Secular Trends of Larynx Cancer Incidence in Lithuania by Age and Gender in 1978–2001

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The purpose of the present study is to evaluate larynx cancer morbidity by gender and age groups in Lithuania in the years 1978–2001 and predict the possible trends.

The data contained in the Lithuanian Cancer Register for the period 1978–2001 on new cases as well as the data compiled by the Lithuanian Department of Statistics on the average number of population of Lithuania within the same period were used and a linear regression analysis of larynx cancer incidence rates was made. Within the period of coverage (1978–2001), the average number of new cases per year with larynx cancer were 179 in men and 10 in women. The incidence of larynx cancer among men is increasing in two of the four age groups studied (50–64 years, 65 years and over). The trends for women, on the contrary, become especially evident in the age group of 35–49 years.

Key words: laryngeal cancer, age groups, gender, incidence, prognosis

INTRODUCTION

In Lithuania, in 1995 larynx cancer accounted for 1.8% and in 2000 for 1.5% of all malignant diseases (1, 2). Larynx cancer incidence in various countries differs considerably. In the USA it accounts annually for 0.9 of all cases of malignant cancer (3, 4). It is worth mentioning that the incidence in the USA among men is four times higher than among women, while in other countries this unfavorable ratio for men increases even up to 10 times. Judging by the data of American Cancer Society, this ratio tends to decrease.

Examining the incidence dynamics of larynx cancer, an increase in both genders can be observed. It is accepted that the main risk factors for larynx cancer are long-time of inveterate smoking and consumption of alcohol and especially interaction between these two factors. Prevention of those risk factors is one of the ways to reduce the morbidity.

MATERIALS AND METHODS

The number of new cases by gender and age groups in Lithuania for the recent 24 years (1978–2001) was received from Lithuanian Cancer Registry. From the State Department of Statistics data on the midyear population of Lithuania during the period of coverage were received. Using those numerators and denominators, the incidence rates per 100,000 population were calculated. To determine the time-related trends in the incidence by age groups among men and women (the number of cases per 100,000 population) a linear regression analysis was employed according to the formula:

$$Y = a + bx,$$

where Y is the incidence of larynx cancer (fitted value), a is the intercept, b is the slope of regression line or the average absolute annual change (the number of cases per 100,000 population), and x is the time (year).

The statistical significance of the slope rate of the regression line was verified using the following statistical procedure (7):

$$P_b = 2P\left(\left|\frac{b-\beta}{S_b}\right| \geq Z_{P/2} \,|H_0 : \beta = 0\right) b .$$

The probability P_b expresses the lowest level of significance where zero hypothesis (H_0ß = 0) can still be rejected.

The linear regression equations obtained were used to predict the incidence trends by age groups and gender. Confidence intervals of the forecasts were also assessed (with 95% of confidence level). Besides, absolute changes in the incidence rates corresponding to the slope of regression curve average

for consecutive three years, growth of larynx cancer incidence rates were calculated disclosing, in per cent the average three-year increase of the number of cases per 100,000 population. The average three-year growth rates were calculated using the geometric mean expressed as a percentage (8).

As recommended by epidemiologists (9), the following enlarged age groups were singled out: 0–14 years (children), 15–34 years (adolescents and youth), 35–49 (mature people), 50–64 years (elderly people), 65 years and over (old people).

RESULTS

The incidence of larynx cancer among the elderly and old men is the highest and has a tendency to increase (Fig. 1 and Table 1). The larynx cancer incidence among adolescent and young people (age group 15–34 years) is the lowest and continues to decrease. The larynx cancer incidence among mature men (age group 35–49 years) is not high and also has a tendency to decrease. The incidence rates in the elderly and in the old men at the beginning of the period of coverage (1978–1980) were similar and reached about 100 cases per 100,000 population (data for three years). However, since the incidence rate among the elderly subjects at the end of the study period per 100,000 population was by about 10 cases higher, the tendencies of incidence growth are more evident. Noteworthy is the fact that even with a 5 or even 10 per cent level of significance one cannot reject the zero hypothesis that the slope of the regression line for the elderly men equals zero. Due to large fluctuations, the coefficient of determination among men of this age group was the lowest and also raised doubts as to

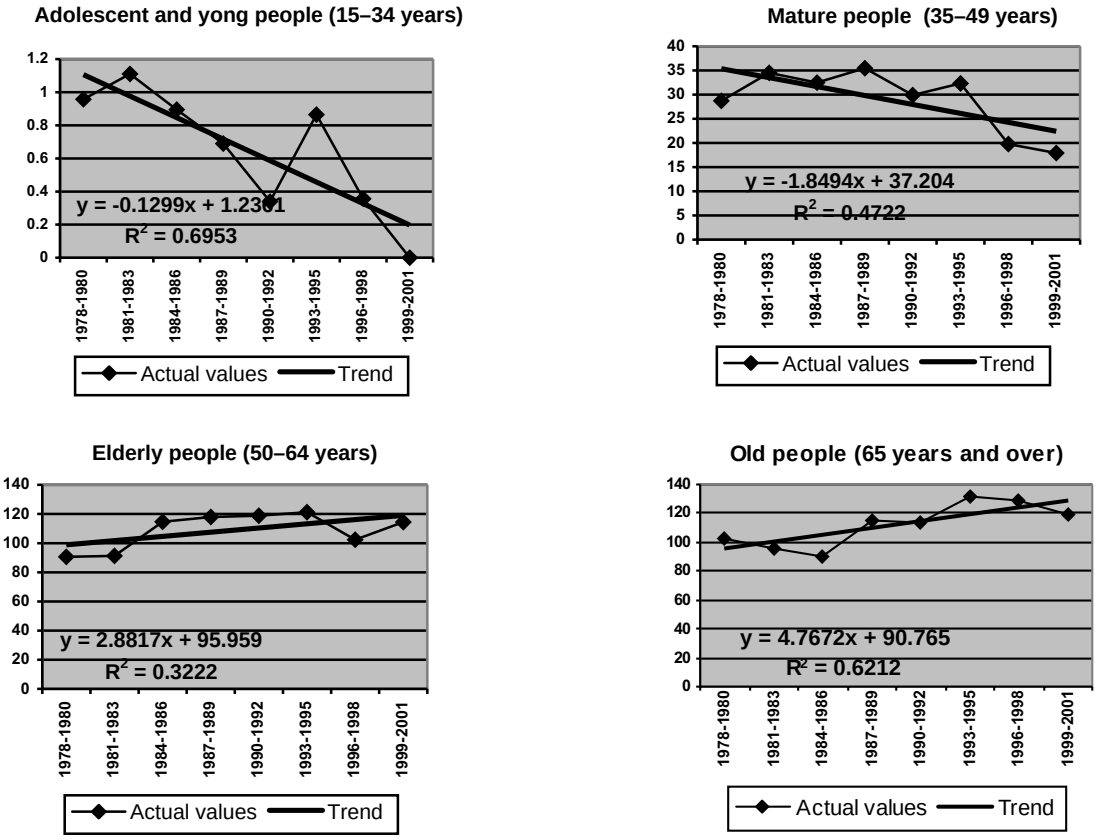

Fig. 1. Parameters and forecasts of incidence rates for men by age groups, 1978–2001

Table 1. **Parameters and forecasts of incidence rates for men by age groups for the period 2002–2004**

Age group	Average change (*b*)	P_b	Average changes for three years, %	Coefficient of determination (R^2)	Forecast (95% CI)
15–34	–0.130	0.01	–21.85	0.70	0.07 (–0.37–0.50)
35–49	–1.849	0.0597	–6.31	0.47	20.56 (10.70–30.42)
50–64	2.882	0.1422	2.69	0.32	121.89 (100.81–142.98)
65 and over	4.767	0.0202	4.37	0.62	133.67 (114.89–152.45)

the reliability of the equation of linear regression analysis. The forecasts are presented for a very short period, because the dynamic line is short. As the dynamic line used is short and the data variation is considerable, the intervals of confidence of the forecasts are quite wide. Besides, it must be borne in mind that we used data for three years.

Women

Incidence of larynx cancer among elderly and old women was the highest, but a statistically significant tendency of growth was observed only among old women (Fig. 2 and Table 2). Larynx cancer incidence among adolescent and young women was comparatively low and continues to decrease. Larynx cancer incidence among mature women was not high, but the tendencies are worrying, as there is an increase of average absolute incidence rates by 0.1865 cases per 100,000 population every three years. The incidence rate among old women at the beginning of the study period (1978–1980) was similar – about 4 cases per 100,000 population, but the tendencies of changes in the two age groups were contradictory – there was a tendency of reduction in incidence rates among elderly women, but a tendency of growth among old women is observed. The calculated probabilities (P_b) confirm the previous conclusion that one must be very cautious when interpreting the results of regression analysis of the incidence rates among women (the number of cases is relatively low and the fluctuation in time relatively high). It is very probable that the slope of the regression line equals zero, that is, the regression equation becomes completely meaningless.

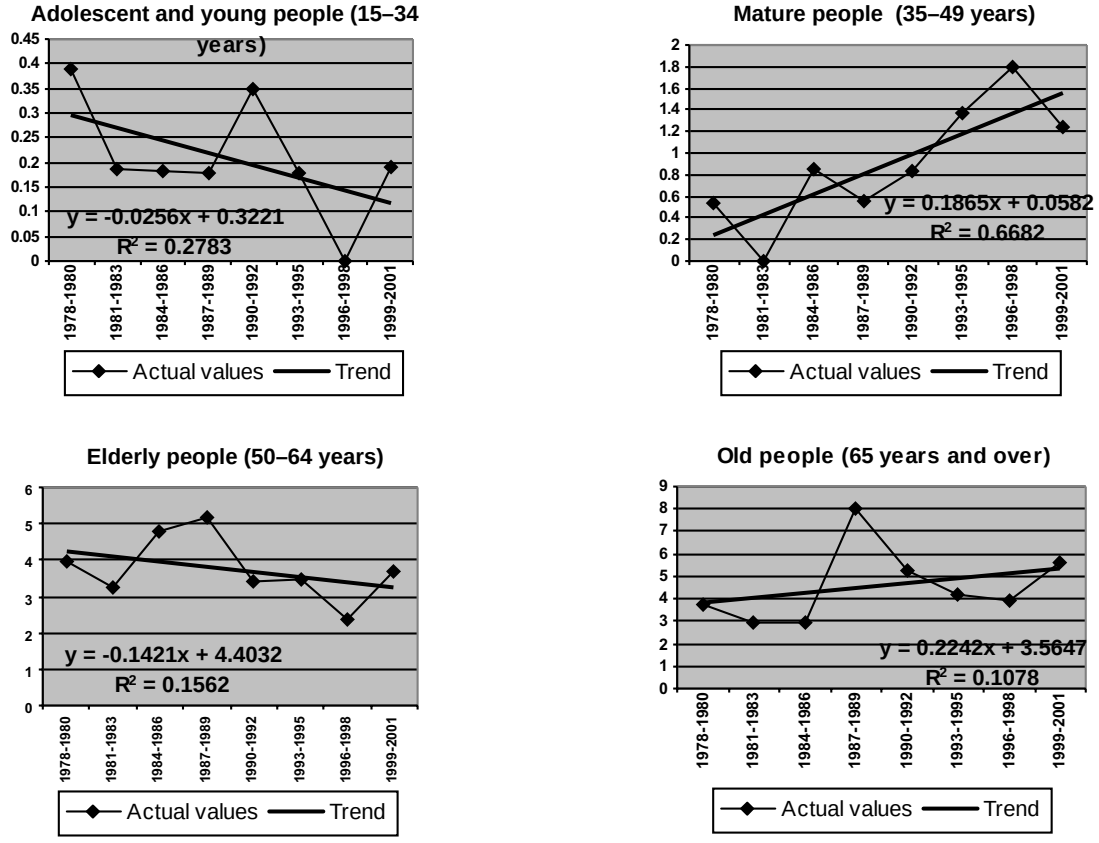

Fig. 2. Incidence rates for women, per 100,000 population, by age groups, 1978–2001

Table 2. **Parameters and forecasts of incidence rates for women by age groups, 1978–2001**

Age group	Average change (*b*)	P_b	Average changes for three years, %	Coefficient of determination (R^2)	Forecast 2004 (95% CI)
15–34	–0.026	0.1790	–12.41	0.28	0.09 (–0.12–0.30)
35–49	0.187	0.1321	30.18	0.67	1.74 (1.07–2.40)
50–64	–0.142	0.3325	–3.73	0.16	3.12 (1.46–4.79)
65 and over	0.224	0.4272	5.08	0.11	5.58 (2.33–8.84)

DISCUSSION

Our data show that the rate of larynx cancer in men is increasing in two of the four age groups analyzed (50–64 years and 65 years and over). Among the European male population, the incidence of larynx cancer increases with age, with most carcinomas being diagnosed in individuals aged 65 or more (about 45% of all cases) and a peak incidence in the 6th and 7th decades with about 50 new cases per 100.000 per year (6).

Contrary to men, in women the increasing rate becomes especially evident in the age group of 35 to 49 years. The above fact is worth attention, because it concerns women of quite a productive age. In this age group, in the period 1978–1980 about 35 new cases of larynx cancer per 100,000 were diagnosed in men, while in 1999–2001 only about 23, showing a reduction by 34%, whereas the corresponding data for women in the years 1978–1980 were about 0.2 and in 1999–2001 – 1.6 cases, i.e. an 8-fold growth was registered. However, we should always remember that larynx cancer is a relatively rare disease, especially in women, therefore high fluctuations of new cases sometimes are not statistically significant.

Interestingly, in the USA, according to the data of American Cancer Society, the larynx cancer incidence rate in male is 4 times higher than in female, while in other countries this ratio is more than 10 times higher for men. The worldwide tendencies show that the above proportions are decreasing, but the reduction is conditioned by the growth of the incidence rates among women. In most developed countries of Europe higher incidence rates are registered in urban areas than in the countryside (2, 5, 6, 10, 11).

CONCLUSIONS

1. The rate of larynx cancer incidence among adolescent and young people (age group 15–34 years) and among mature men (age group 35–49 years) has a tendency to decrease. The rate of larynx cancer cases among elderly (50–64 years) and old men (65 years and over) is the highest and has a tendency to increase.

2. The rate of larynx cancer incidence among adolescent and young (15–34 years) and elderly women (50–64 years) continues to decrease. The tendency of growth is observed among old women (65 years and over). The trend of incidence increase becomes especially evident in the age group of 35 to 49 years.

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SERGAMUMO GERKLŲ VĖŽIU ILGALAIKIAI TRENDAI LIETUVOJE 1978–2001 m. PAGAL LYTĮ IR AMŽIŲ

S a n t r a u k a

Tyrimo tikslas – įvertinti sergamumo gerklų vėžiu pokyčius 1978–2001m. pagal lytį ir amžiaus grupes bei prognozuoti galimas kaitos tendencijas ateityje remiantis linijinės regresijos koeficientų ekstrapoliacija.

Tyrimui naudoti 1978–2001 metų Lietuvos vėžio registro duomenys apie naujai susirgusiuosius gerklų vėžiu, taip pat Lietuvos statistikos departamento duomenys apie vidutinį Lietuvos populiacijos skaičių minėtu periodu. Duomenys skaičiuoti tiesinės regresinės analizės būdu.

Vyrų sergamumas gerklų vėžiu didėja 50–64 metų bei 65 ir vyresnių grupėje. Paauglių ir jaunimo 15–34 metų sergamumas gerklų vėžiu pats mažiausias ir nagrinėjamu periodu mažėjo. Pagyvenusių moterų (50–64 metų) sergamumas gerklų vėžiu turi tendenciją mažėti, o senyvų (65 ir vyresnių) – didėti. Nagrinėjamu laikotarpiu vyrų sergamumas buvo didesnis negu moterų. Moterų sergamumo didėjimo tendencijos ypač išryškėja tarp 35–49 metų. Moterų sergamumas šioje amžiaus grupėje 1978–2001 metais padidėjo 8 kartus, vyrų analizuojamu laikotarpiu sumažėjo 0,7 karto.

Raktažodžiai: gerklų vėžys, lytis, amžiaus grupės, sergamumas, prognozės