Cancer incidence and mortality in Zhejiang Province, Southeast China, 2016: a population-based study

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Abstract

Backgrounds: Cancer is one of the main causes of death worldwide, seriously threatening human health and life expectancy. We aimed to analyze the cancer incidence and mortality rates during 2016 in Zhejiang Province, Southeast China.

Methods: Data were collected from 14 population-based cancer registries across Zhejiang Province of China. Cancer incidence and mortality rates stratified by sex and region were analyzed. The crude rate, age-standardized rate, age-specific and region-specific rate, and cumulative rate were calculated. The proportions of 10 common cancers in different groups and the incidence and mortality rates of the top five cancers in different age groups were also calculated. The Chinese national census of 2000 and the world Segi population was used for calculating the age-standardized incidence and mortality rates.

Results: The 14 cancer registries covered a population of 14,250,844 individuals, accounting for 29.13% of the population of Zhejiang Province. The total reported cancer cases and deaths were 55,835 and 27,013, respectively. The proportion of morphological verification (MV%) was 78.95% of the population, and percentage of incident cases identified through death certificates only (DCO%) was 1.23% with a mortality-to-incidence ratio (M/I ratio) of 0.48. The crude incidence rate in Zhejiang cancer registration areas was $391.80/10^5$; the age-standardized incidence rate of the Chinese standard population (ASIRC) and the age-standardized incidence rate of the world standard population (ASIRW) were $229.76/10^5$ and $220.96/10^5$, respectively. The incidence rate in men was higher than that in women. The incidence rate increased rapidly after 45 years of age and peaked in individuals aged 80 to 84 years. The top 10 incidence rates of cancers were lung cancer, female breast cancer, thyroid cancer, colorectal cancer, stomach cancer, liver cancer, prostate cancer, cervical cancer, esophageal cancer, and pancreatic cancer (from highest to lowest). The crude mortality rate in Zhejiang cancer registration areas was $189.55/10^5$; the age-standardized mortality rate of the Chinese standard population (ASMRC) and the age-standardized mortality rate of the world standard population (ASMRW) were $94.46/10^5$ and $93.42/10^5$, respectively. The mortality rate in men was higher than that in women, and the male population in rural areas was higher than that in urban areas. The cancer mortality rate increased rapidly after 50 years of age and peaked in individuals aged 85+ years. The top 10 mortality rates of cancers were lung cancer, liver cancer, stomach cancer, colorectal cancer, pancreatic cancer, esophageal cancer, female breast cancer, prostate cancer, lymphoma, and leukemia (from highest to lowest).

Conclusions: Lung cancer, female breast cancer, thyroid cancer, colorectal cancer, prostate cancer, liver cancer, and stomach cancer were the most common cancers in Zhejiang Province. Effective prevention and control measures should be established after considering the different characteristics of cancers in urban and rural areas.

Keywords: Cancer registration; Incidence; Malignant tumor; Mortality; Death certificates; Zhejiang Province

Introduction

Presently, cancer is one of the main causes of death worldwide, seriously threatening human health and life expectancy.[1] Population-based cancer registration, which is fundamental for cancer prevention and control, is a system for collecting, storing, organizing, statistically analyzing, and evaluating cancer incidence, mortality, and survival data in a unified and standardized manner.[2] Population-based cancer registration can be used to evaluate the magnitude of the cancer burden and its

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probable future evolution; provide a basis for research on cancer causes and prevention; get clues as to the prevalence of underlying risk factors for cancer; and monitor the effects of programs on cancer prevention, early detection or screening, treatment, and palliative care.[3-5] Zhejiang Province is one of China's most economically developed provinces and is located on the country's southeastern coast. Zhejiang Provincial Office for Cancer Prevention and Control is responsible for the registration of cancer cases in Zhejiang Province and the public release of cancer incidence and mortality rates in Zhejiang registration areas. In recent years, the number of cancer registries in Zhejiang Province has increased, the cancer registration system has greatly improved, and the data quality has also steadily improved over time. In 2019, the Zhejiang Provincial Office for Cancer Prevention and Control collected cancer data from 2016 reported by 14 cancer registries. This article sorts and analyzes the incidence and mortality data of cancers to provide scientific evidence for cancer prevention and control in Zhejiang Province, Southeast China.

Methods

Data sources

By December 31, 2019, the 2016 cancer data from 14 population-based cancer registries (five urban registries: Hangzhou, Yinzhou, Lucheng, Jiaxing, and Shangyu; nine rural registries: Cixi, Jiashan, Haining, Changxing, Yongkang, Kaihua, Daishan, Xianju, and Longquan) in Zhejiang Province were available. In 2016, the 14 cancer registries covered a population of 14,250,844 individuals (including 7,101,223 men and 7,149,621 women; 9,553,364 in urban areas and 4,697,480 in rural areas), representing approximately 29.13% of the registered population in Zhejiang Province.

Data were collected from hospitals and community health centers, including the New Rural Cooperative Medical System and the Basic Medical Insurances for Urban Residents. The All-Death Surveillance System was linked with the cancer incidence database for identifying cases with death certificates only (DCO) and passive follow-ups. Unique identification numbers of individuals are required for case ascertainment and data linkage. The Zhejiang Provincial Office for Cancer Prevention and Control was responsible for cancer data collection, evaluation, and analysis from local population-based cancer registries. Although cancer site information is available through codes from both the International Classification of Diseases for Oncology, 3rd revision (ICD-O-3), and the International Classification of Diseases, 10th revision (ICD-10), we have reported incidence data using the ICD-10 classification for consistency, with mortality data that were only available in the ICD-10 classification.[2]

Quality control

Data were checked and evaluated by the Zhejiang Provincial Office for Cancer Prevention and Control according to the "Guidelines for Chinese Cancer Registration"[6] and the "Cancer Incidence in Five Continents Volume IX"[7] by International Agency for Research on Cancer (IARC)/International Agency for Cancer Registry (IACR).[8,9] Microsoft Excel software and IARC-crgTools (version 2.05, Ferly, IARC/IACR) were used for data collection, sorting, checking, and evaluation. The proportion of morphological verification (MV%), the percentage of cancer cases identified with DCO%, the mortality-to-incidence ratio (M/I ratio), and the percentage of the diagnosis of unknown basis (UB%) were used to evaluate the completeness, validity, and comparability of the data.

Statistical analysis

The incidence or mortality rates were calculated as the annual number of new cancer cases or death cases per million person-year and further stratified by area (urban/rural), sex (male/female), and age (<1 years, 1–4 years, 5–84 years by 5 years, and ≥85 years). The fifth Chinese national census of 2000 and the world Segi's population were used for age-standardized rates.[10,11] The cumulative risk of developing or dying from cancer before 75 years of age (in the absence of competing causes of death) was calculated and presented as a percentage. SAS software (version 9.4, SAS Inc., Cary, NC, USA) and Microsoft Excel software were used for statistical analysis.

Results

Data quality

After data cleaning and evaluation, the cancer information from 14 population-based cancer registries (five in urban areas and nine in rural areas) were included for analysis. The data quality indicators MV%, M/I ratio, DCO%, and UB% were 78.95%, 0.48, 1.23%, and 0.24%, respectively [Supplementary Digital Content, Table 1, http://links.lww.com/CM9/A704]. The data submitted by the 14 cancer registries in Zhejiang Province adhered to the inclusion criteria of the "China Cancer Registration Annual Report", suggesting that the data reported by the Zhejiang Cancer Registration Area in 2016 had completeness and reliability.

Incidence

There were 55,835 new cancer cases (29,433 men and 26,402 women) diagnosed in Zhejiang registration areas in 2016. The crude incidence rate was 391.80/10^5 (414.48/10^5 in men and 369.28/10^5 in women). The age-standardized incidence rate by the Chinese standard population (ASIRC) was 229.76/10^5 and the age-standardized incidence rate by the world standard population (ASIRW) was 220.96/10^5, respectively. Among the patients aged 0 to 74 years, the cumulative rate was 24.86%. The incidence rate in men was 1.12 times higher than that in women. Meanwhile, the incidence rate in urban areas was higher than that in rural areas. The incidence data are summarized in Table 1.

Age-specific incidence rate

The cancer incidence rate increased with age. The age-specific incidence rate was relatively low in subjects

Table 1: Cancer incidence in Zhejiang cancer registries, 2016.

Area	Gender	Cases	Incidence ($1/10^5$)	ASIRC ($1/10^5$)	ASIRW ($1/10^5$)	Cumulative rate (%)
All	Both	55,835	391.80	229.76	220.96	24.86
	Male	29,433	414.48	230.70	226.76	26.55
	Female	26,402	369.28	229.76	216.35	23.21
Urban	Both	38,192	399.78	234.93	225.09	25.22
	Male	19,758	416.21	230.26	225.89	26.43
	Female	18,434	383.54	240.22	225.22	24.06
Rural	Both	17,643	375.58	218.97	212.54	24.11
	Male	9675	410.99	231.71	228.84	26.79
	Female	7968	340.02	207.74	197.98	21.45

ASIRC: Age-standardized incidence rate by the Chinese standard population; ASIRW: Age-standardized incidence rate by the world standard population (Segi population).

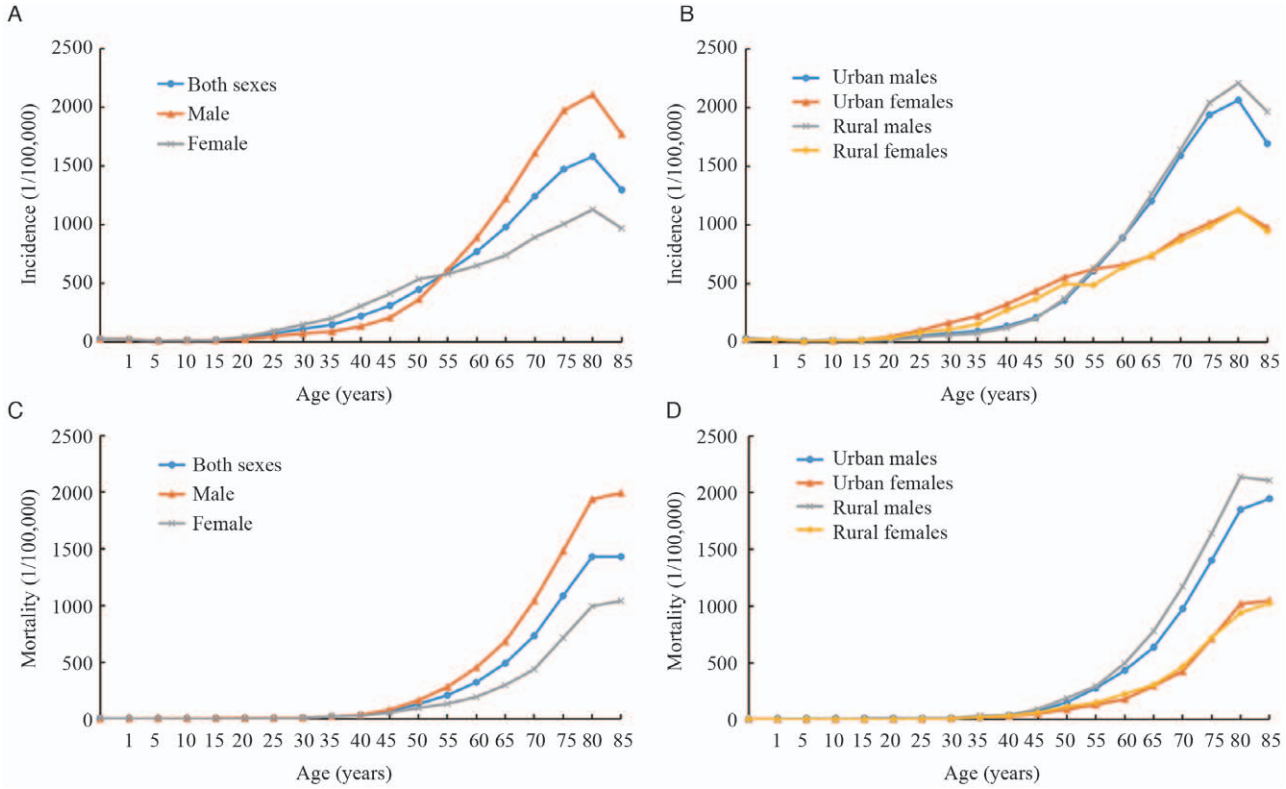

Figure 1: Age-specific incidence and mortality for all cancers in Zhejiang cancer registries, 2016. (A) Incidence in males and females. (B) Incidence in urban and rural areas. (C) Mortality in males and females. (D) Mortality in urban and rural areas.

younger than 44 years. It increased sharply in subjects older than 45 years and peaked in individuals aged 80 to 84 years ($1579.37/10^5$). The incidence rate of men was lower than that of women in the 5 to 54-year-old age group, whereas the incidence rates in the other male age groups were higher than those in the female age groups [Figure 1A].

The change trends of the age-specific incidence rate were quite similar between urban and rural areas. The male incidence rates in rural areas between 1 year and 14 years and between 50 years and ≥85 years were higher than those in urban areas, whereas the female incidence rates in urban areas were slightly higher than those in rural areas, except for 1–4-, 10–19-, and 65 to 69-year-old age groups. The age-specific incidence rate peaked in the 80–84-year-old age group both in urban and rural areas [Figure 1B].

Region-specific incidence rate

Among the 14 cancer registries, Daishan had the highest crude incidence rate of $597.37/10^5$ and Kaihua had the lowest crude incidence rate of $289.18/10^5$. After age standardization, Jiashan had the highest ASIRC of $274.79/10^5$ and Haining had the lowest ASIRC of $189.86/10^5$, whereas Daishan had the highest ASIRW of $282.88/10^5$ and Haining had the lowest ASIRW of $182.10/10^5$ [Supplementary Digital Content, Table 2, http://links.lww.com/CM9/A704].

Table 2: Cancer mortality in Zhejiang cancer registries, 2016.

Area	Gender	Deaths	Mortality (1/10^5)	ASMRC (1/10^5)	ASMRW (1/10^5)	Cumulative rate (0–74)(%)
All	Both	27,013	189.55	94.46	93.42	10.28
	Male	17,676	248.91	127.20	126.35	14.10
	Female	9337	130.59	63.17	62.03	6.51
Urban	Both	17,639	184.64	90.43	89.53	9.75
	Male	11,420	240.57	120.65	120.17	13.30
	Female	6219	129.39	61.56	60.31	6.26
Rural	Both	9374	199.55	102.71	101.40	11.36
	Male	6256	265.75	140.73	139.19	15.71
	Female	3118	133.05	66.36	65.48	7.01

ASMRC: Age-standardized mortality rate by the Chinese standard population; ASMRW: Age-standardized mortality rate by the world standard population (Segi population).

Mortality

There were 27,013 cancer deaths (17,676 men and 9,337 women) in Zhejiang cancer registration areas in 2016. The crude mortality rate was 189.55/10^5 (248.91/10^5 in men and 130.59/10^5 in women). The age-standardized mortality rate of the Chinese population (ASMRC) and age-standardized mortality rate of the world population (ASMRW) were 94.46/10^5 and 93.42/10^5, respectively. Among the patients aged 0 to 74 years, the cumulative rate was 10.28%. The mortality rate in men was 1.91 times higher than that in women. Meanwhile, the mortality rate in rural areas was higher than that in urban areas. The mortality data are summarized in Table 2.

Age-specific mortality rate

The cancer mortality rate increased with age. The mortality rate of cancer was low in subjects younger than 49 years. The rate dramatically increased in individuals older than 50 years and peaked in the ≥85-year-old age group (1430.74/10^5). The mortality rate in men was higher than that in women, except for <1- and 35 to 39-year-old age groups [Figure 1C].

The male age-specific mortality rate in urban areas was relatively lower than that in rural areas, except for 0–9-, 15–24-, and 30 to 34-year-old age groups. Meanwhile, the female age-specific mortality rates in urban and rural areas were similar [Figure 1D].

Region-specific mortality rate

Among the 14 cancer registries, Daishan had the highest crude mortality rate of 292.22/10^5 and Kaihua had the lowest crude mortality rate of 156.67/10^5. After age standardization, Daishan had the highest ASMRC of 122.35/10^5 and Haining had the lowest ASMRC of 82.36/10^5, whereas Changxing had the highest ASMRW of 121.76/10^5 and Haining had the lowest ASMRW of 80.03/10^5 [Supplementary Digital Content, Table 3, http://links.lww.com/CM9/A704].

Incidence rates of the 10 most common cancers

Lung cancer was the most common cancer, followed by cancers of the female breast, thyroid, colorectum, and stomach in Zhejiang cancer registration areas in 2016. The top 10 most common cancers accounted for 77.87% of all cancers. In men, lung cancer was the most common cancer, followed by cancers of the colorectum, stomach, liver, and prostate. The top 10 most common cancers accounted for 83.66% of all cancers in men. In women, thyroid cancer was the most common cancer, followed by cancers of the lung, breast, colorectum, and stomach. The top 10 most common cancers accounted for 82.39% of all cancers in women [Table 3, Figure 2A].

In urban areas, lung cancer was the most common cancer, followed by cancers of the female breast, thyroid, colorectum, and stomach in 2016. The top 10 most common cancers accounted for 77.92% of all cancers [Supplementary Digital Content, Table 4, http://links.lww.com/CM9/A704]. In rural areas, lung cancer was the most common cancer, followed by cancers of the female breast, colorectum, stomach, and liver in 2016. The top 10 most common cancers accounted for 77.78% of all cancers [Supplementary Digital Content, Table 5, http://links.lww.com/CM9/A704].

Mortality rates of the 10 leading causes of cancer death

Lung cancer was the leading cause of cancer death, followed by cancers of the liver, stomach, colorectum, and pancreas in Zhejiang cancer registration areas in 2016. The top 10 leading causes of cancer death accounted for 82.77% of all cancer deaths. In men, lung cancer was the leading cause of cancer death, followed by cancers of the liver, stomach, colorectum, and esophagus. The top 10 most common cancers accounted for 88.58% of all cancers in women. In women, lung cancer was also the leading cause of cancer death, followed by cancers of the colorectum, liver, stomach, and pancreas. The top 10 most common cancers accounted for 80.03% of all cancers in women [Table 4, Figure 2B].

In urban areas, lung cancer was the leading cause of cancer death, followed by cancers of the liver, stomach, colorectum, and pancreas in 2016. The top 10 most common cancers accounted for 82.44% of all cancers [Supplementary Digital Content, Table 6, http://links.lww.com/CM9/A704]. In rural areas, lung cancer was also the leading cause of cancer death, followed by cancers of the liver, stomach, colorectum, and esophagus in 2016. The top 10

Table 3: The top 10 cancer incidence in Zhejiang cancer registries, 2016 (1/10^5).

Rank	Total				Male				Female			
	Site	Incidence	ASIRC	ASIRW	Site	Incidence	ASIRC	ASIRW	Site	Incidence	ASIRC	ASIRW
1	Lung	81.55	42.61	42.40	Lung	104.83	54.32	54.45	Thyroid	69.35	55.58	48.19
2	Breast	56.16	36.55	34.12	Colorectum	49.26	26.20	25.87	Lung	58.42	31.35	30.82
3	Thyroid	45.26	37.15	31.87	Stomach	45.92	24.02	23.80	Breast	56.16	36.55	34.12
4	Colorectum	41.75	21.92	21.55	Liver	41.46	23.09	22.80	Colorectum	34.30	17.74	17.34
5	Stomach	33.07	17.30	16.97	Prostate	26.85	13.14	13.02	Stomach	20.31	10.79	10.37
6	Liver	27.69	15.06	14.89	Thyroid	21.01	18.47	15.40	Cervix	20.11	14.08	12.68
7	Prostate	26.85	13.14	13.02	Esophagus	20.53	10.46	10.62	Liver	14.01	7.16	7.09
8	Cervix	20.11	14.08	12.68	Pancreas	13.74	7.05	7.02	Brain, CNS	12.06	7.98	7.71
9	Esophagus	12.06	6.00	6.08	Lymphoma	12.22	7.51	7.35	Pancreas	10.06	4.75	4.75
10	Pancreas	11.89	5.89	5.87	Bladder	10.91	5.60	5.46	Corpus uteri	9.48	5.81	5.61

ASIRC: Age-standardized incidence rate by the Chinese standard population; ASIRW: Age-standardized incidence rate by the world standard population (Segi population); CNS: Central nervous system.

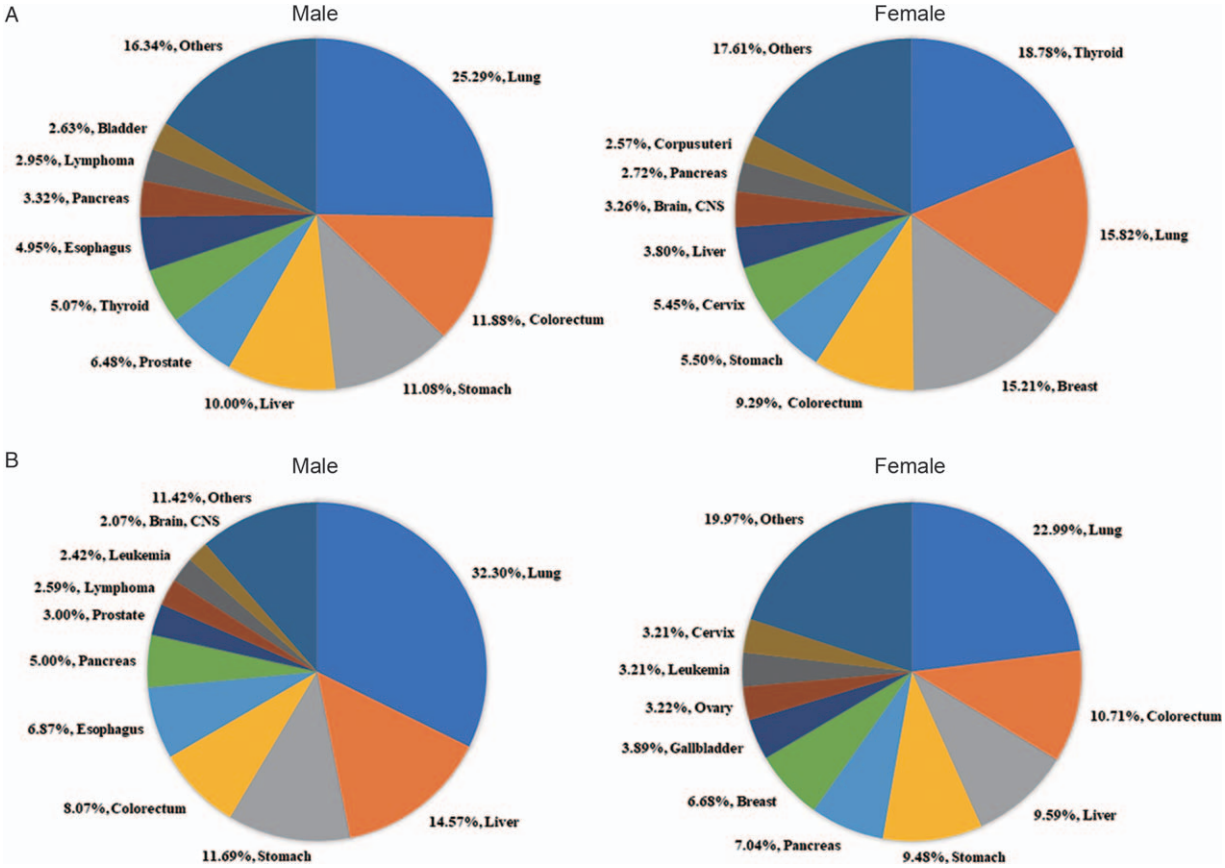

Figure 2: The proportion of top 10 (A) new cases and (B) deaths of cancer in Zhejiang cancer registries (by sex), 2016. CNS: Central nervous system.

most common cancers accounted for 83.55% of all cancers [Supplementary Digital Content, Table 7, http://links.lww.com/CM9/A704].

Incidence and mortality rates of the top five cancers of different age groups

Leukemia was the most common cancer of children aged 0 to 14 years, with an incidence rate of 4.86/10^5, followed by brain cancer, lymphoma, bone cancer, and kidney cancer. Thyroid cancer was the most common cancer in the 15 to 44-year-old age group, with an incidence rate of 46.02/10^5, followed by female breast cancer, cervical cancer, lung cancer, and colorectal cancer. Female breast cancer was the most common cancer in the 45–64-year-old age group, with an incidence rate of 106.66/10^5, followed by lung cancer, thyroid cancer, colorectal cancer, and liver cancer. Lung cancer was the most common cancer in individuals older than 65 years, with an incidence rate of 313.27/10^5, followed by colorectal cancer, prostate cancer, stomach

Table 4: The top 10 cancer mortality in Zhejiang cancer registries, 2016 (1/10^5).

	Total				Male				Female			
Rank	Site	Mortality	ASMRC	ASMRW	Site	Mortality	ASMRC	ASMRW	Site	Mortality	ASMRC	ASMRW
1	Lung	55.13	26.71	26.50	Lung	80.41	40.14	39.98	Lung	30.03	13.86	13.63
2	Liver	24.36	12.81	12.64	Liver	36.28	19.86	19.63	Colorectum	13.99	6.31	6.20
3	Stomach	20.71	10.00	9.74	Stomach	29.09	14.41	14.12	Liver	12.52	5.87	5.75
4	Colorectum	17.02	8.00	7.86	Colorectum	20.08	9.81	9.65	Stomach	12.38	5.83	5.60
5	Pancreas	10.81	5.20	5.16	Esophagus	17.11	8.50	8.54	Pancreas	9.19	4.13	4.10
6	Esophagus	10.34	4.94	4.95	Pancreas	12.45	6.30	6.23	Breast	8.73	4.93	4.74
7	Breast	8.73	4.93	4.74	Prostate	7.46	3.13	3.12	Gallbladder	5.08	2.23	2.20
8	Prostate	7.46	3.13	3.12	Lymphoma	6.45	3.40	3.34	Ovary	4.21	2.25	2.23
9	Lymphoma	5.23	2.69	2.65	Leukemia	6.01	3.95	3.87	Leukemia	4.20	2.46	2.46
10	Leukemia	5.10	3.20	3.16	Brain, CNS	5.15	3.31	3.36	Cervix	4.20	2.37	2.27

ASMRC: Age-standardized mortality rate by the Chinese standard population; ASMRW: Age-standardized mortality rate by the world standard population (Segi population).

cancer, and liver cancer [Supplementary Digital Content, Table 8, http://links.lww.com/CM9/A704].

Brain cancer was the leading cause of cancer death in children aged 0 to 14 years, with a mortality rate of 1.64/10^5, followed by leukemia, liver cancer, lymphoma, and nasopharyngeal cancer. Liver cancer was the leading cause of cancer death in the 15 to 44-year-old age group, with a mortality rate of 2.88/10^5, followed by female breast cancer, leukemia, lung cancer, and colorectal cancer. Lung cancer was the leading cause of cancer death in the 45–64-year-old age group, with a mortality rate of 47.27/10^5, followed by liver cancer, stomach cancer, female breast cancer, and colorectal cancer. Lung cancer was the leading cause of cancer death in individuals older than 65 years, with a mortality rate of 270.05/10^5, followed by stomach cancer, liver cancer, colorectal cancer, and pancreatic cancer [Supplementary Digital Content, Table 9, http://links.lww.com/CM9/A704].

Discussion

According to GLOBOCAN 2020 estimates, there were 19.3 million new cancer cases (10.1 million in men and 9.2 million in women) and 10.0 million cancer deaths (5.5 million in men and 4.4 million in women) worldwide in 2020.[1] The global cancer burden has further increased, and most countries are facing an absolute increase in the number of cancer patients. The IARC has reported that in developed continents such as those in Europe and North America, prostate cancer, lung cancer, and colorectal cancer were the most common cancers in men, whereas breast cancer, lung cancer, colorectal cancer, and thyroid were the most common cancers in women.[1] Based on previous research, in the four cancer registration areas of Zhejiang Province in 2004, the top five most common cancers in men were lung cancer, liver cancer, gastric cancer, esophageal cancer, and colorectal cancer, whereas the top five most common cancers in women were breast cancer, lung cancer, gastric cancer, liver cancer, and colorectal cancer.[12] The results of our study showed that cancers of the lung, colorectum, stomach, liver, and prostate were the most common in men, whereas cancers of the thyroid, lung, breast, colorectum, and stomach were the most common in women. It can be concluded that the number of cancer registries in Zhejiang Province has increased significantly over the past decade, and the order of common cancers has changed. Prostate cancer ranks in the top five cancers in men, and thyroid cancer has jumped to the most common cancer in women. Furthermore, the incidence rates of lung cancer, female breast cancer, and colorectal cancer were high, and the incidence rates of liver cancer and esophageal cancer have declined. Presently, the cancer spectrum in Zhejiang Province is typical of that of developing countries with a high incidence rate of digestive system neoplasms such as liver cancer, stomach cancer, and esophageal cancer. It also has the characteristics of western countries with a high rate of prostate cancer and thyroid cancer. It suggested that the cancer spectrum in Zhejiang Province showed "westernization of the cancer spectrum" in recent years.

The results in this study showed that the crude incidence rate in Zhejiang cancer registration areas in 2016 was 391.80/10^5, the ASIRC was 229.76/10^5, and the ASIRW was 220.96/10^5. The incidence rate was slightly higher than that in 2015. The crude mortality rate was 189.55/10^5, the ASMRC was 94.46/10^5, and the ASMRW was 93.42/10^5. The mortality rate was slightly lower than that in 2015.[13] Although the type of cancer spectrum in Zhejiang Province was westernized, the ASIRW was far lower than that of developed countries such as Australia (452.4/10^5), the United States (362.2/10^5), France (341.9/10^5), and close to that of Argentina (218.2/10^5), Brazil (215.4/10^5), Cuba (217.1/10^5), and other Latin American countries.[1] The per capita GDP of Zhejiang Province in 2016 was US$12,519,[14] which was similar to the per capita GDP of Latin American countries such as Argentina and Brazil,[15] suggesting that cancer incidence was related to the level of local socioeconomic development.

According to the National Cancer Center, the national crude incidence rate of cancers was 285.83/10^5 and the ASIRW was 186.39/10^5 in 2015; the national crude cancer mortality rate was 170.05/10^5 and the ASMRW was 105.84/10^5.[16] The ASIRW in Zhejiang Province was higher than the national average, but the ASMRW was lower than the national average. The cancer incidence

rate in men in Zhejiang Province was higher than that in women, which was consistent with the results of previous studies.[13,17-22] The incidence and mortality rates rose rapidly after the age of 45 years and peaked in individuals aged 80 to 84 years and ≥85 years, respectively, indicating that the middle-aged and elderly subjects may be at high-risk of cancer development. Cancer prevention and control should be carried out in middle-aged and elderly populations. At the end of 2016, there were 10,361,460 elderly people aged 60 years and older in Zhejiang Province, accounting for 21.10% of the total population, with an increase of 436,160 people over the same period last year.[14] Furthermore, China is currently facing a heavy burden of cancer among the elderly.[23] Therefore, the increase in cancer incidence in Zhejiang Province was related to the aging of the population. On the other hand, it may be related to Zhejiang Province's good economic development. In 2016, Zhejiang Province's per capita GDP ranked fifth among all provinces in China. Furthermore, Zhejiang Province has a high level of cancer diagnosis and a well-developed cancer registration system, and the reporting rate of cancer cases in Zhejiang Province is relatively high. In addition, Zhejiang Province has carried out cancer screening programs since 1977 and has achieved good results.[24] These moves have not only improved the residents' health awareness but also reduced cancer mortality.[25]

This study showed that there were some differences in the cancer burden between urban and rural areas in Zhejiang Province, and the composition of cancers also showed different characteristics. The incidence and mortality rates were higher in rural areas compared to those in urban areas. The explanation may be that urban residents are more aware of cancer prevention than rural residents, whereas in rural areas, the medical care is relatively low and health resources are scarce, leading to late consultations and poor prognoses for patients.[26] Therefore, we should consider regional differences in cancer prevention and control. In economically developed urban areas, increasing the proportion of early diagnosis and treatment should be the focus of cancer prevention and control. Meanwhile, in rural areas with relatively low economic levels, strengthening standardized cancer treatment, improving survival rates, and reducing the mortality rates should be the focus of cancer prevention and control.[27]

Moreover, our study showed that the cancer incidence and mortality rates of children were relatively lower than those of the elderly. The common cancers were also different between children and the elderly. The common cancers of the elderly were lung cancer, colorectal cancer, stomach cancer, and liver cancer, whereas those of children were leukemia, brain cancer, and lymphoma, which is similar to the results of the previous study.[28] The impact of cancers on children's health is more serious than that on adults' health, and cancer is one of the main causes of death in children. Therefore, cancer prevention and control in children require more attention.

However, one potential limitation is that this study was a cross-sectional descriptive study rather than a longitudinal study. It did not provide a comprehensive description of the temporal trend of cancer incidence or mortality in Zhejiang Province. More information, such as survival rate and stage at diagnosis, was not yet available in this study. We will continue to analyze the temporal trend in subsequent researches, which should also be useful for studies of domestic and international comparisons of cancer rates.

In summary, lung cancer, female breast cancer, thyroid cancer, colorectal cancer, prostate cancer, liver cancer, and stomach cancer were the most common cancers in Zhejiang Province. Effective prevention and control measures should be established after considering the different characteristics of cancers in different subpopulations.

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Conflicts of interest

None.

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