RESEARCH ARTICLE

Laryngeal Cancer in Kazakhstan - Ethnic, Age and Gender Differences over Time

Nurbek Igissinov[2,3]*, Vera Zatoskikh[3], Malcolm Anthony Moore[4], Saginbek Igissinov[1,5], Gulmira Aldiyarova[3], Gulmira Tokmurziyeva[6], Saule Valieva[6], Sholpan Alpeissova[7], Samal Sarsenova[3]

Abstract

The purpose of the present study was to provide an assessment of the incidence of cancer of the larynx in Kazakhstan with especial attention to ethnicity and gender, as well as age. The retrospective design covered all new cases of laryngeal cancer in 11 years (1999-2009). The total number was 4,967 cases, 4,535 (91.3%) in males and 432 (8.7%) in women, with a gender ratio of 10.5:1. 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.

Keywords: Laryngeal cancer - incidence - ethnic groups - gender - time trends - Kazakhstan

Asian Pac J Cancer Prev, **14 (11)**, 7033-7037

Introduction

Malignant tumors occur in men and women in all age groups. Patterns of morbidity and mortality from cancer is different for each gender and age, as well as ethnicity, first of all determined by the physiological characteristics of the organism and then exposure to modifiable risk factors (Jemal et al., 2011; Shin et al., 2012; Jung et al., 2012). The incidence of cancer of the larynx also has statistical differences according to age and sex (Wunsch, 2004; de Souza et al., 2011), geographical features of the place of residence (Dykhno et al., 2002; Saurina et al., 2010), social class and the living standards of the studied group of population (Vassileiou et al., 2012) and a number of other external factors (Wong et al., 1993; Grant, 2012; Romanowicz-Makowska et al., 2012). In Kazakhstan, it has already been shown that there is geographical variation in incidences of breast (Bilyalova et al., 2012), esophageal (Igissinov S et al., 2012; 2013), and cervical cancer (Igissinov et al., 2012), with changes over time (Igissinov et al., 2011).

Laryngeal cancer is extremely rare in women (Licitra et al., 2003; Ellis et al., 2012). So according to the International Agency for Research on Cancer in 2008, there were 150,677 cases of cancer of the larynx, of whom 129,651 (86%) cases in men and 21,026 (14%) in women. In this case, the standardized (world standard) incidence of laryngeal cancer /100.000 was among the whole population 2.2, in males 4.1 and in females (Ferlay et al., 2010).

The highest incidence rates (crude rate) have been registered in more developed countries of the world and the lowest in the developing countries.The high incidence among male population (>9 per 100 thousand population) are registered in Spain (Zaragoza), France (Calvados), Belarus, Brazil (Sao Paulo), and in African-Americans in the United States, low (<3) in Asia and Africa. In Russia, the incidence of laryngeal cancer is not high, in women of St Petersburg the figure does not exceed 0.3, as compared to 6.0 for males (Forman et al., 2013). We earlier reported geographical variation in laryngeal cancer rates in Kazakhstan with a decreaing trend over time (Igissinov et al., 2013).

The main etiological factor in the development of laryngeal cancer is tobacco (Hashibe et al., 2007; Anantharaman et al , 2011; Ramroth et al., 2011; Sharma et al., 2011). It has been estimated that 87% of laryngeal cancer cases in Central Europe are attributable to tobacco,

*[1]Central Asia Cancer Institute, [2]Research Institute of Traumatology and Orthopedics, [3]Astana Medical University, [5]Kazakh National Medical University named after SD Asfendiyarov, [6]Almaty State Institute of Advanced Medical Education, [7]National Research Center of Surgery AN Syzganov, Almaty, Kazakhstan, [4]APJCP Editorial Office, Bangkok, Thailand *For correspondence: nurbek_igisinov@mail.ru, n.igissinov@gmail.com*

with 75% and 12% due to current and past smoking, respectively (Hashibe et al., 2007). Both increasing duration and intensity of smoking are important (Ramroth et al., 2011) and involuntary smoking exposure is also a factor (Lee et al., 2008). Smokeless chewing tobacco, however, does not appear to be of significance (Sapkota et al., 2007)

Excessive consumption of alcohol, particularly alcoholic beverages increases the risk of cancer in sites like the larynx (Islami et al., 2010; Tavani et al., 2012). In one study approximately 39% of cases appeared attributable to the interaction between alcohol and tobacco (Hashibe et al., 2007). In another, the population attributable risk of tobacco and alcohol for upper aerodigestive tract cancer hypopharyngeal/laryngeal cancer was 85% (Anantharaman et al , 2011).

Type of food consumed also influences laryngeal cancer development (Bradshaw et al., 2012; Tavani et al., 2012). A possible unfavorable effect of dietary patterns based on meats and animal products has been reported (Bravi et al., 2012), while conversely a prudent diet protected in Uruguay (De Stefani et al., 2013). Fried foods, high-fat and processed meats, and sweets pattern was positively associated with laryngeal cancer in the USA (Bradshaw et al., 2012). In central and Eastern Europe, dairy products and yellow/orange vegetables appear protective while preserved vegetables might entail risk (Sapkota et al., 2008). Similarly, in China, eating sauerkraut and BBQ food were found to be risk factors and regular consumption of fresh vegetables, coarse grains, eggs and milk appeared protective (Wang et al., 2011). In contrast yogurt was found to be beneficial in Japan (Kawakita et al., 2012). Consumption of Greek/Turkish coffee may promote (Vassileiou et al., 2012) but no association with caffeinated coffee drinking was found (Al-Dakkak, 2011). Regular physical exercise may reduce risk (Wang et al., 2011) but recreational physical activity was not found to exert any effect in Europe (Nicolotti et al., 2011).

Air pollution with emissions and transport industries, and water and soil with heavy metals above the maximum permissible concentrations and evolution of other exogenous and endogenous risk factors lead to an increase in illness, especially cancer pathology, and in particular cancer of the larynx (Enomoto et al., 2008; Poirier, 2012). Environmental carcinogens and materials causing irritation are well known to be aetiological factors for laryngeal cancer. Several epidemiological studies have found that exposure to asbestos in the workplace increases the risk (Chan et al., 1988; Parnes, 1990). A study in Russia and other countries of Eastern and Central Europe, revealed an increased risk of laryngeal cancer among workers exposed to coal dust, hard metals, chlorinated solvents, as well as formaldehyde (Shangina et al., 2006). Use of coal (Sapkota et al., 2013) and silica dust exposure have also been implicated (Chen and Tsu, 2012).

These factors presumably are responsible for the marked difference between males and females regarding laryngeal cancer incidence. In addition, they could also impact on ethnic variation, especially where there are major lifestyle differences for religious or other sociocultural reasons. For some peoples, smoking or alcohol consumption is one of the elements of the national culture. Alcoholic beverage consumption and smoking growth is the main element of "new mode of life" of Kazakhstan ethnic groups. A significant increase of the tobacco goods production, a wide and colorful advertising of them, visual appeal of smoking for teenagers and young people – all this contributed to a sharp increasing the number of smokers (Jeganathan et al., 2013). This habit entrenched among men, much earlier than among women, with consumption in men being much more higher than among women, typical for many ethnic groups. In Russia, 70.5% of men smoke, and among high school students in large cities 30-47% of boys and 25-32% of girls. Every year in Russia 25 billion cigarettes are smoked. It's found that children smoke the most advertised cigarette brands.

The statistics of tobacco consumption in Kazakhstan shows all the signs of the tobacco epidemics, more than 27% of Kazakhstan citizens smoke (4.2 million people), the 4% jump in the level of tobacco consumption is a direct tobacco companies consequence, aggressive marketing and tobacco products advertising. Per capita consumption of tobacco products among Kazakhstan citizens increased more than 8 times, every day every citizen of Kazakhstan smokes at least 9 cigarettes a day (www.stat.kz). Variation between Russian and Kazakh ethnbic groups is very conceivable and this could be reflected in different laryngeal cancer incidences. The present study was conducted to assess this possibility.

Materials and Methods

As a source served a data of oncology centers about new cases of laryngeal cancer (form 7 "Malignant tumours incidence data"), with the first time established laryngeal cancer diagnosis. Also used the information of the Agency of statistics of the Republic of Kazakhstan about the number of total male and female populations. The study period was 11 years (1999-2009), with a total of 4,967 registered cases.

According to the law of the Republic of Kazakhstan "About State Statistics" (www.adilet.gov.kz), the information in the summary report is confidential and may only be used for statistical purposes. The information may be shared for research purposes only if a requesting organization provides the data security and undertakes 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 study focused on incidence data calculated per 100,000 of the population concerned, with average values (P), the mean error (m), 95% confidence interval (95% CI), and the average annual growth/loss (T %) (Merkov et al., 1974; Stanton, 1999) for the period covered. Details of the statistics have been reported earlier (Igissinov et al., 2013) using the Biostatistics for Windows program (Version 4.03).

Table 1. Change in Laryngeal Cancer Incidences in the Total Population by Age and Ethnic Groups (1999-2009)

Age	All Nationalities			Kazakh			Russian		
	P±m	95% CI	T %	P±m	95% CI	T %	P±m	95% CI	T %
Males									
>30	0.03±0.01	0.01-0.04	–23.2	0.02±0.01	0.00-0.04	–10.8	0.05±0.02	0.01-0.09	–29.1
30-39	0.5±0.1	0.3-0.7	–17.2	0.4±0.1	0.3-0.6	–11.8	0.8±0.2	0.4-1.3	–23.3
40-49	4.4±0.5	3.5-5.3	–8.1	2.8±0.3	2.2-3.3	–4.8	6.7±0.8	5.1-8.3	–10.7
50-59	21.1±1.5	18.2-24.0	–3.5	13.7±1.1	11.5-15.9	–2.3	30.9±2.0	26.9-34.9	–2.9
60-69	40.0±2.1	36.0-44.1	–2.8	28.8±2.2	24.5-33.1	–5.0	54.5±3.0	48.7-60.3	–2.2
≥70	41.4±2.4	36.7-46.1	–2.6	35.2±2.0	31.3-39.2	–1.8	53.5±4.2	45.3-61.7	–2.6
Total	5.7±0.3	5.0-6.3	–3.3	2.9±0.1	2.6-3.1	–2.3	11.5±0.7	10.2-12.7	–3.0
Females									
>30	0.02±0.01	0.01-0.03	+9.7	0.01±0.01	0.00-0.03	+7.0	0.04±0.03	0.0-0.09	+12.1
30-39	0.2±0.04	0.1-0.3	+0.5	0.2±0.07	0.07-0.33	–1.1	0.13±0.06	0.02-0.24	+27.7
40-49	0.7±0.1	0.5-0.9	–8.8	0.7±0.1	0.5-1.0	–8.9	0.7±0.1	0.4-0.9	–7.9
50-59	1.2±0.2	0.8-1.6	–7.7	1.4±0.3	0.8-1.9	–8.7	1.3±0.3	0.8-1.8	–6.3
60-69	1.8±0.2	1.3-2.2	–4.3	2.4±0.4	1.6-3.3	–7.6	1.6±0.3	1.0-2.1	–4.5
≥70	2.6±0.4	1.9-3.4	–10.7	3.1±0.5	2.0-4.1	–9.7	2.9±0.4	2.0-3.7	–10.4
Total	0.5±0.1	0.4-0.6	–6.7	0.4±0.1	0.3-0.5	–6.2	0.8±0.1	0.6-0.9	–5.8

Results

According to the census of Kazakhstan in 1999, the structure of total population consisted mainly of under 30 years of age (54.0%), while people over 60 years were 10.8%. There were 14,955 thousand people, of which 83.3% were Kazakhs (53.3%) and Russian (30.0%). In 2009, the total population of the republic was 15,778 thousand people, 87.9% of which were Kazakhs (63.8%) and Russian (24.1%). Regarding age structure type of the Kazakhs in 1999 the same as in 2009 was progressive, and in Russians regressive. Thus greater percentages of Russians are found in the older age groups.

Over 11 years (2009-2011) in Kazakhstan were registered 4,967 new cases of cancer of the larynx, of which 4,535 (91.3%) men and 432 (8.7%) women. The ratio of male and female patients was 10.5:1 and the crude incidence rate in men ($5.7/10^5$) was higher ($p<0.05$) than in women (0.5). Highest age-specific incidence in male and female populations were established in the older group of 70 years and over: 41.4 and 2.6.

The laryngeal cancer incidences in the whole country, taking into account age and sex are shown in Table 1. Age-standardized rates are illustrated in Figure 1, with a major predomiance inRussian as compared to Kazakh males. Overall a trend for decrease was noted but this was particualrly marked in the Russian and to a lesser extent Kazakh younger age male subjects. In females increases were noted in the youngest, especially Russians.

A high proportion of patients (both sexes) were 60-69 (36.2%). The average age of patients with laryngeal cancer in the whole country among men was 61.4±0.2 years (95% CI, 61.1-61.8 years) and in women was 45.5±0.6 years (95% CI, 58.9-61.0 years), the difference being statistically significant ($p<0.05$). Kazakh females had the lowest average age of presentation (see Figure 2)

Discussion

The present study demonstrated clear age-dependent differences in laryngeal cancer incidence, the male Russian predominance being of interest with reference

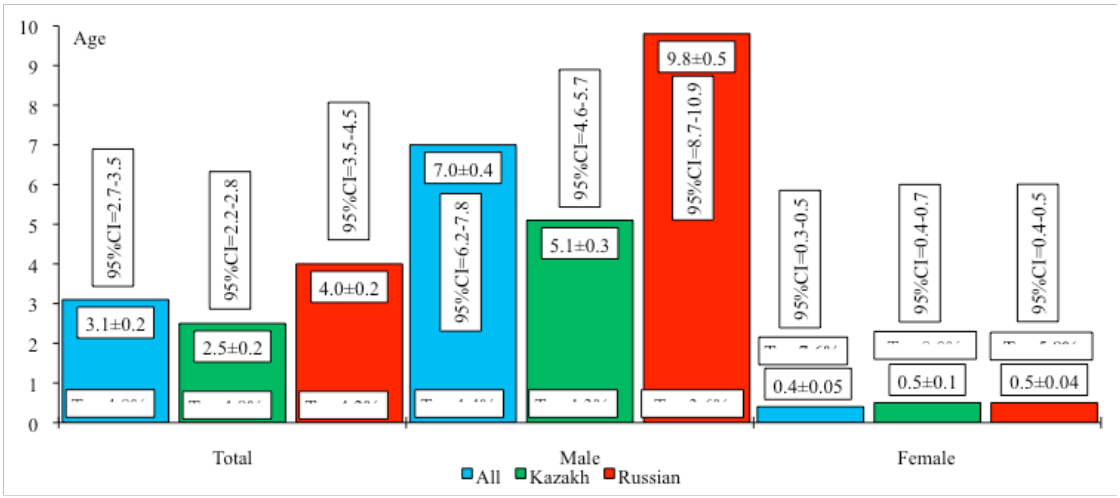

Figure 1. Age-standardized Incidence Rates in Kazakhstan by Gender and Ethnic Group (1999-2009)

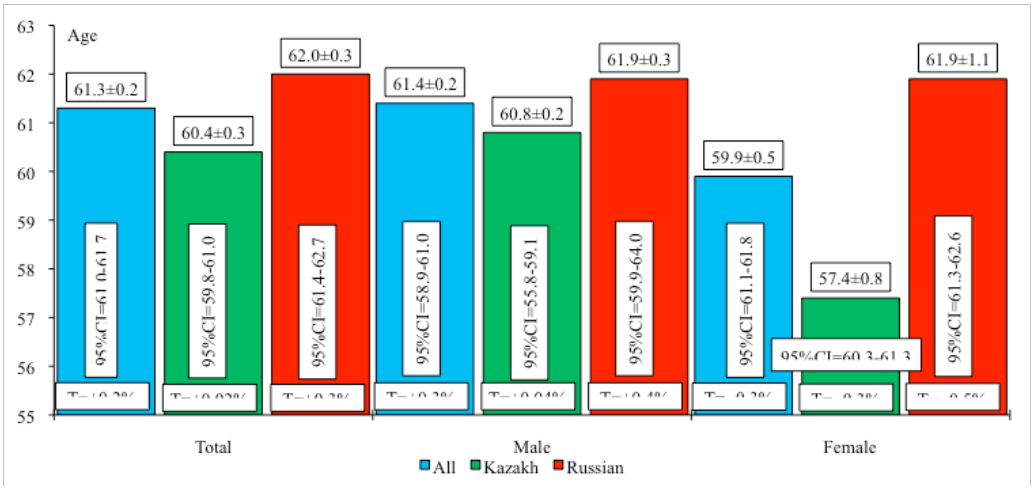

Figure 2. Average Age of Laryngeal Cancer in Kazakhstan by Gender and Ethnic Group (1999-2009)

to the major laryngeal risk factors, tobacco and alcohol consumption. Tobacco quit ratios are low in the former Soviet Union but desire for control and cessation support does exist (Footman et al., 2013). Smoking prevalence appears to have stabilized and may be declining in younger groups, but remains extremely high among men, especially those in lower socioeconomic groups. Large gaps exist in public understanding of the negative health effects of tobacco use, particularly in Kazakhstan (Roberts et al., 2012a; 2012b). The decreases observed in younger males are thus in line with expectation from smoking rates, as is the gender variation. It is conceivable that younger females are now smoking more often than their mothers generation, and this would explain the rise in laryngeal cancer incidence. More data are needed for relative rates of alcohol consumption for better understaning of the role of this risk factor.

The prevalence of *H. pylori* infection has been reported to be almost identical among the two ethnic groups (Russians 79% and Kazakhs 80%) with a negative relation to clean water index (Nurgalieva et al., 2002). Therefore it is unlikely that the bacterium plays a major role in cancer development the larynx, despite an earlier report (Siupsinskiene et al., 2013).

In Central Asia worse socio-economic situation, negative health behaviours (smoking and alcohol consumption) and rural residence were all associated with low levels of fruit and vegetable intake (Krull Abe et al., 2013) so that many factors are probably interacting together to determine risk of laryngeal cancer. One area of obvious interest is availability of various detrimental and advantageous factors like alcohol, tobacco and foodstuffs, as highlighted earlier for Almaty (Yim et al., 2003).

In future our results should be used for targeted anti-cancer activities of laryngeal malignancies. Further study of the incidence of laryngeal cancer taking into acoount a variety of exogenous and endogenous causes is a priority of our research.

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