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Evaluation of Lung Cancer Incidence Dynamics in Kyrgyzstan

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Abstract

BACKGROUND: In 2020, more than half of all cases (59.6%) of lung cancer of both sexes and 61.9% of lung cancer deaths were registered in Asia. In Kyrgyzstan, lung cancer is the second most common cancer after stomach cancer (11.2% of all diagnosed malignancies).

AIM: The study is to conduct a component analysis of the dynamics of the incidence of lung cancer (LC) in Kyrgyzstan.

METHODS: Primary data were for registered patients with LC (ICD 10–C34) in the whole country during the period of 2010–2019. Evaluation of changes in LC incidence in the population of Kyrgyzstan was performed using component analysis according to the methodological recommendations.

RESULTS: The study period, 4931 new cases of LC were recorded. During the studied years, an average age of patients with lung cancer was 61.4 years (95%CI = 60.9–61.9). Age-related indicators of the incidence of LC had a peak in 65+ years in both sexes ($84.9 \pm 3.2^{\circ}/_{0000}$), male ($159.5 \pm 6.4^{\circ}/_{0000}$) and female ($35.5 \pm 2.2^{\circ}/_{0000}$) population. Trends in the ASIR of LC in the entire population tended to decrease in all age groups. The incidence rate decreased from $8.0^{\circ}/_{0000}$ (2010) to $7.2^{\circ}/_{0000}$ in 2019 and the overall decline was $-0.8^{\circ}/_{0000}$, including due to the age structure – $\sum\Delta_A = +1.2^{0}/_{0000}$, due to the risk of acquiring illness – $\sum\Delta_R = -1.8^{\circ}/_{0000}$ and their combined effect – $\sum\Delta_{AR} = -0.2^{\circ}/_{0000}$. The component analysis revealed that the increase in the number of patients with LC was mainly due to the growth of the population ($\Delta_P = +17.9\%$) and changes in its age structure ($\Delta_A = +15.4\%$).

CONCLUSION: In the Republic of Kyrgyzstan, the incidence of lung cancer is decreasing. According to the component analysis, in general, the increase in the number of patients was due to demographic factors, while the decrease in morbidity was influenced by a decrease in the risk of acquiring illness. The implementation of the results of this study is recommended in the management of anticancer measures for lung cancer.

Introduction

Lung cancer is considered a serious health problem worldwide for both men and women and is the leading cause of death from cancer. Lung cancer is the most common diagnosed type of cancer worldwide. According to recent WHO data, about 2.2 million new cases of lung cancer are diagnosed annually, which is 11.4% in the structure of oncological diseases [1]. In 2020, more than half of all cases (59.6%) of lung cancer of both sexes and 61.9% of lung cancer deaths were registered in Asia. In Kyrgyzstan, lung cancer is the second most common cancer after stomach cancer (11.2% of all diagnosed malignancies).

In general, the incidence of lung cancer has been decreasing slightly in the world over the past decades, which is a combination of a noticeable decrease among men and an increase among women [2], [3]. An increase in tobacco consumption by women will lead to a further increase in the incidence and mortality from lung cancer in women [4]. Lung cancer with an overall 5-year survival rate of 20.5% is a prognostically poor disease [5]. However, lung cancer at an early stage has a better prognosis and is better treatable.

Geographical and temporal features of lung cancer incidence at the population level are largely determined by tobacco consumption, which is the main etiological factor of lung carcinogenesis [6]. Smoking is the cause of about 90% of all lung cancer cases [7]. Furthermore, passive smoking increases the risk of developing lung cancer by as much as 26% [8]. Older age is also a risk factor for lung cancer. The average age of diagnosis of lung cancer is 70 years [9]. Other factors, such as genetic predisposition [10], [11], poor nutrition [12], use of drugs [13], education level [14], occupational exposure, and air pollution [15], [16], may act independently or in conjunction with tobacco smoking in the formation of lung cancer [17], [18].

Most cases of lung cancer are diagnosed in individuals with symptoms, the most common symptoms of which are cough, fatigue, shortness of breath, chest pain, weight loss, and hemoptysis. Diagnosis of lung cancer in the early stages is closely related to improving survival and, therefore, requires improved examination of patients at high risk, even with non-specific symptoms [19].

Lung cancer screening studies are in the development stage. New techniques, including computer detection and deep learning, have proven useful in identifying smokers at high risk for lung cancer screening using low-dose tomography [20], [21]. Low-dose computed tomography has high sensitivity and acceptable specificity for detecting lung cancer. Screening of high-risk smokers with chest computed tomography reduced lung cancer mortality by 20% in NLST (National Lung Screening Study) [22] and by 24% in male participants in the NELSON study (Nederlands-Leuvens Longkanker Screenings Onderzoek) [23]. However, this screening includes false-positive results leading to unnecessary tests and invasive procedures, overdiagnosis, radiation-induced cancer, accidental findings, and increased distress or anxiety [24]. There are many unresolved issues regarding the implementation of screening, and many studies have focused on solving the problems of cost-effectiveness, screening intervals, selection criteria, participation indicators, optimal diagnostic work and harm minimization, as well as the inclusion of effective smoking cessation [25].

The last study that was conducted to study the incidence of lung cancer in Kyrgyzstan was published in 2002, which examined the incidence of lung cancer in general in selected mountain regions for 1986–1990 [26]. This underlines the relevance of this study. The purpose of this study is to study new trends in the incidence of lung cancer in Kyrgyzstan.

Materials and Methods

Cancer registration and patient recruitment

The population of Kyrgyz Republic as the 2019 census was 6.5 million [27], while the dynamics of the population increased by 15.2% compared to 2010. The cancer registry of the population of Kyrgyzstan covers seven regions and cities of national significance – Osh and Bishkek. New cases of lung cancer were extracted from the accounting and reporting forms of the Ministry of Health of Kyrgyz Republic – Form 7 and Form 35, which were formed from the register of oncological diseases based on the administrative-territorial division of the republic for 15 years (from 2010 to 2019) using the International Disease Code 10, code C34.

Population denominators

Population denominators for calculation of incidence rates were provided by the National Statistical Committee of the Kyrgyz Republic for 2010–2019. At the same time, data on the number of whole populations of the republic, taking into account the studied regions, are used, all data are presented on the official website [28].

Statistical analysis

The main method used in the study of incidence was a retrospective study using descriptive and analytical methods of modern epidemiology. Age-standardized incidence rates (ASRs) were calculated for nine different age groups (0–30, 30–34,…, 60–64, and 65+) and 10 calendar periods from 2010 to 2019 (1-year intervals). ASRs standardized to the world population proposed by the World Health Organization [29] with recommendations from the National Cancer Institute (2013) were estimated for each studied year [30].

The extensive, crude, and age-specific (ASIR) incidence rates are determined according to the generally accepted methodology used in modern sanitary statistics. The annual averages (M, P), mean error (m), Student’s criterion, 95% confidence interval (95% CI), and average annual upward/downward rates (T%) were calculated. We did not justify the main calculation formulas in this paper, since they are detailed in the methodological recommendations and textbooks on medical and biological statistics [31], [32], [33].

The dynamics of incidence rates was studied for 10 years, while the trends of incidence were determined by the least squares method. To calculate the average annual growth rate and/or growth rate of the dynamic series, the geometric mean equal to the root of the power of n from the product of the annual growth rate indicators was used.

The dynamics of the incidence of LC was studied using a component analysis according to the methodological recommendations [34]. The method of component analysis was used in this study to break down the growth of number of cases belonging to the same population, but in different time periods.

There are seven components of the increase in the number of cases. The first three components are related to changes in the population number, its age structure, and the combined influence of these factors. The true increase in the number of patients with oncological pathology is due only to a change in the risk indicator of morbidity and is represented by the 4th component. The following three components are associated with the risk of developing a malignant neoplasm, with the growth of the population, changes in its age structure, and the influence of all three factors. Thus, the last four components are associated with an increase in the risk of developing the disease. The "risk of acquiring illness" refers to the whole range of reasons that can lead to an increase, decrease, or stabilization of morbidity rates.

The method of components was applied to study the dynamics of the number of LC patients and has been performed on cases that occurred from 2010 to 2019 among the entire population of the country. Assessments of the component analysis of the dynamics of morbidity of LC in the population of Kyrgyzstan are presented in the relevant tables.

Viewing and processing of the received materials were carried out using the Microsoft 365 software package (Excel, Word, PowerPoint), in addition, online statistical calculators were used [35], where Student's criterion was calculated when comparing the average values.

The following symbols and abbreviations were used in this article: AN – absolute number; ASIR – age specific incidence rate; ASP (Δ_A) – the age structure of the population; ASR – age-standardized rate; END – the expected number of diseases; NCLC – the number of LC cases; PN (Δ_P) – population number; RAI (Δ_R) – risk of acquiring illness; R^2 – the value of the approximation confidence; SIs – structural indexes; P – the incidence of LC; and $^0/_{0000}$ – prosantimille, designation per 100,000.

Ethics approval

Because this study involved the analysis of publicly available administrative data and did not involve contacting individuals, consideration and approval by an ethics review board were not required. At the same time, the submitted data are in accordance with the Law of Kyrgyz Republic No. 82 – July 8, 2019, "On official statistics" [Law of the Kyrgyz republic of July 8, 2019], the information in the summary report is confidential and can only be used for statistical purposes in accordance with the Principles of the World Medical Association [WMA Declaration of Helsinki, 2013].

Results

During the study period, 4931 new cases of LC were registered in the country (3724 [75.5%] – in men, and 1207 [24.5%] – in women). The greatest proportion of patients (both sexes) falls on the age of 65+ years (Table 1). The average age of patients with lung cancer in dynamics increased slightly from 60.3 ± 0.5 years (95%CI = 59.3–61.3) in 2010 to 61.9 ± 0.4 years (95%CI = 61.2–62.7) (2019), and average annual rate of growth made T = +0.04. The average age of the patients was 61.4 ± 0.3 years (95%CI = 60.9–61.9). At the same time, the average age had a different trend in men and women. In male patients, the average age was 61.5 ± 0.4 years (95%CI = 60.8–62.2) and tended to increase (T = +0.5%). The average age of women was 60.9 ± 0.3 years (95%CI = 60.3–61.5) and generally decreased during the study period (T = −0.1%) (Table 1).

Age-related indicators of the incidence of LC had a peak in 65+ years in both sexes (84.9 ± 3.2$^0/_{0000}$), male (159.5 ± 6.4$^0/_{0000}$) and female (35.5 ± 2.2$^0/_{0000}$) population (Figure 1). Trends in the ASIR of LC in the entire population tended to decrease in all age groups. Trends of ASIR in the male population increased only in 65+ years (T = +0.4%). In the female population, the age indicators grown in 35–39 years (T = +6.6%), 40–44 years (T = +7.6%), 45–49 years (T = +8.3%), and 55–59 years (T = +1.8%). It should be noted that the value of the accuracy of the approximation of the listed increases is not significant (Table 1).

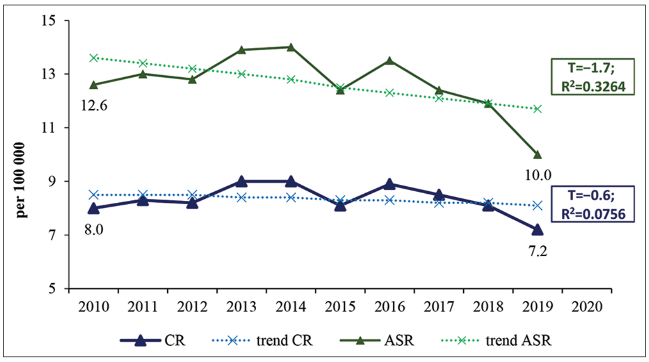

Figure 1: Dynamics of crude and age-standardized incidence rates (both sexes) of lung cancer in Kyrgyzstan, 2010–2019

Table 1: Lung cancer incidence in Kyrgyzstan, 2010-2019

Age	All				Male				Female			
	Number (%)	Incidence			Number (%)	Incidence			Number (%)	Incidence		
		per 100,000	T, %	R^2		per 100,000	T, %	R^2		per 100,000	T, %	R^2
<30	42 (0.9)	0.1 ± 0.0	−10.5	0.5541	28 (0.8)	0.2 ± 0.0	−14.4	0.3589	14 (1.2)	0.1 ± 0.0	−4.0	0.0056
30–34	22 (0.4)	0.5 ± 0.1	−3.8	0.0357	11 (0.3)	0.5 ± 0.1	−9.1	0.1540	13 (1.1)	0.6 ± 0.2	−8.2	0.0400
35–39	74 (1.5)	2.0 ± 0.2	−4.1	0.1439	49 (1.3)	2.7 ± 0.4	−9.6	0.3516	25 (2.1)	1.3 ± 0.2	+6.6	0.1141
40–44	91 (1.8)	2.7 ± 0.4	−6.9	0.2916	57 (1.5)	3.5 ± 0.8	−18.6	0.5723	35 (2.9)	2.0 ± 0.4	+7.6	0.1339
45–49	248 (5.0)	8.0 ± 0.6	−4.3	0.2966	187 (5.0)	12.5 ± 1.3	−8.4	0.6332	61 (5.1)	3.8 ± 0.6	+8.3	0.2636
50–54	502 (10.2)	17.6 ± 1.0	−3.7	0.4395	375 (10.1)	27.6 ± 1.9	−4.1	0.3579	126 (10.4)	8.4 ± 0.5	−2.0	0.1091
55–59	807 (16.4)	35.9 ± 2.3	−4.8	0.6099	638 (17.1)	60.8 ± 5.3	−6.5	0.5784	168 (13.9)	13.7 ± 1.0	+1.8	0.0600
60–64	917 (18.6)	58.8 ± 2.6	−2.1	0.2322	716 (19.2)	102.0 ± 4.5	−2.1	0.2469	204 (16.9)	23.9 ± 1.7	−2.8	0.1575
65+	2228 (45.2)	84.9 ± 3.2	−0.1	0.0010	1663 (44.7)	159.5 ± 6.4	+0.4	0.0121	561 (46.5)	35.5 ± 2.2	−1.1	0.0323
CR	4931 (100.0)	8.3 ± 0.2	−0.6	0.0756	3724 (100.0)	12.7 ± 0.3	−1.1	0.1820	1207 (100.0)	4.0 ± 0.2	+1.0	0.0881
ASR	–	12.7 ± 0.4	−1.7	0.3264	–	22.5 ± 0.7	−1.8	0.3116	–	5.4 ± 0.2	−0.5	0.0194
Average age	–	61.4 ± 0.3	+0.4	0.7199	–	61.5 ± 0.4	+0.5	0.8390	–	60.9 ± 0.3	−0.1	0.0747

T – Average annual upward/downward rates. R^2 – the value of the approximation confidence. CR: Crude rate.

Trends in age indicators generally affected the overall incidence rates, so the crude rate of LC incidence in the total population of the country lessened from $8.0^{0}/_{0000}$ (2010) to $7.2^{0}/_{0000}$ in 2019 (p = 0.110) (Figure 2), the total decline was $-0.8^{0}/_{0000}$ and depended on changes in the age structure of the population ($\sum\Delta_A = +1.2^{0}/_{0000}$), the risk of acquiring illness ($\sum\Delta_R = -1.8^{0}/_{0000}$), and the combined influence of the age structure and the risk of acquiring illness ($\sum\Delta_{AR} = -0.2^{0}/_{0000}$) (Table 2). At the same time, the average annual growth rate of the aligned indicator was T=−0.6%, and the approximation confidence value was low (R^2 = 0.0756).

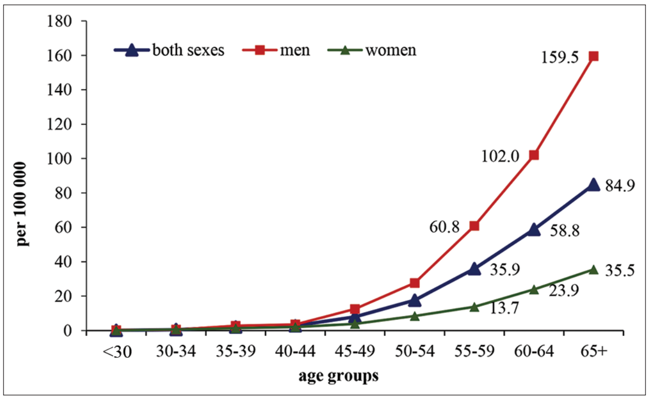

Figure 2: Age-specific incidence rate of lung cancer in Kyrgyzstan, 2010–2019

In the male population of the republic, the crude incidence rates also decreased from $11.9^{0}/_{0000}$ (2010) to $10.5^{0}/_{0000}$ in 2019 (p = 0.129). The overall drop ($-1.4^{0}/_{0000}$) depended on changes in the age structure of the population ($\sum\Delta_A = +1.9^{0}/_{0000}$) and the risk of acquiring illness ($\sum\Delta_R = -3.0^{0}/_{0000}$), and their combined effect was not pronounced ($\sum\Delta_{RA} = -0.3^{0}/_{0000}$) (Table 2). The average annual growth rate was T = −1.1% and the approximation value is R^2 = 0.1820 (Table 1).

In the female population of the country, the overall decrease ($-0.1^{0}/_{0000}$) in crude incidence rates from $4.1^{0}/_{0000}$ (2010) to $4.0^{0}/_{0000}$ (2019) (p = 0.842) depended on changes in the age structure of the population ($\sum\Delta_A = +0.6^{0}/_{0000}$), the risk of acquiring illness ($\sum\Delta_R = -0.6^{0}/_{0000}$), and the combined effect of the age structure and the risk of acquiring illness ($\sum\Delta_{RA} = -0.2^{0}/_{0000}$) (T=+1.0; R^2 = 0.0881) (Tables 1 and 2).

Age-standardized incidence rate for the country was 12.7 ± 0.4 per 100,000 population (T = −1.7%; R^2 = 0.3264). The standardized incidence rate for the study period in the male population was 22.5 ± 0.7 per 100,000 (T = −1.8%; R^2 = 0.3116), while this indicator in the female population was 4 times less and amounted to 5.4 ± 0.2 per 100,000 (T = −0.5%; R^2 = 0.0194).

Further, we will consider the results of a component analysis of the dynamics of the number of patients with LC in the whole population, in men and women (Table 3). The results of the study show that the reduction in the number of patients with LC in the republic was associated with the influence of the following factors:

1. Growth of population number Δ_P=+269.3% (Male – Δ_P=+426.6%; Female – Δ_P=+131.2%).
2. Changes in the age structure of the population Δ_A=+232.8% (Male – Δ_A=+370.7%; Female – Δ_A=+118.4%).
3. Combined effect of changes in population number and its age structure Δ_{PA}=+41.6% (Male – Δ_{PA}=+68.5%; Female – Δ_{PA}=+20.4%).
4. Change in the risk of acquiring illness Δ_R=−336.4% (Male – Δ_R=−586.7%; Female – Δ_R=−110.5%).
5. Combined effect of changes in the risk of acquiring illness and population number Δ_{PR}=−60.1% (Male – Δ_{PR}=−108.5%; Female – Δ_{PR}=−19.1%).
6. Combined effect of changes in the risk of acquiring illness and age structure of the population Δ_{RA}=−40.0% (Male – Δ_{RA}=−59.6%; Female – Δ_{RA}=−34.5%).
7. Combined effect of the changes in the risk of acquiring illness, population number, and its age structure Δ_{RAP}=−7.1% (Male – Δ_{RAP}=−11.0%; Female – Δ_{RAP}=−6.0%).

Table 2: Component analysis of the lung cancer incidence growth in Kyrgyzstan, 2010–2019

Age group (*i*)	ASP ($Sij = \frac{Nij}{Nj}$)		Growth (S_{i2}–S_{i1}) (3)–(2)	Incidence		Incidence growth			
	2010 (S_{i1})	2019 (S_{i2})		2010 (P_{i1})	2019 (P_{i2})	General (P_{i2}–P_{i1}) (6)–(5)	Including due to changes of Δ_A (4)×(5)	Δ_R (2)×(7)	Δ_{RA} (4)×(7)
1	2	3	4	5	6	7	8	9	10
Both sexes									
<30	0.6049	0.5758	−0.0291	0.3	0.0	+0.0	−0.008	−0.148	+0.007
30–34	0.0706	0.0851	+0.0145	0.3	0.0	−1.1	+0.004	−0.018	−0.004
35–39	0.0630	0.0657	+0.0026	2.0	1.7	−1.7	+0.005	−0.024	−0.001
40–44	0.0591	0.0548	−0.0042	2.8	2.5	−2.5	−0.012	−0.014	+0.001
45–49	0.0559	0.0500	−0.0059	8.8	6.8	−3.3	−0.052	−0.112	+0.012
50–54	0.0482	0.0458	−0.0023	19.0	12.8	−13.6	−0.044	−0.294	+0.014
55–59	0.0326	0.0430	+0.0104	42.6	25.9	−14.3	+0.444	−0.542	−0.173
60–64	0.0222	0.0319	+0.0098	57.7	56.7	−17.4	+0.564	−0.021	−0.009
65+	0.0437	0.0479	+0.0042	78.6	64.7	−2.6	+0.332	−0.608	−0.059
Total	$\sum S_{i1}$ = 1.0	$\sum S_{i2}$ = 1.0		P_1 = 8.0	P_2 = 7.2	−0.8	$\sum\Delta_A$ = +1.2	$\sum\Delta_R$ = −1.8	$\sum\Delta_{RA}$ = −0.2
Male*									
Total	$\sum S_{i1}$ = 1.0	$\sum S_{i2}$ = 1.0		P_1 = 11.9	P_2 = 10.5	−1.4	$\sum\Delta_A$ = +1.9	$\sum\Delta_R$ = −3.0	$\sum\Delta_{RA}$ = −0.3
Female*									
Total	$\sum S_{i1}$ = 1.0	$\sum S_{i2}$ = 1.0		P_1 = 4.1	P_2 = 4.0	−0.1	$\sum\Delta_A$ = +0.6	$\sum\Delta_R$ = −0.6	$\sum\Delta_{RA}$ = −0.2

ASP: Age structure of the population. Δ_A: The age structure of the population. Δ_R: Risk of acquiring illness. Δ_{RA}: Risk of acquiring illness and age structure of the population. *The calculations were made in the same way as for the entire population.

Table 3: Influencing components on the number of cases of lung cancer in Kyrgyzstan

Components of growth in the number of cases due to:	Both sexes			Male			Female		
	AN	%, growth		AN	%, growth		AN	%, growth	
		to (n_2-n_1)	to n_1		to (n_2-n_1)	to n_1		to (n_2-n_1)	to n_1
1. Growth PN. $\Delta P = \frac{N_1 - N_2}{N_1} n_1$	+78	+269.3	+17.9	+60	+426.6	+18.5	+20	+131.2	+17.3
2. Changes ASP. $\Delta A = \frac{N_1}{N_2}(E(n_2) - n_2 - \Delta H$	+68	+232.8	+15.4	+52	+370.7	+16.1	+18	+118.4	+15.6
3. Combined effect of changes in PN+ASP. $\Delta PA = \frac{N_2 - N_1}{N_1} \Delta A$	+12	+41.6	+2.8	+10	+68.5	+3.0	+3	+20.4	+2.7
	$\sum_{1\text{-}3}$ = +543.7$\sum 1_{-3}$ = +36.1			$\sum_{1\text{-}3}$ = +865.9$\sum 1_{-3}$ = +37.5			$\sum_{1\text{-}3}$ = +270.1$\sum 1_{-3}$ = +35.5		
4. Change of RAI. $\Delta R = N_1 \left(P_2^c - P_1^c \right) \times 10^{-5}$	−98	−336.4	−22.3	−82	−586.7	−25.4	−17	−110.5	−14.5
5. Combined effect of changes of RAI+PN. $\Delta RP = \frac{N_2 - N_1}{N_1} \Delta R$	−17	−60.1	−4.0	−15	−108.5	−4.7	−3	−19.1	−2.5
6. Combined effect of changes of RAI+ASP. $\Delta RA = \frac{N_2 - N_1}{N_1} \Delta R$	−12	−40.0	−2.7	−8	−59.6	−2.6	−5	−34.5	−4.5
7. Combined effect of the changes RAI+PN+ASP. $\Delta RAP = \frac{N_1}{N_2} \left(n_2 - n_1 - \sum_{x=1}^{5} \right)$	−2	−7.1	−0.5	−2	−11.0	−0.5	−1	−6.0	−0.8
	$\sum_{4\text{-}7}$ = −443.7$\sum 4_{-7}$ = −29.4			$\sum_{4\text{-}7}$ = −765.9$\sum 4_{-7}$ = −33.2			$\sum_{4\text{-}7}$ = −170.1$\sum 4_{-7}$ = −22.4		
Total$\sum 1_{-7}$	29	100.0	+6.6	14	100.0	+4.3	15	100.0	+13.2

AN – Absolute number. PN – Population number. ASP – Age structure of the population. RAI – Risk of acquiring illness.

The total increase in the absolute number of patients as a whole (both sexes) is equal to the sum of the components. The number of patients was increased by +6.6% compared to the primary number of patients. Thus, LC (both sexes) is characterized by an increase in the number of cases because of the changes in the total population size and its structure (36.1% of the total increase of 6.6%). The change in the number of cases was most affected by the risk of acquiring illness component Δ_R=−22.3%.

Discussion

Over the past 10 years, the incidence of lung cancer in the country has been decreasing. Today, Kyrgyzstan belongs to the countries with an average incidence rate. Apparently, the reduction in the incidence of lung cancer was influenced by the ban on smoking in public places, the conduct of anti-tobacco advertising campaigns to minimize tobacco consumption. Considering that the smoking behavior of fathers makes a significant contribution to the decision of adolescents to smoke or not [36], [37], [38] and the spread of tobacco outlets near schools [39] gives us reason to worry that in the future the number of smokers will increase and, as a result, the incidence of lung cancer among Kyrgyzstan residents will increase. But at the same time, according to the morbidity of the male population, it still belongs to countries with a high incidence rate. Tobacco smoking is undoubtedly the most important and common risk factor for lung cancer in men. As we found out, the female population suffers from lung cancer 4 times less than the male population of Kyrgyzstan. Most likely, this is due to the fact that the prevalence of tobacco use among men is 52.5%, while for women, this figure is approximately 3.4% [40]. However, during the study period, the crude incidence rate in the female population tended to increase, the same phenomenon was found in China [41]. As in the USA [4] and in China [41], if we compare the rates of standardized indicators in Kyrgyzstan, we see that the decline in morbidity is faster in men than in women. We found a significant increase in the incidence of lung cancer among women in the 35–49 age group. It is unclear whether women are more susceptible to the carcinogenic effects of tobacco; smokers tend to be younger when they are diagnosed with lung cancer, and non-smoking women are diagnosed with lung cancer more often than non-smoking men [4], [42]. Women may be more susceptible to the influence of hormonal, environmental, and molecular factors [4], [43], [44]. In addition, a study conducted among young Swedish women was aimed at describing the epidemiological picture of lung cancer and identifying risk factors: it determined that giving up tobacco smoke is the most effective preventive measure against lung cancer [45].

In the Republic, the largest proportion of patients and the highest incidence rates were found in the 65+ age group. As in the whole world, the largest proportion of lung cancer cases is the age group over forty, since smokers aged 20, 30, and 40, after reaching the peak of tobacco consumption, later make up a huge group of those who get sick and die from lung cancer at the age of 40, 50, and 60 [46], [47], [48]. Without a doubt, the most effective form of intervention aimed at ending the epidemic of lung cancer in both women and men is to reduce smoking rates. To combat the prevalence of lung cancer, it is necessary to take measures such as tobacco use prevention programs, promotion of smoking cessation, and, of course, earlier detection. It is estimated that screening people aged 50–55 to 80 years with smoking for 20 pack-years or more will bring more benefits, and there are fewer differences in the acceptability of screening by gender and race/ethnicity. That is, the introduction of screening, compared with the absence of screening, can increase the number of prevented deaths from lung cancer and increase the number of years of life with optimal targeting and implementation [49].

The limitation of our study was that currently population cancer registries in Kyrgyzstan are not well organized throughout the country, and epidemiological data on cancer are limited at the regional level. The study of the incidence of lung cancer at the histological level, taking into account socioeconomic status, ethnic characteristics, and especially tobacco history, is a priority of our future research. The advantage of this study is that over the past decade, it is the first retrospective study of lung cancer incidence in Kyrgyzstan.

Conclusion

In the Republic of Kyrgyzstan, the incidence of lung cancer is decreasing. According to the component analysis, in general, the increase in the number of patients was due to demographic factors, while the decrease in morbidity was influenced by a decrease in the risk of acquiring illness. The implementation of the results of this study is recommended in the management of anticancer measures for lung cancer.

Authors' Contribution Statement

AB, ZT, ES, and GN – Collection and preparation of data, primary processing of the material and their verification.

AB, NI, and ZT – Statistical processing and analysis of the material, writing the text of the article (material and methods, results).

AB, ES, SA, and GN – Writing the text of the article (introduction and discussion).

AB, NI, and SA – Concept, design and control of the research, and approval of the final version of the article.

All authors approved the final version of the manuscript.

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