

Analysis on the Characteristics of Malignant Tumors treatment in Chongqing (Main Urban Area) from 2020-2021

Cui-e G and Miao H*

Chongqing Key Laboratory of Translational Research for Cancer Metastasis and Individualized Treatment, Chongqing University Cancer Hospital, Chongqing, China

*Corresponding author:

HE Miao,
Basic and clinical gastrointestinal surgery,
Chongqing University Cancer Hospital, 181
Hanyu Road, Shapingba District, Chongqing,
400030, China, Tel: 13996123692;
E-mail: hemiao777777@163.com

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1. Abstract

1.1. Objective: To analyze the characteristics of malignant tumors treatment in Chongqing (main urban area, including 10 million people) from 2020-2021.

1.2. Methods: We collected and analyzed the data of special medical insurance for malignant tumors treatment (reflect malignant tumors treatment directly) in Chongqing (main urban area) managed by the Chongqing University Cancer Hospital from 2020 to 2021.

1.3. Results: From 2020-2021, there were 26003 and 30902 cases of malignant tumor treatment registered in Chongqing (main urban area), respectively, including 13714 and 15613 male cases; 12289 and 15289 female cases. The malignant tumors treatment peaked in male at the age of 60 to 70 years old but peaked in women from the age of 50 years old. The top 5 malignant tumors in males were lung cancer, colorectal cancer, liver cancer, prostate cancer and esophageal cancer; the top 5 in females were lung cancer, breast cancer, thyroid cancer, colorectal cancer and cervical cancer. Among the common malignant tumors, thyroid cancer showed the youngest median age of treatment (42-43 years old); prostate cancer showed the est median age of treatment (73-75 years old). Thyroid cancer was the only common malignant tumor that attacked women more than men besides breast cancer, cervical cancer and ovarian cancer. All other common malignant tumors attacked men more than women. The highest invasion and metastasis rates were showed in ovarian cancer, pancreatic cancer, prostate cancer and lung cancer, and the lowest rates were in thy-

roid cancer and bladder cancer. Compared with the national data of malignant tumors in 2016, the composition ratio of malignant tumors in Chongqing (main urban area) was significantly different with unique characteristics.

1.4. Conclusion: The spectrum of malignant tumors in Chongqing (main urban area) has its own characteristics. The tumor screening in Chongqing should consider the differences in gender, age and composition of common malignant tumors.

2. Introduction

Malignant tumors are serious threats to human health. Each year, malignant tumors attack about 19 million people and cause about 10 million deaths globally; 57% of new cases and 65% of deaths occur in developing countries [1, 2]. Studies have shown that the incidence of malignant tumors is increasing significantly in China [3, 4]. Malignant tumors have become the leading cause of death among Chinese [5].

The onset of malignant tumors may be associated with factors such as genetic mutation, smoking, chronic infections (e.g., helicobacter pylori, hepatitis B virus and human papillomavirus), obesity, unhealthy lifestyle, environmental pollution and occupational exposure[6-9]. Chinese government attaches great importance to tumor prevention and treatment.

Chongqing is the largest municipality in China and a central city in western China. Data of the incidence of malignant tumors in Chongqing have been released intermittently but not in a regular and specific way. This is neither conducive to the development

of Chongqing malignant tumor prevention and treatment program from an overall situation nor the evaluation of effects on the prevention and treatment.

Chongqing University Cancer Hospital undertakes the management and registration of special medical insurance for malignant tumors treatment among Chongqing citizens (main urban area, including 10 million people). These data directly reflect the annual characteristics of malignant tumors treatment in Chongqing urban area (almost all the malignant tumor patients have the special medical insurance in Chongqing main urban area). This paper analyzed the registration data of special medical insurance for malignant tumors treatment in Chongqing (main urban area) from 2020 to 2021 and compared them with the previous data as well as the national data, hoping to provide a theoretical basis for the development of malignant tumor prevention and treatment program in Chongqing.

3. Materials and Methods

3.1. General data

The data of special medical insurance for malignant tumors treatment in Chongqing (main urban area, including 10 million people) registered in Chongqing University Cancer Hospital from 2020 to 2021.

3.2. Methods

The data were collated, organized and statistically analyzed.

3.3. Statistical processing

SPSS 17.0 software was used to compare the composition ratios of common tumors. Count data were expressed as rate / percentage / composition ratio and processed using Chi square test ($\alpha = 0.05$). $P < 0.05$ was considered statistically significant.

4. Results

4.1. Overview

The malignant tumors treatment in Chongqing (main urban area, including 10 million people) from 2020 to 2021 are shown in Table 1, characterized by an annual case increase, more males cases than female ones, a median age of 60 years old, nearly 90% of pathologically confirmed diagnosis and 30% metastasis.

4.2. Age distribution

According to the data, the highest number of malignant tumors treatment was showing in age group of 60-70 years old, followed by age of 50-60 years old, then 70-80 years old. See Figure 1.

The most common age of tumor treatment in male cases was between 60-70 years old, followed by 50-60 years old and 70-80 years old, with similar number of cases. See Figure 2. Among female patients, the most common age was between 50-60 years old, followed by 60-70 years old and 40-50 years old. See Figure 3.

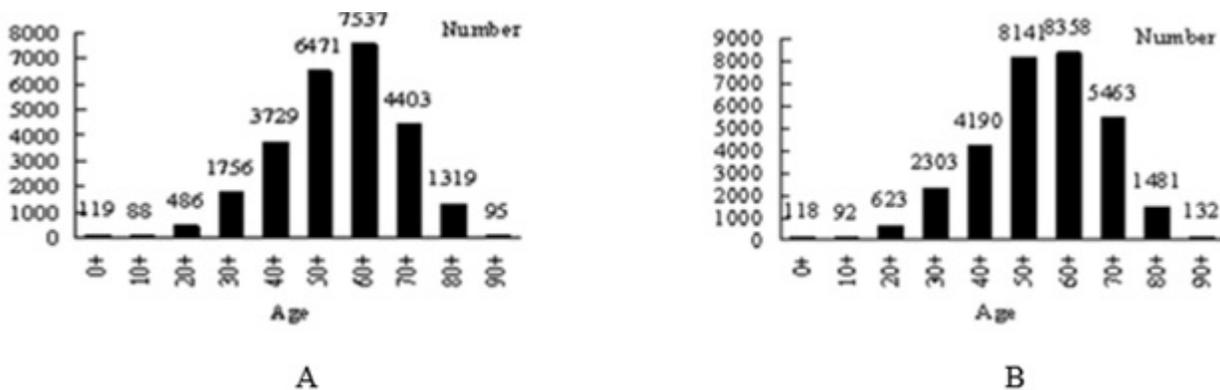


Figure 1: (A) Number of malignant tumors treatment at each age group in 2020; (B) Number of malignant tumors treatment at each age group in 2021

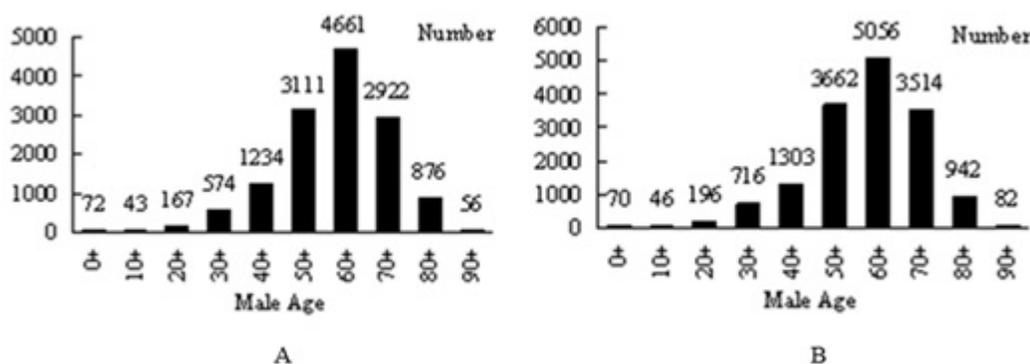


Figure 2: (A) Male cases of malignant tumors treatment at each age group in 2020; (B) Male cases of malignant tumors treatment at each age group in 2021

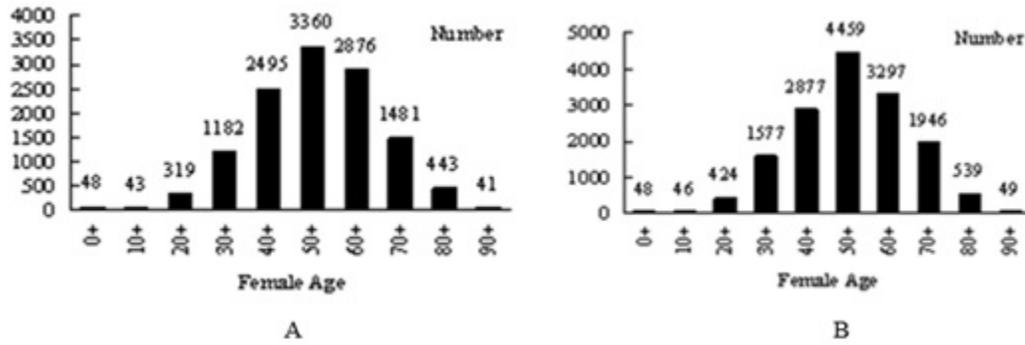


Figure 3: (A) Female cases of malignant tumors treatment at each age group in 2020; (B) Female cases of malignant tumors treatment at each age group in 2021

4.3. Type distribution

In general, the most common malignant tumors were lung cancer, colorectal cancer, breast cancer and thyroid cancer, followed by liver cancer and cervical cancer. Besides, prostate cancer, esophageal cancer, lymphoma and gastric cancer were also stably ranked among the tops. See Table 2. The sum of these 10 types of malignant tumors accounted for 75.3% and 77.1% of the total number of special medical insurance for malignant tumors in Chongqing (main urban area) from 2020 to 2021, respectively.

For men, lung cancer, colorectal cancer, liver cancer, prostate cancer and esophageal cancer were the most common malignant tumors. See Table 3. The sum of these 5 types of malignant tumors accounted for 64.1% and 65.0% of the total male number of malignant tumors from 2020 to 2021, respectively.

While for women, lung cancer, breast cancer, thyroid cancer, cervical cancer, colorectal cancer and ovarian cancer were the most common tumors. See Table 4. The number of these 6 types of malignant tumors accounted for 72.4% and 74% of the total female number of malignant tumors from 2020 to 2021, respectively.

Table 1: Data of special medical insurance for malignant tumors treatment in Chongqing urban area from 2020 to 2021

	2020	2021
Total number	26003	30902
Male / female	13714/12289	15613/15289
Median age (year)	0-102(60)	0-101(62)
Pathologically confirmed diagnosis (%)	23510(90.4%)	28546(92.4%)
Imaging and clinical diagnosis (%)	2493(9.6%)	2356(7.6%)
Metastasis (%)#	8123(31.2%)	9732(31.5%)

Note: “#” indicating all metastases such as lymphatic metastasis and distant metastasis.

Table 2: Type of malignant tumors from 2020 to 2021

2020	Number(%)	2021	Number(%)
Lung cancer	7049(27.1)	Lung cancer	8689(28.1)
Colorectal cancer	2639(10.1)	Colorectal cancer	3071(9.9)
Breast cancer	2356(9.1)	Thyroid cancer	2932(9.5)
Thyroid cancer	1906(7.3)	Breast cancer	2615(8.5)
Liver cancer	1574(6.1)	Liver cancer	1807(5.8)
Cervical cancer	1129(4.3)	Cervical cancer	1204(3.9)
Esophageal cancer	799(3.1)	Prostate cancer	963(3.1)
Prostate cancer	757(2.9)	Esophageal cancer	947(3.1)
Gastric cancer	731(2.8)	Lymphoma	860(2.8)
Lymphoma	658(2.5)	Gastric cancer	749(2.4)
Kidney cancer	541(2.1)	Bladder cancer	595(1.9)
Bladder cancer	495(1.9)	Kidney cancer	551(1.8)
Nasopharynx cancer	489(1.9)	Nasopharynx cancer	550(1.8)
Pancreatic cancer	424(1.6)	Pancreatic cancer	491(1.6)
Leukemia	363(1.4)	Ovarian cancer	424(1.4)
Ovarian cancer	353(1.4)	Leukemia	389(1.3)
Brain tumor (malignant)	211(0.8)	Brain tumor (malignant)	245(0.8)

Table 3: Type of malignant tumors in male from 2020 to 2021

2020	Number of cases (%)	2021	Number of cases (%)
Lung cancer	4432(32.3%)	Lung cancer	5058(32.5%)
Colorectal cancer	1636(11.9%)	Colorectal cancer	1860(11.9%)
Liver cancer	1318(9.6%)	Liver cancer	1470(9.4%)
Prostate cancer	757(5.5%)	Prostate cancer	963(6.2%)
Esophageal cancer	665(4.8%)	Esophageal cancer	778(5.0%)
Gastric cancer	522(3.8%)	Thyroid cancer	706(4.5%)
Thyroid cancer	469(3.4%)	Gastric cancer	558(3.6%)
Bladder cancer	405(3.0%)	Lymphoma	505(3.2%)
Lymphoma	359(2.6%)	Bladder cancer	482(3.1%)
Nasopharynx cancer	358(2.6%)	Nasopharynx cancer	422(2.7%)
Kidney cancer	345(2.5%)	Kidney cancer	357(2.3%)
Pancreatic cancer	267(1.9%)	Pancreatic cancer	288(1.8%)
Leukemia	202(1.5%)	Leukemia	224(1.4%)
Larynx cancer	194(1.4%)	Larynx cancer	220(1.4%)
Brain tumor (malignant)	121(0.9%)	Brain tumor (malignant)	137(0.9%)

Table 4: Type of malignant tumors in female from 2020 to 2021

2020	Number of cases (%)	2021	Number of cases (%)
Lung cancer	2617(21.3%)	Lung cancer	3631(23.8%)
Breast cancer	2343(19.1%)	Breast cancer	2597(17.0%)
Thyroid cancer	1437(11.7%)	Thyroid cancer	2226(14.6%)
Cervical cancer	1129(9.2%)	Colorectal cancer	1211(7.9%)
Colorectal cancer	1003(8.2%)	Cervical cancer	1204(7.9%)
Ovarian cancer	353(2.9%)	Ovarian cancer	424(2.8%)
Lymphoma	299(2.4%)	Lymphoma	355(2.3%)
Liver cancer	256(2.1%)	Liver cancer	337(2.2%)
Gastric cancer	209(1.7%)	Gastric cancer	256(1.7%)
Kidney cancer	196(1.6%)	Pancreatic cancer	203(1.3%)
Leukemia	161(1.3%)	Kidney cancer	194(1.3%)
Pancreatic cancer	157(1.3%)	Esophageal cancer	169(1.1%)
Esophageal cancer	134(1.1%)	Leukemia	165(1.1%)
Nasopharynx cancer	131(1.1%)	Nasopharynx cancer	128(0.8%)
Brain tumor (malignant)	90(0.7%)	Bladder cancer	113(0.7%)

4.4 Characteristics of common malignant tumor

We focused on 15 common malignant tumors, and thyroid cancer was found to have the youngest median age of treatment (42-43 years old), followed by breast cancer, ovarian cancer, cervical cancer and nasopharyngeal carcinoma (52-54 years old). Prostate cancer was found to have the oldest median age of treatment (73-75 years old), followed by bladder cancer (68 years old), esophageal cancer (67-68 years old) and pancreatic cancer (67-68 years old). See Table 5.

According to our data, the most obvious invasion to adjacent organs or distant metastasis was shown in ovarian cancer (45.5-60.1%), pancreatic cancer (41.1-55%), prostate cancer (30.0-48.9%), and lung cancer (22.3-34.3%). While the least invasion and distant metastasis was showed in thyroid cancer (1.0-1.7%, but the lymphatic metastasis was obvious, See Table 5), followed by bladder cancer (1.0-3.4%) and cervical cancer (4.2-5.0%).

In terms of male to female ratio, thyroid cancer was the only one that attacked women significantly more than men besides gender-specific tumors (breast cancer, cervical cancer, ovarian cancer, and prostate cancer), with an male to female ratio of about 1:3. Other common malignant tumors attacked men more than women, including lung cancer with a male-female ratio of about 3:2, liver cancer with a ratio of 4:1, esophageal cancer with a ratio of 5:1, gastric cancer with a ratio of 5:2, bladder cancer with a ratio of 5:1, and nasopharynx cancer with a ratio of 3:1. In addition, we also found a significant gender difference in larynx cancer, with a male to female ratio of about 30:1 from 2020-2021.

4.5 Composition ratio of tumors

The composition ratios of common tumors in data of malignant tumors treatment in Chongqing (main urban area) from 2020-2021 are shown in Table 6. The national data in 2016 is also shown in Table 6.

Table 5: Common characteristics of malignant tumors (2020-2021)

	2021				2020			
	male/ female	median age	metastasis(%)#	metastasis(%)*	male/ female	median age	metastasis(%)#	metastasis(%)*
Lung cancer	5058/3631	65	2877(33.1)	1939(22.3)	4432/2617	64	3446(48.9)	2418(34.3)
Colorectal cancer	1860/1211	66	1301(42.4)	447(14.6)	1636/1003	66	1539(58.3)	599(22.7)
Breast cancer	18/2597	53	995(38.0)	84(3.2)	13/2343	52	1181(50.1)	154(6.5)
Liver cancer	1470/337	61	252(13.9)	218(12.1)	1318/256	58	282(17.9)	253(16.1)
Thyroid cancer	706/2226	42	1612(55.0)	28(1.0)	469/1437	43	1448(76.0)	32(1.7)
Cervical cancer	0/1204	54	164(13.6)	50(4.2)	0/1129	54	175(15.5)	56(5.0)
Esophageal cancer	778/169	68	211(22.3)	57(6.0)	665/134	67	214(26.8)	51(6.4)
Gastric cancer	558/256	65	341(41.8)	101(12.4)	522/209	65	431(59.0)	138(18.9)
Prostate cancer	963/0	73	313(32.5)	289(30.0)	757/0	75	402(53.1)	370(48.9)
Nasopharynx cancer	422/128	53	108(19.6)	29(5.3)	358/131	52	117(23.9)	28(5.7)
Kidney cancer	357/194	63	84(15.2)	65(11.8)	345/196	62	118(21.8)	100(18.5)
Bladder cancer	482/113	68	11(1.8)	6(1.0)	405/90	68	28(5.7)	17(3.4)
Pancreatic cancer	288/203	67	236(48.1)	202(41.1)	267/157	68	278(65.5)	233(55.0)
Ovarian cancer	0/424	54	234(55.2)	193(45.5)	0/353	53	251(71.1)	212(60.1)
Lymphoma	505/355	63	—	—	359/299	59	—	—
Leukemia	224/165	56	—	—	202/161	51	—	—

Note: “#” indicating all metastases such as lymphatic metastasis and distant metastasis.

Note: “*” indicating invasion to adjacent organs or distant metastasis.

Table 6: Composition ratio of tumors

Composition ratio	Lung cancer	Colorectal cancer	Breast cancer	Liver cancer	Cervical cancer	Esophageal cancer	Thyroid cancer	Gastric cancer
Special diseases in Chongqing in 2020	7049/26003 (27.1)*	2639/26003 -10.1	2356/26003 (9.1)*	1574/26003 (6.1)*	1129/26003 (4.3)*	799/26003 (3.1)*	1906/26003 (7.3)*	731/26003 (2.8)*
Special diseases in Chongqing in 2021	8689/30902 (28.1)*	3071/30902 -9.9	2615/30902 (8.5)*	1807/30902 (5.8)*	1204/30902 (3.9)*	947/30902 (3.1)*	2932/30902 (9.5)*	749/30902 (2.4)*
National data of onset in 2016	828/4064 (20.4%)	408/4064 (10.0%)	306/4064 (7.5%)	389/4064 (9.6%)	119/4064 (2.9%)	253/4064 (6.2%)	203/4064 (5.0%)	397/4064 (9.8%)

Note: Compared with the national data in 2016, Chi square test, *P < 0.05

5. Discussion

From 2020 to 2021, there were more than 26,000 cases of special medical insurance for malignant tumors in Chongqing main urban area (including 10 million people) managed by Chongqing University Cancer Hospital each year (directly reflect the malignant tumors treatment in Chongqing main urban area every year). The number of cases was significantly increased compared with that in 2015-2019[10, 11]. The possible reasons are, firstly, increasing annual new-developed malignant tumors in Chongqing; secondly, increasing coverage of the basic medical insurance in Chongqing; thirdly, increasing awareness of citizens in managing special medical insurance for tumors. During 2020-2021, 90.4-92.4% of the cases were pathologically diagnosed (“gold standard”), showing a significant increase when comparing with the data in 2015-2019[10, 11]. It is suggested that the clinical methods for tumor diagnosis are improving gradually.

Special attention should be paid to the patients who have invasion

and metastasis (including lymphatic metastasis) at the time of registration. Compared with patients with tumors at an early stage, those patients have poorer prognosis and treatment efficacy, resulting in heavy mental, life and economic burdens to the themselves, their families and the society. In 2020, there were 8123 patients with invasion and metastasis, accounting for 31.2%; in 2021, there were 9732 patients, accounting for 31.5%. It is worthy of our vigilance to control this number, which is a direct reflection of the effectiveness of early diagnosis and treatment of tumors.

In terms of age distribution, the data from 2020-2021 are consistent with those from 2015-2019[10, 11]. People at age of 60-70 and 50-60 years old were the peak of malignant tumors treatment in both sexes. Figure 2 showed that the age distribution of malignant tumors treatment in men follows a normal distribution with 60-70 years old as the midline. However, it is different in women (Figure 3), and 50-60 years old becomes the midline, possibly because the female tumors (breast cancer, cervical cancer, ovarian cancer, and

thyroid cancer) have a younger age of onset. Therefore, screening for breast cancer, cervical cancer, and thyroid cancer in women at the age of 40-50 years old may contribute to early diagnosis and treatment.

In terms of type distribution, the top three malignant tumors were always lung cancer, colorectal cancer and breast cancer (thyroid cancer in 2021), which are consistent with that in data from 2015 to 2019[10, 11]. The above three tumors were also the most common malignant tumors in the world [12, 13]. Additionally, thyroid cancer had gradually risen from the seventh place in 2015, the sixth in 2016 to the fifth in 2017 and the fourth in 2018-2020, the third in 2021, indicating that thyroid cancer had an increasing treatment in Chongqing in recent years. Therefore, thyroid cancer requires increasing vigilance.

The top 5 male malignant tumors were lung cancer, colorectal cancer, liver cancer, prostate cancer and esophageal cancer, which are consistent with the data from 2015 to 2019 [10, 11]. However, the cases of prostate cancer increased from the sixth place in 2015 and 2016 to the fourth place at present. These 5 types of tumors were about 60% of all the male tumor cases!

The top 5 female malignant tumors were lung cancer, breast cancer, thyroid cancer, cervical cancer and colorectal cancer. Lung cancer crossed over breast cancer to become the top malignant tumor of female from 2020 compared with 2015-2019 [11] (Chest CT became a common examination after COVID-19 break out in 2019), while the cases of thyroid cancer increased from the fifth to the third place compared with the date of 2015 and 2016[10], with the increase showed both in number and proportion.

Among the common malignant tumors, thyroid cancer showed the youngest age of treatment (42-43 years old), and there were significantly more female patients with thyroid cancer than males, with a male-female ratio of about 1:3. In addition, the onset age of female-specific tumors such as breast cancer, cervical cancer and ovarian cancer is around 50 years old, which leads to a younger peak age of malignant tumors treatment in females than in males, as shown in Figure 3.

We have noted that various malignant tumors have a significant imbalance in male to female ratio, even after excluding sexual specific tumors such as breast cancer, cervical cancer, prostate cancer and ovarian cancer. For example, the male to female ratio of liver cancer was up to 5:1, thyroid cancer 1:3, esophageal cancer 5:1, bladder cancer 5:1, lung cancer 3:2, gastric cancer 5:2, nasopharynx cancer 3:1, and larynx cancer as high as 30-40: 1. The cause for the pronounced gender differences is unclear yet, but it is the basis for targeted tumor screening for different genders.

Tumor invasion and metastasis often indicate poor prognosis of patients. Our data showed that ovarian cancer has the highest invasion and metastasis rate, reaching 45.5-60.1%, followed by pancreatic cancer (41.1-55.0%), prostate cancer (30.0-48.9%) and

lung cancer (22.3-34.3%). Besides, over 10% of invasion and metastasis rates were also showed in colorectal cancer, liver cancer, gastric cancer and kidney cancer. Early diagnosis and treatment for these metastasis-prone cancers is of significant importance to improve the prognosis. Thyroid cancer had the lowest metastasis rate, only 1.0-1.7%, followed by bladder cancer (1.0-3.4%).

We compared our data with the national data of malignant tumors in 2016. The composition ratios of tumors were found to be very different, showing in the ratios of almost all common malignant tumors, indicating that the malignant tumor spectrum in Chongqing (main urban area) had its own characteristics. The composition ratios of gastric cancer, esophageal cancer and liver cancer in data of Chongqing were significantly lower than those of the national data, while the ratios of lung cancer, breast cancer, cervical cancer and thyroid cancer in Chongqing were significantly higher than those of national data. These differences are theoretical basis for the program development in terms of cancer prevention and treatment in Chongqing. Some differences in tumor composition ratios were showing even comparing the data in 2021 with those in 2017 - 2018 in Chongqing, such as an increase in the composition ratio of thyroid cancer [11]. Therefore, it is necessary to report the city data of malignant tumors every year, so as to understand the change trend of tumor spectrum and to revise the prevention and treatment plan correspondingly.

At last, it is expected that a regular release of the data is conducive to the development of early diagnosis and treatment plan for malignant tumors in Chongqing, thereby serving the citizens.

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