac{P_1^c-P_2^c}{P_2^c}$ 100=–36.9		
Male									
<30	2	1	4086220	4482640	0.05	0.02		0.013	2.19
30–39	10	7	1128750	1239427	0.89	0.56		0.089	11
40–49	63	26	894552	1032625	7.04	2.52		0.313	72.7
50–59	130	120	488769	860760	26.6	13.94		0.946	228.9
60–69	203	161	413219	406101	49.13	39.65		2.274	199.5
≥70	97	83	191444	263262	50.67	31.53		0.838	133.4
Total	$_{n1}$=505	$_{n2}$=398	N_1=7202954	N_2=8284815	P_1=7.01	P_2=4.80	P_1^c 7.01	P_2^c 4.47	$E(_{n2})$=648
Growth	$\frac{n_1-n_2}{n_2}$ 100 = –21.2		$\frac{N_1-N_2}{N_1}$ 100 = +15.02		$\frac{P_1-P_2}{P_1}$ 100=–31.5		$\frac{P_1^c-P_2^c}{P_2^c}$ 100=–36.2		
Female									
<30	1	2	3992545	4348714	0.03	0.05		0.024	1.09
30–39	1	4	1178431	1280017	0.08	0.31		0.048	1.1
40–49	14	6	993472	1121202	1.41	0.54		0.069	15.8
50–59	10	13	599011	1020306	1.67	1.27		0.098	17
60–69	15	13	548129	578617	2.74	2.25		0.159	15.8
≥70	23	6	440564	527103	5.22	1.14		0.065	27.5
Total	$_{n1}$=64	$_{n2}$=44	N_1=7752152	N_2=8875959	P_1=0.83	P_2=0.50	P_1^c 0.83	P_2^c 0.46	$E(_{n2})$=78
Growth	$\frac{n_1-n_2}{n_2}$ 100=–31.3		$\frac{N_1-N_2}{N_1}$ 100=+14.50		$\frac{P_1-P_2}{P_1}$ 100=–40.0		$\frac{P_1^c-P_2^c}{P_2^c}$ 100=–44.1		

Table 6. Influencing Components on the Number of Cases of Laryngeal Cancer in Kazakhstan

Components of growth in the number of cases due to:	All			Male			Female		
	AN	% growth		AN	% growth		AN	% growth	
		κ (*n2–n1*)	κ *n1*		κ (*n2–n1*)	κ *n1*		κ (*n2–n1*)	κ *n1*
1. Growth PN $\Delta_P = \frac{N_1-N_2}{N_1} n_1$	84	66.1	14.7	76	70.9	15	9	46.4	14.5
2. Changes ASP $\Delta_A = \frac{N_1}{N_2} (E(n_2)-$	57	45.1	10.1	58	54.3	11.5	4	22.2	6.9
3. Combined effect of changes in PN and ASP $\Delta_{PA} = \frac{N_2-N_1}{N_1} \Delta_A$	8	6.6	1.5	9	8.2	1.7	1	3.2	1
		∑=+117.8	∑=+26.3		∑=+133.4	∑=+28.3		∑=+71.8	∑=+22.4
4. Change of RP $\Delta_R = N_1 (P_2^c - P_1^c) \times 10$	–210	–165.5	–36.9	–183	–170.9	–36.2	–28	–141.0	–44.1
5. Combined effect of changes of RP and PN $\Delta_{RA} = \frac{N_2-N_1}{N_1} \Delta_R$	–31	–24.4	–5.4	–27	–25.7	–5.4	–4	–20.4	–6.4
6. Combined effect of changes of RP and ASP $\Delta_{RA} = \frac{N_2-N_1}{N_1} \Delta_R$	–31	–24.3	–5.4	–34	–32.0	–6.8	–2	–9.0	–2.8
7. Combined effect of the changes RP. PN and ASP $\Delta_{PAR} = \frac{N_1}{N_2} \left(n_2 - n_1 - \sum_{x=1}^{5} \right)$	–5	–3.6	–0.8	–5	–4.8	–1.0	0	–1.3	–0.4
		∑=–217.8	∑=–48.6		∑=–233.4	∑=–49.5		∑=–171.8	∑=–53.7
Total	∑=–127	∑=–100.0	∑=–22.3	∑=–107	∑=+100.0	∑=–21.2	∑=–20	∑=+100.0	∑=–31.3

dynamics showed the reduction of indexes, with the total decline in 2014 compared to 1999 caused by the changes in the age structure of the population. The disease risk and the combined influence of the age structure and the disease risk. At the same time, for all, male and female population, these changes caused by changes associated by the risk of illness ($\sum=\Delta_P=-1.41$, $\sum=\Delta_P=-2.54$ and $\sum=\Delta_P=-0.36$ respectively, Table 4).

It can be concluded from the researches that in general the dynamics of the number of patients with laryngeal cancer for the entire population of Kazakhstan can be caused by the following factors (Table 6).

1. Growth population number $\Delta_P=+66.1\%$ (Male – $\Delta_P=+70.9$. Female – $\Delta_P=-46.4\%$);
2. Changes in the Age Structure of the population $\Delta_A=+45.1\%$ (Male – $\Delta_A=+54.3\%$. Female – $\Delta_A=+22.2\%$).
3. Combined effect of changes in population number and its age structure $\Delta_{PA}=+6.6\%$ (Male – $\Delta_{PA}=+8.2\%$. Female – $\Delta_{PA}=+3.2\%$).
4. Change of illness risk $\Delta_R=-165.5\%$ (Male – $\Delta_R=-170.9\%$. Female – $\Delta_R=-141.0\%$).
5. Combined effect of changes in the disease risk and population number $\Delta_{PR}=-24.4\%$ (Male – $\Delta_{PR}=-25.7\%$. Female – $\Delta_{PR}=-20.4\%$).
6. Combined effect of changes in the disease risk and age structure of the population $\Delta_{AR}=-24.3\%$ (Male – $\Delta_{AR}=-32.0\%$. Female – $\Delta_{AR}=-9.0\%$).
7. Combined effect of the changes in the disease risk of the population and its age structure $\Delta_{PAR}=-3.6\%$ (Male – $\Delta_{PAR}=-4.8\%$. Female – $\Delta_{PAR}=-1.3\%$).

The total decrease in the absolute number of patients overall (all sexes) equals the sum of components: $_{n2-n1}=+84+57+8-210-31-31-5=-127$ or -22.3% in comparison with the primary number of patients ($-127\div569\times100=22.3\%$). At the same time. the components of the reduction in the percentage at the primary level are equal for the whole population:

$$\underbrace{+14.7\%+10.1\%+1.5\%}_{+26.3\%}\underbrace{-36.9\%-5.4\%-5.4\%-0.8\%}_{-48.6\%}=-22.3\%$$

The overall decrease for male population equals to: $_{n2-n1}=+76+58+9-183-27-34-5=-107$ or -21.2% compared to 1999 ($-107\div505\times100=-21.2\%$). the components were:

$$\underbrace{+15.0\%+11.5\%+1.7\%}_{+28.3\%}\underbrace{-36.2\%-5.4\%-6.8\%-1.0\%}_{-49.5\%}=-21.2\%$$

The overall decrease for female population equals to: $_{n2-n1}=+9+4+1-28-4-2+0=-20$ or -31.3% compared to the original number of patients ($-20\div64\times100=-31.3\%$). According to that. the components of growth in percent of the initial level were equal to:

$$\underbrace{+14.5\%\ +6.9\%+1.0\%}_{=-31.3\%}\underbrace{-44.1\%-6.4\%-2.8\%-0.4\%}$$

Discussion

Thus, the laryngeal cancer in Kazakhstan is characterized by the decrease in the number of patients due to the changes in total number and the structure of the population (for the entire population +26.3% of the total decreasing of –22.3%; for male population +28.3 of the total decreasing –21.2% and for female population +22.4% of the total growth of –31.3%). The actual decreasing of the laryngeal cancer cases is significant and is equal to –36.9% for the whole population. –36.2% for men and –44.1% for women.

The components are grouped into 3 classes. one of which represents different kinds of changes in the population ($\Delta_P+\Delta_A+\Delta_{PA}$). the second one shows only the growth of infection risk (Δ_R) and the third – the relationship between these factors ($\Delta_{PR}+\Delta_{AR}+\Delta_{PAR}$). Therefore. to characterize the cumulative effect of changes in population or the disease risk the components of the 1st and 2nd class the effect of influence of the 3rd class components should be added:

1. $(\Delta_P+\Delta_A+\Delta_{PA})+(\Delta_{PR}+\Delta_{AR}+\Delta_{PAR})$
2. $\Delta_R+(\Delta_{PR}+\Delta_{AR}+\Delta_{PAR})$

If the overall decrease in the number of laryngeal cancer patients for the population (–127) is taken as 100%. the decrease associated with the illness risk is –217.8% [(–36.9–5.4–5.4–0.8)÷22.3×100] and with «pure» risk growth it equals to –165.5%. For men the reducing number of the disease risk (107=100%) will be –233.4% [(–36.2–5.4–6.8–1.0)÷21.2×100]. and with «pure» increased risk of –170.9%. respectively. and for women (–20 =100%) the reduce of laryngeal cancer risk will be –171.8% [(–44.1–6.4–2.8–0.4)÷31.3×100]. and with «pure» decreased risk –141.0%.

Thus, the number of patients with laryngeal cancer in Kazakhstan is steadily decreasing, while the worldwide epidemiological observations define such patterns, according to which the population growth and in its age structure changing, must increase the number of patients with malignant tumors, in particular cancer of the larynx. Carrying out this component analysis, we confirmed the growth of patients number due to demographic factors (change in the population number and the population age structure, and their combined action), but this growth is absorbed by sharply reduced risk of ill.

Discovered changes may possibly be associated with the account and registration of patients, reduction of risk factors (smoking and alcohol) exposure, this requires further study.

The results of the component analysis of the dynamics of laryngeal cancer cases in Kazakhstan are recommended to use when planning anti–cancer activities of laryngeal cancer.

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