

Analysis of cancer incidence and mortality data in Heilongjiang province cancer registries, China, 2015

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Abstract

Objective In recent years, the rising incidence of cancer has increased patients' living and economic burdens. This study analyzed the incidence and death due to malignant tumors in tumor registries in Heilongjiang province (China) in 2015 to provide a scientific basis for the prevention and treatment of malignant tumors in this province.

Methods Data on tumor incidence and patient deaths were collected from seven tumor registries in Heilongjiang province (China) in 2015. According to the stratification of urban and rural areas and patient sex, the crude, standard, and accumulative rates (0–74 years of age) were calculated. The 2000 China Population Census data and Segi's standard population were used to calculate the age-standardized rates.

Results In 2015, the incidence rate of malignant tumors in Heilongjiang cancer registries was 259.90/100 000. The age-standardized incidence rates in the Chinese and world standard populations were 158.89/100 000 and 155.06/100 000, respectively, with a cumulative incidence rate (0–74 years) of 17.68%. The incidence of malignant tumors in urban areas was 273.55/100 000, while that in rural areas was 220.32/100 000. The incidence of malignant tumors in men was 270.89/100 000, higher than that in women (249.04/100 000). Lung cancer had the highest incidence, followed by breast cancer, liver cancer, colorectal cancer, and thyroid cancer. The mortality rate of malignant tumors in Heilongjiang cancer registries was 164.69/100 000. The age-standardized mortality rates in Chinese and in world standard populations were 95.29/100 000 and 94.35/100 000, respectively, with a cumulative mortality rate (0–74 years) of 10.44%. The mortality rate of malignant tumors in urban areas was 169.51/100 000, while that in rural areas was 150.72/100 000. The mortality rate of malignant tumors in men was 201.64/100 000, higher than that in women (128.21/100 000). Lung cancer had the highest mortality, followed by liver cancer, stomach cancer, colorectal cancer, and breast cancer.

Conclusion Lung, liver, breast, and colorectal cancers were the most common cancers in Heilongjiang province, China, and should be considered the key cancer types for prevention and treatment. Moreover, the incidence of thyroid cancer is increasing, and thus early preventative measures should be implemented.

Key words: tumor registration; incidence; mortality; Heilongjiang province, China

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Rapid economic development in Heilongjiang province (China) in recent years has resulted in significantly improved standards of living. In this province, smoking, excessive drinking, and lack of exercise are the main risk factors for chronic diseases [1]. In addition to the aggravation of aging, malignant tumors have become the main disease affecting the health of residents in Heilongjiang province, China. Tumor registration is an internationally recognized standard method to objectively collect information on the incidence and

death due to tumors in the population, provide data for formulating health plan guidelines and policies, and offer basic theoretical data [2]. The Heilongjiang Cancer Center, Harbin, China is responsible for surveillance of the incidence and mortality of malignant tumors in the province via annual collection, auditing, evaluation, analysis, and timely publication of registration data. The present study assessed data on the incidence and death of malignant tumors in Heilongjiang province, China, in 2015. Following auditing and evaluation, qualified

registry data were selected for analysis and reported as follows.

Materials and methods

Data sources

Nine registries in Heilongjiang province (China) reported data on cancer incidence, death, and the corresponding population database. The study period was January 1, 2015, to December 31, 2015, and included confirmed new cases of malignant tumors (ICD10: C00.0–C97, D45–D47) and benign tumors of the central nervous system (ICD10: D32.0–D33.9). Deaths due to malignant tumors recorded in the cancer registries during the study period were also obtained.

Quality evaluation

According to the Guidelines for Cancer Registration in China (2016)^[3], the Cancer Incidence in Five Continents Volume IX, and the requirements for registration of the International Cancer Research Center/International Association for Cancer Registration^[4–5], statistical software was used to examine and evaluate the data. The integrity, validity, and timeliness of the data were evaluated by main indicators such as percentage of morphologically verified cases (MV%), percentage of death certificates only (DCO%), and mortality-to-incidence ratio (M/I).

The quality evaluation criteria of the cancer registration data received by the National Cancer Center in China were 55% < MV% < 95%, 0.55% < M/I < 0.85, and DCO% < 20%. The data reported in the present study were assessed and audited according to these requirements. A total of seven cancer registration areas were included, including four urban areas (Nangang District, Harbin City; Xiangfang District, Harbin City; Daoli District, Harbin City; and Mudanjiang City) and three rural areas (Shangzhi City, Boli County, and Hailin City).

The seven cancer registration areas included 4 985 087 registered residents (2 476 644 men and 2 508 443 women), of which 3 706 516 were in urban areas and 1 278 571

in rural areas, accounting for 13.12% of the registered population in Heilongjiang province (China) in 2015. The total MV%, DCO%, and M/I of cancer registration areas in Heilongjiang province (China) were 78.98%, 2.01%, and 0.63, respectively. These indicators suggested that the data had good integrity and reliability.

Statistical analysis

Crude incidence and mortality, sex- and age-specific incidences and mortalities, age-standardized rates (ASR), and cumulative and truncated rates were analyzed. The top 10 malignant tumors in morbidity and mortality were described. Segi's world population and the China 2000 Population census data were used as the population standards.

Results

Incidence of malignant tumors

In 2015, the crude incidence of malignant tumors was 259.90/100 000 (270.89/100 000 men and 249.04/100 000 women), while the age-standardized incidence rates in Chinese standard (ASIRC) and world standard (ASIRW) populations were 158.89/100 000 and 155.06/100 000 respectively, with a cumulative rate (0–74 years of age) of 17.68%.

The crude incidence of malignant tumors in urban cancer registration areas was 273.55/100 000 (283.89/100 000 men and 263.54/100 000 women), while the ASIRC and ASIRW were 160.32/100 000 and 156.41/100 000 respectively, corresponding to a cumulative rate (0–74 years) of 17.95%. The crude incidence of malignant tumors in rural cancer registration areas was 220.32/100 000 (234.67/100 000 men and 205.30/100 000 women). The ASIRC and ASIRW were 156.42/100 000 and 152.72/100 000, respectively, and the cumulative rate (0–74 years) was 16.97%. Compared to that in rural areas, the total incidence among men and women in urban areas was higher than that in rural areas (Table 1).

Table 1 Incidence of malignant tumors in Heilongjiang province, China, 2015

Area	Gender	New cases	Cruded incidence (1/10 ⁵)	ASIRC (1/10 ⁵)	ASIRW (1/10 ⁵)	Cumulative rate (0–74) (%)
Total	Both	12956	259.90	158.89	155.06	17.68
	Male	6709	270.89	169.35	168.46	19.89
	Female	6247	249.04	151.30	144.57	15.85
Urban	Both	10139	273.55	160.32	156.41	17.95
	Male	5174	283.89	170.74	169.75	20.20
	Female	4965	263.54	153.51	146.72	16.21
Rural	Both	2817	220.32	156.42	152.72	16.97
	Male	1535	234.67	167.03	166.52	19.26
	Female	1282	205.30	146.30	139.41	14.72

Age-specific morbidity

In 2015, the incidence of malignant tumors in Heilongjiang cancer registries increased slowly in patients less than 25 years of age and rapidly in those older than 25 years of age. Among those 15–50 years of age, the incidence of malignant tumors in women was higher than that in men. After 55 years of age, the incidence of malignant tumors in men was higher than that in women (Fig. 1).

Incidence of major cancers

In 2015, lung cancer had the highest overall incidence among tumor registries in Heilongjiang province (China), with a crude incidence of 60.32/100 000 and accounting for 23.21% of all new malignant tumor cases. This was followed by breast, liver, colorectal, thyroid, stomach, cervical, ovarian, corpus uteri, and pancreatic cancer. Lung cancer had the highest incidence in urban areas, with a crude incidence of 61.94/100 000, accounting for 22.65% of all new malignant tumor cases, followed by breast, colorectal, liver, thyroid, stomach, cervical, ovarian, prostate, and pancreatic cancers. Lung cancer also was the most common cancer in rural areas, with a crude incidence of 55.61/100 000, accounting for 25.24% of all new malignant tumor cases, followed by liver, breast, colorectal, stomach, cervical, thyroid, corpus uteri, ovarian, and pancreatic cancers (Table 2).

Mortality of malignant tumors

In 2015, the crude mortality rate of malignant tumors among Heilongjiang cancer registries was 164.69/100 000, with age-standardized mortality rates in Chinese (ASMRC) and in world (ASMRW) standard populations of 95.29/100 000 and 94.35/100 000 respectively, and cumulative rate (0–74 years) of 10.44%. The crude mortality rate of malignant tumors in urban areas was 169.51/100 000, with ASMRC and ASMRW of 92.20/100 000 and 91.71/100 000 respectively

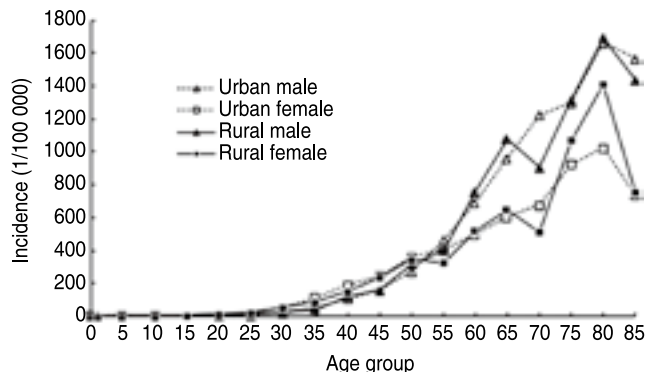


Fig. 1 Age-specific incidence of malignant tumors among cancer registries in Heilongjiang province, China

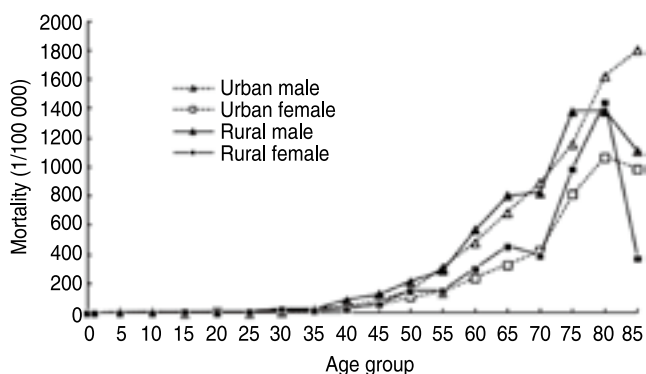


Fig. 2 Age-specific mortality of malignant tumors in cancer registries of Heilongjiang province, China

and cumulative rate (0–74 years) of 10.12%. In rural areas, the crude mortality rate of malignant tumors was 150.72/100 000, with ASMRC and ASMRW of 106.32/100 000 and 103.72/100 000 respectively, and cumulative rate (0–74 years) of 11.58% (Table 3).

Table 2 Incidences of the top 10 types of cancer, Heilongjiang province, China, 2015

Rank	Both			Urban			Rural					
	Site	Incidence (1/10 ⁵)	Proportion (%)	ASIRC (1/10 ⁵)	Site	Incidence (1/10 ⁵)	Proportion (%)	ASIRC (1/10 ⁵)	Site	Incidence (1/10 ⁵)	Proportion (%)	ASIRC (1/10 ⁵)
1	Lung	60.32	23.21	34.64	Lung	61.94	22.65	33.75	Lung	55.61	25.24	38.29
2	Breast	47.04	9.15	29.75	Breast	53.56	9.99	32.76	Liver	35.27	16.01	24.95
3	Liver	27.44	10.56	16.31	Colorectum	30.16	11.03	16.77	Breast	27.38	6.11	19.40
4	Colorectum	26.74	10.29	15.57	Liver	24.74	9.04	13.87	Colorectum	16.82	7.63	11.50
5	Thyroid	18.39	7.08	13.73	Thyroid	20.34	7.44	15.14	Stomach	13.92	6.32	9.66
6	Stomach	17.55	6.75	10.15	Stomach	18.80	6.87	10.29	Cervix	13.29	2.95	9.74
7	Cervix	13.91	2.69	8.61	Cervix	14.12	2.62	8.27	Thyroid	12.75	5.79	9.80
8	Ovary	9.37	1.81	5.92	Ovary	9.77	1.81	5.92	Uterus corpus	11.85	2.63	8.27
9	Uterus corpus	9.09	1.76	5.74	Prostate	9.55	1.72	5.26	Ovary	8.17	1.81	5.98
10	Pancreas	8.47	3.26	4.80	Pancreas	8.66	3.17	4.66	Pancreas	7.90	3.59	5.35

Age-specific mortality

In 2015, the mortality of malignant tumors in the tumor registries of Heilongjiang province (China) increased slowly before the age of 30 and rapidly thereafter. The mortality among men was higher than that among women (Fig. 2).

Mortality of malignant tumors

Lung cancer ranked first among the malignant tumor deaths in the tumor registries of Heilongjiang province, with a crude mortality rate of 56.27/100 000 and accounting for 34.17% of all malignant tumor death cases. This was followed by liver, stomach, colorectal, breast, pancreatic, esophageal, ovarian, cervical, and prostate cancers. Lung cancer ranked highest among deaths due to malignant tumors in urban areas, with a crude mortality rate of 57.98/100 000, followed by liver, colorectal, gastric, breast, pancreatic, ovarian, esophageal, cervical, and prostate cancers. Lung cancer was the leading cause of cancer mortality in rural areas, with a crude mortality rate of 51.31/100 000, followed by liver, gastric, colorectal, breast, pancreatic, esophageal, cervical, ovarian, and brain cancers (Table 4).

Discussion

With the rapid development of science in recent years, we have gradually determined the underlying causes of cancer development and innovative cancer treatment schemes have gradually emerged; however, the burden of cancer is still relatively heavy [6]. From 2011 to 2015, the hospitalization medical expenses of cancer patients in China increased by 84.1%. In 2015, the expenses reached 177.1 billion yuan, accounting for 4.3% of total health expenses. Cancer has become the most important public health problem in China and currently faces significant challenges and economic burdens [7]. Therefore, promotion of the coverage of cancer registration in our province, building of a data platform for cancer, promotion of data exchange and sharing with cancer-related monitoring systems, and understanding of the dynamics of cancer incidence in our province will allow not only targeted prevention and control efforts but also provide a theoretical basis for cancer health prevention and control. In the 1980s, Heilongjiang province (China) initiated population-based cancer registries in the Nangang District of Harbin City, China. In 2009, with

Table 3 Cancer mortalities in Heilongjiang province, China, 2015

Areas	Gender	Deaths	Cruded mortality (1/10 ⁵)	ASMRC (1/10 ⁵)	ASMRW (1/10 ⁵)	Cumulative rate (0–74) (%)
Total	Both	8210	164.69	95.29	94.35	10.44
	Male	4994	201.64	123.03	122.85	14.03
	Female	3216	128.21	70.42	68.75	7.23
Urban	Both	6283	169.51	92.20	91.71	10.12
	Male	3777	207.24	120.18	120.47	13.76
	Female	2506	133.02	68.04	66.76	6.99
Rural	Both	1927	150.72	106.32	103.72	11.58
	Male	1217	186.05	132.02	130.37	14.97
	Female	710	113.70	80.37	76.89	8.15

Table 4 Mortality due to the top 10 types of cancer, Heilongjiang province, China, 2015

Rank	Both			Urban			Rural					
	Site	Mortality (1/10 ⁵)	Proportion (%)	ASMRC (1/10 ⁵)	Site	Mortality (1/10 ⁵)	Proportion (%)	ASMRC (1/10 ⁵)	Site	Mortality (1/10 ⁵)	Proportion (%)	ASMRC (1/10 ⁵)
1	Lung	56.27	34.17	36.92	Lung	57.98	34.20	30.94	Lung	51.31	34.04	35.86
2	Liver	25.20	15.30	16.49	Liver	23.18	13.67	12.85	Liver	31.05	20.60	21.96
3	Stomach	13.78	8.37	9.06	Colorectum	15.30	9.02	7.96	Stomach	12.28	8.15	8.54
4	Colorectum	13.60	8.26	8.91	Stomach	14.30	8.44	7.59	Colorectum	8.68	5.76	6.02
5	Breast	10.29	3.15	6.44	Breast	11.52	3.45	6.51	Breast	6.57	2.18	4.21
6	Pancreas	8.45	5.13	5.48	Pancreas	9.23	5.44	4.92	Pancreas	6.18	4.10	4.16
7	Esophagus	5.54	3.36	3.56	Ovary	5.84	1.75	3.36	Esophagus	6.02	4.00	4.06
8	Ovary	5.26	1.61	3.39	Esophagus	5.37	3.17	2.88	Cervix	4.80	1.56	3.56
9	Cervix	4.50	1.38	2.81	Cervix	4.41	1.32	2.36	Ovary	3.52	1.14	2.43
10	Prostate	3.15	0.95	2.28	Prostate	3.73	1.08	1.95	Brain, CNS	2.82	1.87	2.09

Note: CNS: central nervous system

support from central financial transfer payments, the coverage of cancer registration in Heilongjiang province has gradually expanded. The seven cancer registries included in the present study cover 13.12% of the total population of the province. Thus, the results reflect the current epidemic of malignant tumors in Heilongjiang province to a certain extent.

In 2015, the incidence of malignant tumors in the tumor registries in Heilongjiang province was 259.90/100 000. The ASIRW was 155.06/100 000, lower than the national average incidence (285.83/100 000) and ASIRW (186.39/100 000) in 2015^[8]. Compared to the 2014 data in this province (incidence of 263.62/100 000 and ASIRW of 156.41/100 000)^[9], the incidence decreased slightly. Compared to 2014, ovarian cancer increased by one ranking while corpus uteri cancer decreased by one ranking, with the order of the other cancers remaining unchanged. The incidence of tumors in urban areas was higher than that in rural areas, with significant differences in the rankings of cancer types between urban and rural areas. In 2015, the mortality rate of malignant tumors among the tumor registries in Heilongjiang province was 164.69/100 000 with an ASMRW of 94.35/100 000, lower than the national average mortality rate and ASMRW in 2015 of 170.05/100 000 and 105.84/100 000, respectively. Compared to the data in 2014 (mortality 168.562/100 000 and ASMRW 100.972/100 000), the mortality rate was slightly reduced. The crude mortality rate in urban areas of Heilongjiang province was much higher than that in rural areas, while the standardized mortality rate was lower than that in rural areas, indicating that mortality rate of the elderly population in urban areas was higher while the adjusted mortality rate of the standard population was lower. Thus, the proportion of the elderly population in urban areas was larger than that in the standard population.

Lung, liver, and colorectal cancer are the most common malignant tumors in Heilongjiang province and are the focus of prevention and treatment efforts. In recent years, comprehensive prevention and treatment of cancer, early diagnosis and treatment of urban cancer, and early diagnosis and treatment of upper gastrointestinal cancer in rural areas have been taken up as key projects in our province. Standardization of early diagnosis and treatment of cancer and increased support for the early diagnosis and treatment of the key cancer species and high-risk groups are critical^[10–11]; however, the high population base and increases in adverse behavioral, environmental, and dietary factors in recent years mean that there is still a long way to go in cancer prevention and control in this province^[12–13].

Among the 31 provinces, cities, and autonomous regions in China, Heilongjiang province has the highest proportion of cancer deaths attributable to 23

carcinogenic factors (52.9%), while Shanghai has the lowest proportion (35.2%)^[14]. External carcinogenic factors play an important role in the progress of cancer in Heilongjiang province. Therefore, we should formulate adaptive preventive and control measures according to the main carcinogenic factors. Effective control of these carcinogenic factors will significantly reduce the cancer burden in our province. Mortality due to breast, ovarian, and cervical cancer are among the top 10 and should be of concern to the administrative department of public health in our province. It is also an important task for future cancer prevention and treatment. Human papillomavirus (HPV) infection is a major risk factor for cervical cancer. Ovarian cancer is located in the pelvic cavity, a deep location in which this disease is not easy to find; thus, it is necessary to increase women's health care consciousness to develop good habits and customs; avoid unnecessary intake of exogenous estrogen; reduce intake of fatty food; educate women about breast cancer and prevention of tumors of the female reproductive system; and strive for early detection, diagnosis, and treatment^[15–16].

In conclusion, the task of prevention and control of malignant tumors in Heilongjiang province is significant and poses new challenges. Realization of the goals of cancer prevention and control plans such as the Outline of the Health China 2030 Program requires the formulation of comprehensive cancer prevention and control strategies according to the current high incidence of cancer in Heilongjiang province. The network system for cancer prevention and control in this province should adopt health care, health education and health promotion, popularization of cancer prevention and treatment knowledge, improvement of unhealthy lifestyles, and exploration and development of opportunistic screening to reduce the cancer burden among residents.

Conflicts of interest

The authors indicate no potential conflicts of interest.

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