

RESEARCH COMMUNICATION

Epidemiological Aspects of Morbidity and Mortality from Cervical Cancer in Kazakhstan

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Abstract

Epidemiological studies of cancer incidence in Kazakhstan have revealed an uneven distribution for cervical cancer. Incidence and mortality rates were calculated for different regions of the republic, including the two major cities of Almaty and Astana, in 1999-2008. Defined levels for cartograms for incidence were low (up to 12.8/100,000), medium (12.8 to 15.9) and high (above 15.9) and for mortality were up to 7.1, 7.1 to 10.8 and more than 10.8, respectively. Basically high incidence rates were identified in the eastern, central and northern parts of the country and in Almaty. Such differences in cervical cancer data, and also variation in mortality/incidence ratios, from a low of 0.4 in Almaty to a high of 0.71 in Zhambyl, point to variation in demographic and medical features which impact on risk and prognostic factors for cervical cancer in the country. Further research is necessary to highlight areas for emphasis in cancer control programs for this important cancer.

Keywords: Cervical cancer - time trends - geographical variation - Kazakhstan

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Introduction

In spite of some achievements in the field of diagnosis and treatment, cervical cancer continues to be on a leading position in the structure of the cancer incidence of female genital system. The structure of malignant tumors in females cervical cancer holds the sixth position in the world. According to the International Agency for Research on Cancer, an annual worldwide registered 530,000 new cases of cervical cancer with 275,000 mortalities (Ferlay et al., 2010). In recent years in developed countries, there is a tendency to reduce the incidence of cervical cancer. However, an increase in the incidence of cervical cancer among younger women. In the U.S., cervical cancer occurs with a frequency of 13.0/100,000, in Japan – 22.0, in India – 43.0 and in Brazil – 80.0. High-standardized rates of cervical cancer are found in Haiti (93.8) and the lowest in Syria (3.0). Most cases of cervical cancer (78.0%) occur in the developing countries – in Latin America and the Caribbean, Eastern and Southern Africa, South and South-East Asia (Hanson, 2002; Ferlay et al., 2010; MEPS against cancer, 2011; American Cancer Society, 2012). However, in Central Asia data are limited (Moore et al., 2009; 2010), although slight increase has been noted over the last ten years in Kazakhstan, especially in the middle-aged groups (Igissinov et al., 2011a; 2011b). In Kyrgyzstan, rates were found to be slightly higher in Russian than Kyrgyz ethnic groups, again with slight increase in incidence over time (Igissinov, 2004).

In the study of the epidemiology of cervical cancer had been revealed significant variations in the incidence of this disease in different geographical areas and different ethnic populations living in similar climatic and geographic conditions. In connection with this, the incidence and mortality from cervical cancer is one of the important tasks of oncology, as this problem has a clinical, epidemiological, morphological, immunological, bioclinical and other aspects, and it is important to many professionals involved in oncology (Parkin et al., 2005; Moore et al., 2010; MEPS against cancer, 2011; American Cancer Society, 2012).

With progress of medicine, advances in biology and geography content, software, health problems topographical descriptions were changed. At the same time, questions of medical-geographical zoning and subsequent evaluation of the natural, socio-economic factors in relation to the health and geographical areas and the introduction of medical and geographic maps are observed (Igissinov, 1974). Medical-geographical map is a prospective method to establish the relationship between the factors of geographical environment and human health, the emergence and dynamics of various diseases. Medical-geographical approach with help of cartography of morbidity and mortality in certain forms of cancer can reveal features of the prevalence of malignant tumors in the range of natural-territorial complexes, in close liaison with existing systems and living conditions of the population (Ushakov et al., 2005).

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The incidence and mortality from cervical cancer was therefore here investigated according to the administrative-territorial division of Kazakhstan and regional particularities.

Materials and Methods

A retrospective study was the main method which is been used here, with a descriptive and analytical methods of epidemiology and medical statistics (Glantz, 1999). Materials of morbidity we have got from stored in a data bank «Cancer Registry» of the Kazakh Research Institute of Oncology and Radiology for 1999-2008. Data on the female population of the Agency of the Republic of Kazakhstan from 1999 to 2009 (Demography Yearbook of Kazakhstan regions, 2007, 2010). For comparative analyzes of epidemiological rates the incidence of cervical cancer in Kazakhstan, the pre-selected the following regions: East (East Kazakhstan, Pavlodar region), Central (Akmola, Karaganda region), North (Kostanay, North-Kazakhstan region), Western (Aktobe, Atyrau, West Kazakhstan region, and Mangystau) and South (Almaty, Zhambyl, Kyzylorda and South Kazakhstan regions), as well as the city of Almaty and Astana.

Source of information on deaths was compiled counted patients who died from cancer of the cervix: accounting and reporting materials according to oncological institutions of the republic for 2003-2009. To study the mortality of the population selected materials relating to the 5,520 patients who died from cervical cancer.

In making up of maps were used morbidity and mortality rates, calculated per 100,000 population (0/0000). In the study was used the method for making cartograms, proposed in 1974 by Igissinov, based on the definition of standard deviation (σ) from the mean (x). Scale steps of cartogram were determined as follows: 1) $(x-1,5\sigma)+\sigma$; 2) $(x-1,5\sigma)+2\sigma$; 3) $(x-1,5\sigma)+3\sigma$, etc., and the grouping of indicators produced by the formula $x\pm 0,5\sigma$, corresponding to an average level $(x-0,5\sigma, \text{ and } x+0,5\sigma)$.

Results

The average age of cervical cancer patients was 53.5 ± 0.7 years. The incidence among women of reproductive age ($15.0\pm 1.20/0000$) was 2.2 times lower than those figures for postmenopausal age ($32.6\pm 0.40/0000$), with statistical significance ($p<0.05$) (Figure 1). Incidence data are summarized in Table 1.

The central region of Kazakhstan consists of 2 areas, where live 1,109,161 women, 395,572 of them in Akmola and 713,589 in the Karaganda region. The average annual incidence of cervical cancer in this region, $16.6\pm 0.60/0000$ and ranked first or second place in the country. The high incidence of cervical cancer is revealed in Akmola ($17.4\pm 0.90/0000$), and lowest – in Karaganda ($16.1\pm 0.60/0000$) areas. The average age of cervical cancer patients was 54.3 ± 0.7 years. The incidence among women of reproductive age ($13.6\pm 0.80/0000$) is 2.7 times lower than those figures postmenopausal age ($36.6\pm 1.30/0000$), the difference is statistically significant ($p<0.05$) (Figure 1).

Table 1. Average Annual Incidence Rates of Cervical Cancer in Kazakhstan by Region (1999-2008)

Region	State/City	Incidence	Mortality	M/I
East	East Kazakhstan	16.7±0.8	9.5±0.3	0.57
	Pavlodar	16.3±0.9	9.0±0.6	0.55
Central	Akmola	17.4±0.9	11.8±0.6	0.68
	Karaganda	16.1±0.6	10.6±0.9	0.66
North	Kostanay	17.6±0.8	7.8±0.4	0.44
	North Kazakhstan	14.2±0.8	7.1±0.6	0.50
West	Atyrau	16.3±1.6	9.2±0.5	0.56
	Aktobe	14.6±0.6	7.0±0.4	0.48
	West Kazakhstan	12.9±1.0	8.3±0.5	0.64
South	Mangystau	8.7±0.7	3.8±0.5	0.44
	Almaty	16.0±0.7	9.1±0.6	0.57
	Zhambyl	12.0±0.7	8.5±0.6	0.71
Cities	Kyzylorda	10.4±0.9	6.9±0.7	0.66
	South Kazakhstan	9.2±0.4	5.2±0.3	0.57
	Almaty city	18.6±0.8	7.5±0.5	0.40
Republic of Kazakhstan	Astana city	12.9±0.9	6.9±0.3	0.53
	Republic of Kazakhstan	14.5±0.3	8.0±0.1	0.55

The northern region of Kazakhstan also consists of 2 areas, where about 845,289 women live, of whom 490,542 and 354,747, respectively, in Kostanay and North Kazakhstan regions. The average annual incidence of cervical cancer in this region amounted to $16.2\pm 0.60/0000$ and ranked third in the country. The high incidence of cervical cancer was found in Kostanay ($17.6\pm 0.80/0000$), and low – in the North Kazakhstan ($14.2\pm 0.80/0000$) region (Table 1). The average age of cervical cancer patients was 50.9 ± 0.7 years. The incidence among women of reproductive age ($16.3\pm 0.80/0000$) is 1.7 times lower than those figures postmenopausal age ($27.9\pm 1.00/0000$), statistical difference is significant ($p<0.05$) (Figure 1).

The western region of Kazakhstan consists of 4 areas, where live about 1,077,200 women, 351,367 of them in Aktobe, 234,555 in Atyrau, 314,301 West Kazakhstan and 176,977 in Mangystau regions. The average annual incidence of cervical cancer in this region amounted to $13.5\pm 0.60/0000$ and ranked fifth in the country. The high incidence of cervical cancer is revealed in Atyrau ($16.3\pm 1.60/0000$), and lowest – in Mangystau ($8.7\pm 0.70/0000$), and Aktobe occupied an intermediate position ($14.6\pm 0.60/0000$) and West Kazakhstan ($12.9\pm 1.00/0000$) region . The average age of cervical cancer patients is amounted 52.0 ± 0.7 years, with the lowest average age is in the Atyrau region (50.6 ± 1.1 years). The incidence among women of reproductive age ($12.7\pm 0.90/0000$) is 2.7 times lower than those

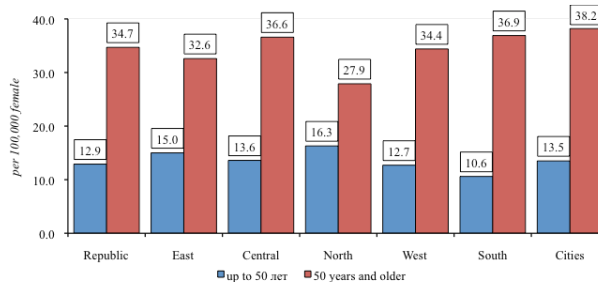


Figure 1. Average Age Incidence Rates of Cervical Cancer in the Various Regions of Kazakhstan for 1999-2008

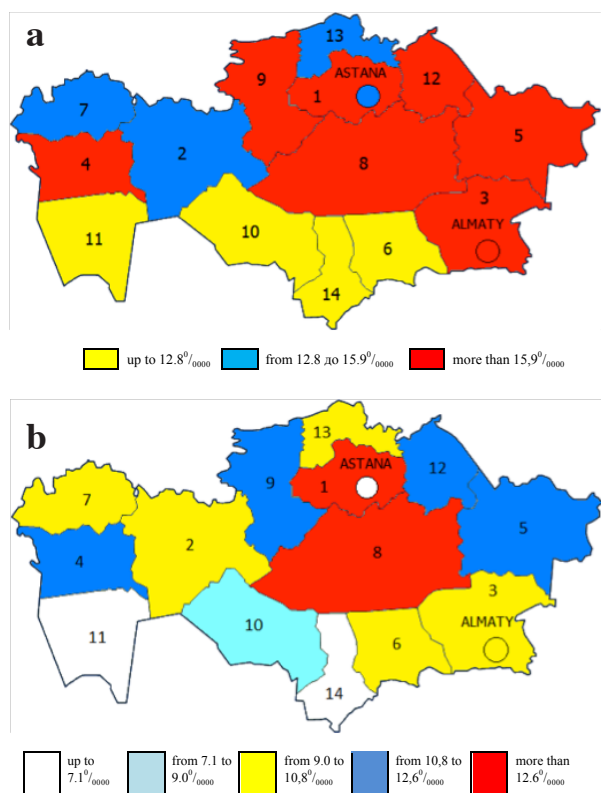


Figure 2. Cartograms for Cervical Cancer in Kazakhstan (2003-2009): a) Incidence; b) Mortality.

Areas: 1. Akmola, 2. Aktobe, 3. Almaty, 4. Atyrau, 5. East Kazakhstan, 6. Zhambyl, 7. West Kazakhstan, 8. Karaganda, 9. Kostanay, 10. Kyzylorda, 11. Mangystau, 12. Pavlodar, 13. North Kazakhstan, 14. South Kazakhstan

figures postmenopausal age ($34.4 \pm 1.10/0000$), statistical difference is significant ($p < 0.05$) (Figure 1).

Southern region of Kazakhstan consists of 4 areas, where live about 2,707,802 women, 806,505 of them in Almaty, 510,456 in Zhambyl, 305,749 in Kyzylorda and 1,085,092 in South Kazakhstan regions. The average annual incidence of cervical cancer in this region amounted to $11.9 \pm 0.30/0000$ and ranked sixth in the country. The high incidence of cervical cancer is set in Almaty ($16.0 \pm 0.70/0000$), and low - in the South Kazakhstan ($9.2 \pm 0.40/0000$), and Zhambyl occupied the intermediate position ($12.0 \pm 0.70/0000$) and Kyzylorda ($10.4 \pm 0.90/0000$) areas. The average age of cervical cancer patients was 53.0 ± 0.5 years, with the lowest average age was set in the South Kazakhstan region (52.0 ± 0.8 years). The incidence among women of reproductive age ($10.6 \pm 0.40/0000$) is 3.5 times lower than rates of women at postmenopausal age ($36.9 \pm 0.80/0000$), the difference is statistically significant ($p < 0.01$).

In the major cities of Kazakhstan, Almaty and Astana live on average 903,947 women, 650,792 of them in the Almaty and 253 155 in Astana. The number of women living in Almaty, 2.6 times higher than in the Astana. The average annual incidence of cervical cancer in these cities amounted to $17.0 \pm 0.60/0000$ and ranked fourth in the country. The high incidence of cervical cancer is set in Almaty ($18.6 \pm 0.80/0000$), and lowest - in Astana - $12.9 \pm 0.90/0000$ (Table 1). The average age of cervical cancer patients was 53.4 ± 0.5 years. The incidence among

women of reproductive age ($13.5 \pm 0.80/0000$) is 2.8 times lower rates than at postmenopausal age ($38.2 \pm 1.40/0000$), statistical difference is significant ($p < 0.01$).

Spatial assessment of morbidity and mortality of the female population of cancer of the cervix in different climatic regions is one of the most important aspects that allow to analyze the spread of morbidity and mortality, i.e. to establish the effect of various medical and social conditions and environmental factors on morbidity and mortality of the female population. On the basis of the above scale cartogram of cervical cancer incidence and mortality was made (Figure 2). Since survival data are lacking efficacy of treatment was simply assessed in terms of the mortality/incidence ratios. Considerable variation was noted, from a low of 0.4 in Almaty to a high of 0.71 in Zhambyl (see Table 1).

Discussion

The present study demonstrated marked variation in both cervical cancer incidences and mortality, as well as the ratios between the two in the various geographical regions of Kazakhstan, as well as the two major cities, Astana and Almaty. These data point to variation in both risk factors and screening and treatment. Similar spatial variation has also been reported elsewhere (van der Aa et al., 2008; Lorenzo-Luaces Alvarez et al., 2009; Cheng et al., 2011).

The major risk factors for cervical cancer are well established to be infection with high-risk forms of the human papilloma virus (HPV), tobacco smoking and sexually transmitted disease (Moore and Sobue, 2010). No data are available for Kazakhstan but globally variation in types has been shown with geographical region, histological type of lesion, ethnicity and even year of publication (Domingo et al., 2008; Ting et al., 2010; Li et al., 2011; Soto-De Leon et al., 2011). Regarding the Central and North-West Asian region, in Turkey, the overall frequency rate of HPV infection was demonstrated to be 6.1% (Ozcelik et al., 2003). Among HPV-positive dysplasia and metaplasia cases, 55.6% had HPV16 and 18 (Hamkar et al., 2002). In another series, 64% of lesion samples proved positive, mostly for 16, 31 or 18 (Esmaili et al., 2008). High rates of infection with HPV genotypes have also been reported in sexually active Iranian women, again with HPV16 and 18 (Ghaffari et al., 2006). In newly independent states of the former Soviet Union, the distribution of the most common high-risk HPV-types seems to be similar in these countries as reported in other major geographical regions (Kulmala et al., 2007). Clearly, future research should focus on the prevalent types in different regions and any relationship to ethnicity and age group in Kazakhstan. Similarly data need to be generated on smoking prevalence and STDs, again in relation to age, to determine whether this might contribute to geographical variation.

Whether differences in screening rates played a major role in determining the presently demonstrated geographical variation in incidence and mortality of cervical cancer is unclear. Non-implementation of screening would obviously increase risk (Ondrusova et al.,

2012) and it might be expected that availability in rural areas might be lower than in the cities. However, many cultural factors could be important in this context, again pointing to the need for more research in the future.

Lastly, mention should be made about the variation in proportion of mortalities. In this context, local socio-economic covariates deserve stress (Cheng et al., 2011; Walters et al., 2011) as do ethnic factors (Roder and Currow, 2009). Accessibility of care, including facilities for brachytherapy, radiotherapy and chemotherapy may be of particular importance, as well as issues of cost and convenience.

In conclusion, there is considerable geographical variation in cervical cancer incidence and mortality in Kazakhstan. Generating an understanding of underlying causal factors is a high priority for development of an appropriate cancer control program.

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