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The dynamics of Incidence Rate of Ovary Cancer at Female Population of Primorskiy Krai (1992–2011)

ABSTRACT

The incidence of ovarian cancer among female population of Primorsky krai for the period 1992-2011 was analyzed. Ovarian cancer was detected to be the 8-th most common type of cancer, occurring more frequently among females of Vladivostok city than among females of Primorsky krai. The ovarian cancer incidence tends to increase over time. By 2017, the ovarian cancer incidence is expected to rise by 16,8–26,6% in Primorsky krai.

Keywords: ovarian cancer incidence, Primorsky krai, Vladivostok city

INTRODUCTION

Women's reproductive health is one of the most important problems of modern society. It is therefore not surprising that the problem of cancer of the female reproductive system is under close medical attention. Ovarian cancer is the most common cause of death among gynecologic malignancies [4]. Worldwide, approximately 225,5 thousands women are diagnosed with ovarian cancer annually, with an estimated 140,2 thousands cancer-related deaths. In the United States, approximately 22,3 thousands are estimated to be diagnosed with ovarian cancer annually and over 15,5 thousands will die of this disease. In Russia, the number of ovarian cancer cases and cancer-related deaths has been estimated to be around 13,1 and 7,8 thousands per year, respectively. Ovarian cancer is the 5-th most common cancer among women worldwide [1; 17] and the 7-th most (5,1%) frequent for incidence in the regions of Siberia and the Russian Far East [15]. The highest incidence rates of ovarian cancer are registered in industrialized countries, such as the USA and Western Europe (12,5 cases per 100000 population) except Japan. The incidence of ovarian cancer in Japan is 4,6 times lower than that observed in other developed countries [10].

The prognosis for ovarian cancer patients is poor. Over 70% of ovarian cancer patients are diagnosed with stage III or IV disease, and the percentage of patients with stage I disease is two times less than that of patients with cervical and endometrial cancers [2; 8].

In Russia, the median age of ovarian cancer patients ranges from 58,2 to 58,4 years [7], being 61,4 years in Tomsk region (Siberia) [9].

In recent years, the reported data have shown an increase in the ovarian cancer incidence rate by 6,5% and 5,1% [6; 14] and 8,5% [10]. One-year mortality rate have increased by 36,8% [3].

The etiology of ovarian cancer has many factors. Ovarian cancer risk is associated with a number of factors: inheritance, state of reproductive system, hormonal and anthropometric factors, exposure to harmful environmental substances and others [3]. About 15% of ovarian cancer cases are related with the exposure to various environmental factors including 5% with exposure to air pollution [16]. In the vicinity of industrial centers, under the influence of anthropogenic pollution, the biogeochemical provinces are formed, that are characterized by increased cancer incidence, including ovarian cancer [12; 15; 16]. In general, epidemiological studies indicate that ovarian cancer is geographically unevenly distributed [2; 5; 12].

Therefore, it is necessary to conduct epidemiological monitoring of ovarian cancer in cohorts of the population residing in different environments, particularly in Primorsky krai, which has its own climatic, geographical, medical- demographic, social and technological features, and Vladivostok, which is the biggest industrial center of Primorsky krai.

The aim is to analyze the incidence rates of ovarian cancer during the period 1992–2011 for the population of Vladivostok and Primorsky krai (with the exception of Vladivostok)

MATERIALS AND METHODS.

The study was based on cancer register data collected at the Primorsky Regional Cancer Center, and covered the period 1992–2011. A total of 3005 women with newly diagnosed ovarian cancer were registered in Primorsky Krai including 968 women from Vladivostok city.

The ovarian cancer incidence was compared between the female population of Vladivostok city and Primorsky krai (except Vladivostok city).

Ovarian cancer incidence was analyzed over the 20-year period using the crude incidence rates (CIR) and age-standardized rates (ASR) cases per 100000 population (‰00), adjusted by each year of diagnosis and by 4 five-year time periods: 1992–1996, 1997–2001, 2002–2006 and 2007–2011. Trends in the annual CIR and ASR were analyzed using the following linear equation:

$$CIR = AT + B;\ ASR = A_1T + B_1,$$

with T being the number of years since 1992 and A, B, A_1, B_1 the coefficients determined using the method of the least squares. Correlation between actual and calculating incidence rates was analyzed using correlation coefficients [11].

The component analysis was carried out in accordance with Health Ministry guidelines [5]. There were calculated the following coefficients: C_a – a component of crude incidence increase, associated with changes in age-sex structure, C_r – a component of incidence increase associated with changes in risk to develop disease at the same age-sex structure and C_c – a component of increase associated with a combination of changes in the age-sex structure and risk to develop disease.

Statistical analysis was carried out by methods of mathematical statistics, adopted in modern epidemiological studies and recommended by the Ministry of Health [5; 13]. The change was regarded as statistically significant if the p value was $p \leq 0,05$.

RESULTS AND DISCUSSION.

Analysis of ovarian cancer incidence for the population of Vladivostok city and Primorsky krai over the 20-year period showed no significant changes. Ovarian cancer is still the 8-th most common type of cancer, accounting for 4,6 to 5,0% of all cancer cases.

Fig.1 shows that females of Vladivostok city were more frequently diagnosed with ovarian cancer than females of Primorsky krai. The average CIR for ovarian cancer was higher by 14,3% in females of Vladivostok city (15,2±1,0‰00) compared to that observed in females of Primorsky krai (13,3±0,6‰00).

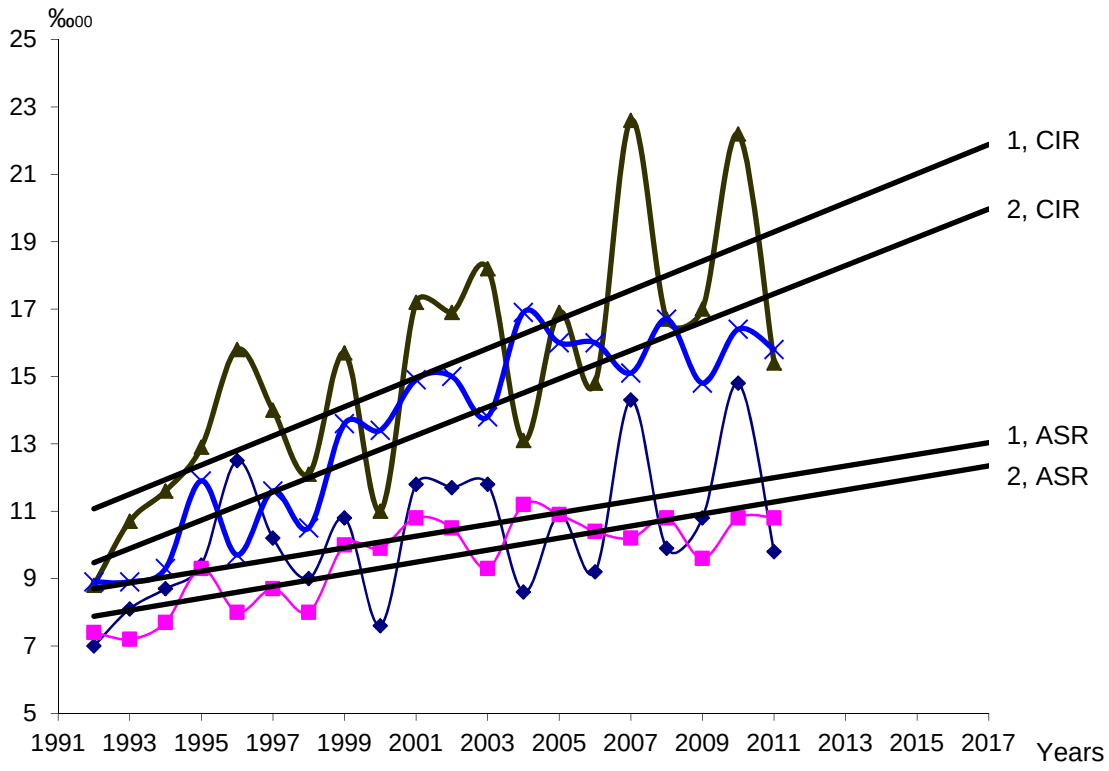

Fig. 1. Ovarian cancer incidence among female population of Vladivostok city (line 1) and Primorsky krai (line 2). The CIR and ASR of ovarian cancer per 100000 population

As shown in fig.1, the CIR is increasing over time. The increasing trends in both female populations of Vladivostok city (line 1) and Primorsky krai (line 2) are nearly parallel, although the CIR for ovarian cancer was higher in Vladivostok than in Primorsky krai.

Table 1 shows the average ovarian cancer incidence rates among females of Vladivostok city and Primorsky krai in various 5-year time periods. Between 1992–1996 and 2007–2011, the overall CIR for ovarian cancer increased by 56,7% in women of Vladivostok city and by 62,9% in women of Primorsky krai. During the period 1992–1996, a total of 592 women were diagnosed with ovarian cancer in Primorsky krai and 195 in Vladivostok city. Over the last 5-year time period (2007–2011), the number of new ovarian cancer cases had increased to 867 in Primorsky krai and to 304 in Vladivostok city.

Table 1

The CIR and ASR of ovarian cancer among the female population of Vladivostok city and Primorsky krai (except Vladivostok) for each 5-year time period from 1992 to 2011 and the predicted incidence rate by 2017

Female population	CIR in 5-yaer time periods				
	1992–1996	1997–2001	2002–2006	2007–2011	2017 year
Vladivostok	12,0±1,8	14,0±2,0	16,0±2,0	18,8±2,1	21,9±1,8
Primorsky krai	9,7±1,0	12,8±1,2	15,5±1,4	15,8±1,4	20,0±1,1
	ASR in 5-yaer time periods				
Vladivostok	9,1±1,3	9,9±1,3	10,6±1,3	11,9±1,4	13,0±1,6
Primorsky krai	7,9±0,8	9,4±0,8	10,4±0,9	10,5±0,9	12,4±0,9

The annual CIR for ovarian cancer among women of Vladivostok city with a statistical significance of r=0,72 and p≤0,0001 is described by a linear equation: CIR(‰00)=0,43T+11,1. Under conditions of maintaining the identified trends, the extrapolation of this equation allows making prediction of the CIR for ovarian cancer, at least until 2017, when the CIR is projected to increase by 16,8% compared to the period 2007–2011. In female population of Primorsky krai, the CIR is projected to increase by 26,6% in 2017 (table 1).

Ovarian cancer is much more common in older women, with incidence rates increasing with age. In Primorsky krai, including Vladivostok, there were no cases of ovarian cancer or only a few cases of this disease were registered among women under 30 years. In Vladivostok city, a sharp increase (a 1,9-fold increase per each decade) in ovarian cancer incidence was observed in women aged from 30 to 60 (table 2). For women aged 60 years and over, incidence rates remained stable or slightly increased.

Table 2

Ovarian cancer incidence among the female population of Vladivostok city and Primorsky krai by age (CIR per 100000 females) and the incidence increase (t) between 1992–1996 and between 2006–2011.

Age, years	Female population of Vladivostok city			Female population of Primorsky krai		
	1992–1996	2007–2011	t, %	1992–1996	2007–2011	t, %
30–39	6,6±3,3	8,2±3,9	24,2	5,4±1,9	9,7±2,8	79,6
40–49	12,5±4,7	18,8±5,7	50,4	13,6±3,1	20,2±4,2	48,5
50–59	32,1±8,1	35,5±7,8	10,6	23,4±4,7	31,6±5,0	35,0
60–69	27,3±9,5	42,9±10,0	57,1	30,5±6,1	31,4±6,3	2,9
70 and >	37,1±12,7	44,4±12,2	19,7	20,9±6,0	29,7±6,0	42,1
Median age	57,2±2,2	58,5±1,7	–	56,3±1,4	57,1±1,2	–

The age-specific ovarian cancer incidence rates in Primorsky krai were different from those observed in Vladivostok city. In Primorsky krai, over the first 5-yaer time period (between 1992 and 1996), the incidence of ovarian cancer gradually increased with the women's age up to 70 years, then the rate of increase dropped. Over the latest 5-year study period (between 2007 and 2011), the incidence rate increased with the women's age up to 60 years, then it remained stable.

The overall rise in the ovarian cancer incidence was observed in all age groups during the study period (table 2). In Vladivostok city, the highest incidence was recorded in the age groups 40 to 49 and 60 to 69. Among women of Primorsky krai, the highest increase was noted in the 30–49 age groups and in women aged 70 and over. Since the latter age groups were the largest in terms of the number of patients, age 60 and older for women of Vladivostok city and age over 50 for women of Primorsky Krai should be considered as the most significant risk factors for developing ovarian cancer by 2007–2011.

Table 2 also shows that CIR for ovarian cancer in women of Vladivostok city differed from that in women of Primorsky krai, but these differences were not statistically significant. The only significant difference in CIR for ovarian cancer between women of Vladivostok city and women of Primorsky krai was observed in the 70 plus age group. During the first and the latest 5-year study periods, the CIR of ovarian cancer was 1,8 and 1,5 times higher in women of Vladivostok city than in women of Primorsky krai, respectively.

Between 1992 and 2011, the median age of ovarian cancer patients increased by 0,8 years in Primorsky krai and by 1,3 years in Vladivostok, reaching the median age in Russian Federation in 2011 (58,4 years).

The component analysis data (table. 3) indicated that ovarian cancer incidence rates increased more slowly due to changes in the age-sex structure, than due to risk factors.

Table 3

The components of CIR rise among the population of Vladivostok city and Primorsky krai (except Vladivostok) between the time periods 1992–1996 and 2007–2011: $\mathbf{C_o}$ – the overall, $\mathbf{C_a}$ – related to changes in age-sex structure of the population, $\mathbf{C_r}$ – related to the risk of developing disease and $\mathbf{C_c}$ – related to the combined effect of age-sex structure of the population and risk to develop disease.

Population of Vladivostok				Population of Primorsky krai			
C_o, %	C_a, %	C_r, %	C_c, %	C_o, %	C_a, %	C_r, %	C_c, %
57,2	21,8	29,4	6,0	61,8	23,0	34,5	4,3

The ASR of ovarian cancer is steadily increasing over time (fig.1 and table 1). For women of Vladivostok city, the ASR was 1,3 times lower than the CIR between 1992 and 1996 and 1,6 times lower between 2007 and 2011. As a result, between 2007 and 2011, among the population of Vladivostok city, the ASR was higher by 10,1% than the average ASR in the RF in 2011(10,7±0,1(‰00), while among the population of Primorsky krai, the ASR was nearly equal to that in the RF. The fact that the CIR was higher than the ASR indicated that there was a standard deviation in the distribution of patients by age towards a greater number of elderly people, and the CIR increased mainly due to population aged 60–69 years (table. 2).

The line of trend in ASR with statistical significance of $p \leq 0,05$ ($r=0,50$) among women of Vladivostok city can be described by the equation:

$$ASR(‰00)=0,17T+8,7.$$

As shown in Fig 1, this line is smoother than CIR. By 2017, in Vladivostok, the ASR is expected to be higher by 9,2% compared to that registered in 2007–2011 (table. 1).

Conclusions. In Primorsky krai, ovarian cancer ranks as the 8-th most prevalent cancer among female population. Ovarian cancer occurs 14,3% times more frequently in women of Vladivostok city than in women of Primorsky krai (excepting Vladivostok), particular evident in women aged over 70, for which incidence is 1,5–1,8 times higher

Between 1992–1996 and 2007–2011, the overall CIR for ovarian cancer increased by 62,9% in women of Primorsky krai and by 56,9% in women of Vladivostok. The overall rise was related to a greater extent to changes in the risk of developing disease and to a lesser extent to the changes in age-sex structure. The highest incidence was observed for the 30–49 age group among women of Primorsky krai and for the 40–49 and 60–69 age groups among women of Vladivostok city.

In 2007–2011 yeas the ASR in women of Vladivostok city was 10,1% higher than the average for the RF in 2011, while it was similar to that in the RF among the rest of the female population of Primorsky krai. The crude incidence rate of ovarian cancer in Vladivostok city is expected to rise by 16,8% by 2017 compared to the period 2007–2011, and it is expected to be 21,5% higher than that in the RF in 2011.

Epidemiologic analysis of ovarian cancer among the female population of Vladivostok city dictates the necessity of ovarian cancer screening and risk factor identification, as well as the development of molecular and biological markers for early detection of cancers, including ovarian cancer.

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