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Letter to Editor

Survival benefit of breast-conserving surgery with adjuvant radiotherapy for young women with ductal carcinoma in situ: A population-based cohort study

Jie Tang [1], Jinkui Wang [1], Dianlong Zhang, Xiudan Pan

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To the editor,

Ductal carcinoma in situ (DCIS) is a typical precancerous lesion in breast cancer. Since 1990, the incidence of DCIS in women has remained at a high level, with approximately 30 cases per 100,000 women. The prognosis of DCIS is better, and the 10-year survival rate is 97.5%–99.2%.[1] However, without appropriate treatment, DCIS patients have a high risk of progression to invasive breast cancer and a higher risk of death.[2] Surgical resection is the primary treatment for DCIS. Total mastectomy (MT) has been one of the main treatments for DCIS patients to reduce the risk of developing invasive breast cancer. Due to better cosmetic results, breast-conserving surgery (BCS) has become the standard surgical method for DCIS patients. Adjuvant radiotherapy (RT) after BCS has also been widely used and achieved a good local control effect.[2] Previous studies have shown that young age (less than 40 or 50) is a poor prognostic factor for female patients with DCIS.[4] A study showed that the risk of death in patients diagnosed with DCIS before 35 years

old was 2.58 times that of patients over 35 years old [10]. Currently, the treatment of young women with DCIS is inferred from older patients. Therefore, a study is needed to analyze the treatment of young female DCIS patients to guide clinical practice.

We conducted a retrospective cohort study using data obtained from the SEER database. A total of 18068 patients were included in the study. The clinicopathological features of all patients are shown in Table 1. To balance the clinical characteristics of the BCS group and BCS+RT group, as well as the BCS+RT group and MT group, we used the nearest neighbor 1: 1 Propensity score (PS) matching. We obtained a cohort 3176 patients receiving BCS and 3176 patients receiving BCS+RT, and a cohort of 5317 patients receiving BCS+RT and 5317 patients receiving MT for subsequent analysis. In the 1: 1PS matched BCS and BCS+RT cohort, the cumulative incidence plot suggested that the breast cancer-specific mortality (BCSM) rate of patients receiving BCS+RT was significantly lower than that of patients receiving BCS alone (p=0.008). In the 1: 1PS matched BCS+RT and MT cohort, the cumulative incidence plot suggested that the BCSM rate (p=0.04) of patients receiving BCS+RT were lower than those of the MT group (Fig. 1).

Table 1. Clinicopathological characteristics of young women with ductal carcinoma in situ.

	ALL N=18068	BCS N=862	BCS+RT N=550	P	BCS+RT N=862	MT N=550	P
Age (mean (SD))	44.6 (4.42)	44.9 (4.38)	45.2 (3.89)	<0.001	45.2 (3.89)	43.9 (4.82)	<0.001
Age (median (IQR))	45 (42, 48)	46 (42, 48)	46 (43, 48)	<0.001	46 (43, 48)	45.000 (41, 48)	<0.001
Race				<0.001			0.012
white	13360 (73.9%)	2383 (73.7%)	5346 (72.9%)		5346 (72.9%)	5631 (75.0%)	
black	1782 (9.86%)	313 (9.68%)	748 (10.2%)		748 (10.2%)	721 (9.61%)	
other	2926 (16.2%)	537 (16.6%)	1235 (16.9%)		1235 (16.9%)	1154 (15.4%)	
Marital				0.647			0.014
Married	12230	2091	4970 (67.8%)		4970 (67.8%)	5169	

	(67.7%)	(64.7%)			(68.9%)	
Single	5204 (28.8%)	982 (30.4%)	2148 (29.3%)		2148 (29.3%)	2074 (27.6%)
Unknown	634 (3.51%)	160 (4.95%)	211 (2.88%)		211 (2.88%)	263 (3.50%)
Year of diagnosis				<0.001		<0.001
2004–2006	3939 (21.8%)	745 (23.0%)	1717 (23.4%)		1717 (23.4%)	1477 (19.7%)
2007–2009	4344 (24.0%)	722 (22.3%)	1795 (24.5%)		1795 (24.5%)	1827 (24.3%)
2010–2012	4788 (26.5%)	776 (24.0%)	1906 (26.0%)		1906 (26.0%)	2106 (28.1%)
2013–2015	4997 (27.7%)	990 (30.6%)	1911 (26.1%)		1911 (26.1%)	2096 (27.9%)
Grade				<0.001		<0.001
I	1789 (9.90%)	534 (16.5%)	734 (10.0%)		734 (10.0%)	521 (6.94%)
II	7518 (41.6%)	1527 (47.2%)	3144 (42.9%)		3144 (42.9%)	2847 (37.9%)
III	6904 (38.2%)	942 (29.1%)	2722 (37.1%)		2722 (37.1%)	3240 (43.2%)
IV	1857 (10.3%)	230 (7.11%)	729 (9.95%)		729 (9.95%)	898 (12.0%)
Tumor size				<0.001		<0.001
1-9	7082 (39.2%)	1656 (51.2%)	3418 (46.6%)		3418 (46.6%)	2008 (26.8%)
10-19	4787 (26.5%)	754 (23.3%)	2166 (29.6%)		2166 (29.6%)	1867 (24.9%)
20-49	4439	629	1505		1505	2305

	(24.6%)	(19.5%)	(20.5%)		(20.5%)	(30.7%)	
≥50	1760 (9.74%)	194 (6.00%)	240 (3.27%)		240 (3.27%)	1326 (17.7%)	
PR				<0.001			<0.001
Negative	2761 (15.3%)	358 (11.1%)	1011 (13.8%)		1011 (13.8%)	1392 (18.5%)	
Positive	11850 (65.6%)	2076 (64.2%)	5132 (70.0%)		5132 (70.0%)	4642 (61.8%)	
Unknown	3457 (19.1%)	799 (24.7%)	1186 (16.2%)		1186 (16.2%)	1472 (19.6%)	
ER				<0.001			<0.001
Negative	1805 (9.99%)	231 (7.15%)	648 (8.84%)		648 (8.84%)	926 (12.3%)	
Positive	13888 (76.9%)	2411 (74.6%)	5935 (81.0%)		5935 (81.0%)	5542 (73.8%)	
Unknown	2375 (13.1%)	591 (18.3%)	746 (10.2%)		746 (10.2%)	1038 (13.8%)	
Risk				<0.001			<0.001
1	1242 (6.87%)	392 (12.1%)	558 (7.61%)		558 (7.61%)	286 (3.81%)	
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3	6218 (34.4%)	959 (29.7%)	2861 (39.0%)		2861 (39.0%)	2384 (31.8%)	
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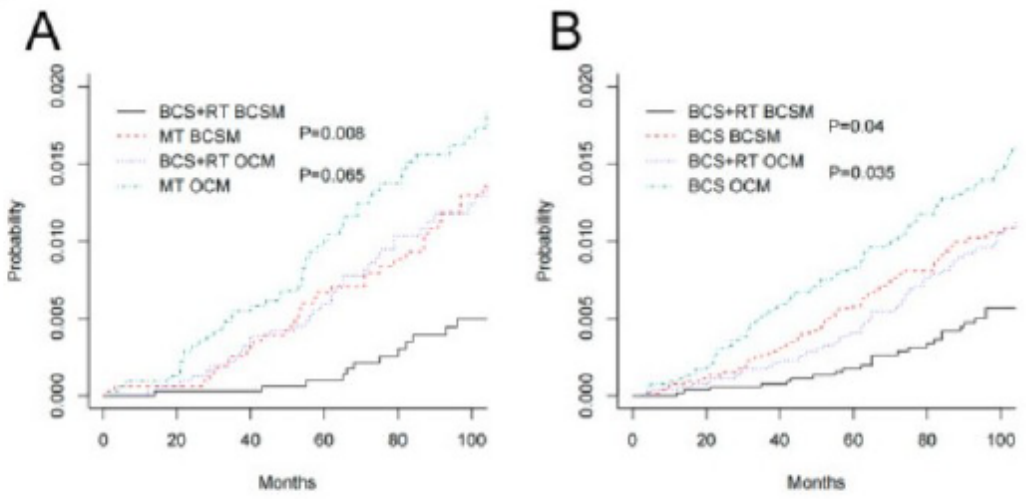

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Fig. 1. Cumulative incidence plots. (A) Comparison of BCSM rate and other cause mortality (OCM) rate between BCS group and BCS+RT group after 1: 1 matching. (B) Comparison of BCSM rate and OCM rate between BCS+RT group and MT group after 1: 1 matching.

This is the first time the young female DCIS patients in the SEER database have been used to analyze and compare the BCS, BCS+RT, and MT results. Through the PS matching and competing risks model analysis, our study confirms that BCS combined with RT has the most significant benefit among young DCIS women. However, this study was population-based, it lacked specific patient characteristics such as surgical margins, endocrine therapy, and comorbidities. Therefore, our findings should be used cautiously, and prospective randomized controlled trials are still necessary.

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Consent for publication

Not applicable.

Availability of data and materials

The data analyzed in this study is available at https://seer.Cancer.gov/ ↗.

Funding

Not applicable.

Authors' contributions

JT, JW, and XP contributed to the conception and design. DZ and JT collected and analyzed the data. DZ and JT drew the figures and tables. JT and JW wrote the draft. XP, DZ and JT contributed to manuscript writing and revision. All authors approved the final manuscript.

Declaration of competing interest

The authors declare that they have no competing interests.

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Not applicable.

Appendix A. Supplementary data

The following is the Supplementary data to this article:

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Multimedia component 1.

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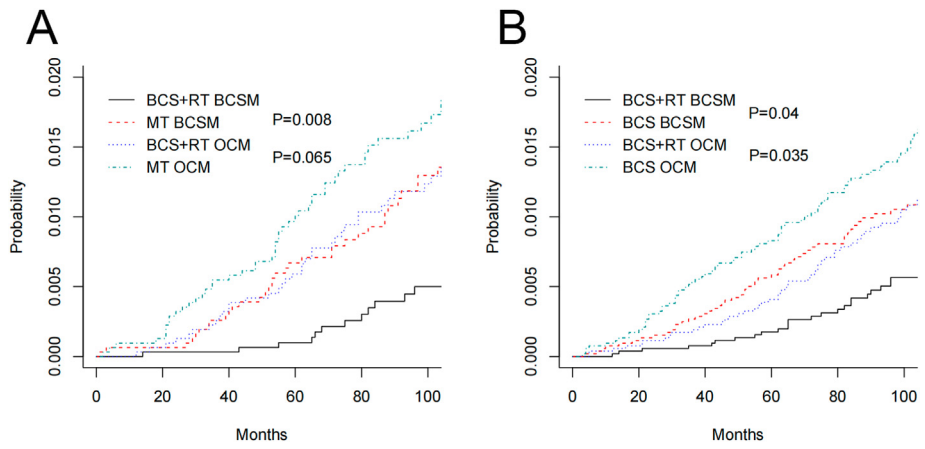

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Authors' contributions

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Declaration of competing interest

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.asjsur.2023.02.107.

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(编校:徐萌)

◇肿瘤流行病学◇ 【*Oncology Epidemiology*】

2013 年至 2019 年沈阳市儿童白血病发病及死亡分析

田 葳[1],李 恂[2],于海洋[1],潘秀丹[1]

Incidence and mortality of childhood leukemia in Shenyang,China from 2013 to 2019

TIAN Wei[1],LI Xun[2],YU Haiyang[1],PAN Xiudan[1]
[1]*Shenyang Medical College,Liaoning Shenyang* 110034,*China*; [2]*Shenyang Center for Disease Control and Prevention,Liaoning Shenyang* 110031,*China*.

【Abstract】 Objective: To analyze the trend of morbidity and mortality of childhood leukemia in Shenyang,China from 2013 to 2019. **Methods:** The data of incidence and death of childhood leukemia aged 0 ~ 14 years old were obtained from Shenyang Cancer Registration and Reporting System and resident cause of death report. The constituent ratio,incidence rate,age - specific incidence rate,mortality rate and age - specific mortality rate were calculated and standardized by Chinese standard population in 2000. Joinpoint regression model was applied for trend analysis. **Results:** The incidence and standardized incidence of childhood leukemia in Shenyang increased from 0.90/100 000 and 1.34/100 000 in 2013 to 5.33/100 000 and 5.14/100 000 in 2019,respectively,and APC was 19.64% and 16.39%,respectively. Among them,the change trend of incidence rate had statistical significance ($P < 0.05$). The average annual increase in the incidence of females was 22.77%,and the trend was statistically significant ($P < 0.05$). The incidence of lymphoid leukemia increased from 0.60/100 000 in 2013 to 3.77/100 000 in 2019,with an APC of 35.84%,and the increasing trend was statistically significant ($P < 0.05$). In 2013,the mortality rate and standardized mortality rate of childhood leukemia in Shenyang were 1.50/100 000 and 1.06/100 000,respectively,the mortality rate and standardized mortality rate of childhood leukemia in 2019 were 1.11/100 000 and 1.21/100 000,respectively,and the APC were -3.80% and -2.53%,respectively. There were no significant trend changes ($P > 0.05$). The average annual decrease in mortality was 6.25% in men and the average annual increase in mortality was 7.07% in women,but the trends were not statistically significant ($P > 0.05$). Leukemia morbidity and mortality occurred in all age groups,with the highest incidence of 4.74/100 000 in the age group of 0 ~ 4 years old and the highest mortality of 1.93/100 000 in the age group of 10 ~ 14 years old. **Conclusion:** From 2013 to 2019,the mortality

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rate of childhood leukemia in Shenyang was relatively stable，and the incidence rate increased，especially in women and lymphoid leukemia，which should be highly concerned.

【Key words】children，leukemia，incidence，mortality

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【摘要】 目的：分析沈阳市 2013 年至 2019 年儿童白血病发病和死亡变化趋势。方法：从沈阳市肿瘤登记报告系统及居民死因报表中获取 0 ~ 14 岁儿童白血病的发病、死亡数据，计算构成比、发病率、年龄别发病率、死亡率、年龄别死亡率，采用 2000 年中国标准人口进行标化。应用 Joinpoint 回归模型进行趋势分析。结果：2013 年至 2019 年沈阳市儿童白血病发病率和标化发病率分别从 2013 年的 0.90/10 万、1.34/10 万上升至 2019 年的 5.33/10 万、5.14/10 万，APC 分别为 19.64%、16.39%。其中，发病率的变化趋势有统计学意义（P < 0.05）。女性发病率年均增长 22.77%，变化趋势有统计学意义（P < 0.05）。淋巴样白血病发病率从 2013 年的 0.60/10 万上升至 2019 年的 3.77/10 万，APC 为 35.84%，上升趋势有统计学意义（P < 0.05）。2013 年沈阳市儿童白血病死亡率和标化死亡率分别为 1.50/10 万、1.06/10 万，2019 年儿童白血病死亡率和标化死亡率分别为 1.11/10 万、1.21/10 万，APC 分别为 - 3.80%、- 2.53%，趋势变化均无统计学意义（P > 0.05）。男性死亡率年均下降 6.25%，女性死亡率年均上升 7.07%，但变化趋势均无统计学意义（P > 0.05）。白血病发病和死亡各年龄组均有发生，0 ~ 4 岁年龄组发病率最高为 4.74/10 万，10 ~ 14 岁年龄组死亡率最高为 1.93/10 万。结论：2013 年至 2019 年沈阳市儿童白血病死亡率相对稳定，发病率呈上升趋势，尤其是女性和淋巴样白血病，应引起高度重视。

【关键词】儿童；白血病；发病率；死亡率

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白血病是造血系统的恶性增生性疾病，也是儿童最常见的恶性肿瘤。白血病的发病率和死亡率均居我国儿童恶性肿瘤首位，严重危害儿童的身体健康[1]。随着社会经济快速发展，环境污染日趋严重，恶性肿瘤的发病率不断增加，儿童白血病的发病及死亡情况亦令人堪忧。本文对沈阳市 2013 年至 2019 年儿童白血病的发病和死亡趋势进行分析，为制定儿童白血病防治策略提供依据。

1　资料与方法

1.1　资料来源

发病资料来自沈阳市肿瘤登记报告系统中 0 ~ 14 岁儿童白血病发病报告。死亡资料来自沈阳市居民病伤死亡原因报表。人口资料来自沈阳市公安局。2013 年至 2019 年沈阳市 0 ~ 14 岁儿童累积人口 2 693 322 人，男性 1 394 337 人，女性 1 298 985 人，男女比例 1.07∶1。疾病编码采用国际疾病分类第 10 版（International Classification of Diseases - 10，ICD - 10），编码范围 C91 ~ 95。

1.2　质量控制

根据国家癌症中心《中国肿瘤登记工作指导手册》对肿瘤登记资料进行质量控制。白血病病理组织学诊断所占比例（histological verification，HV）为 98.9%，仅有死亡证明书病例（death certification only，DCO）比例为 1.11%，死亡/发病比（mortality∶incidence，M∶I）为 0.46，达到质控要求。

1.3　统计学方法

采用 Excel 2010 和 SPSS 22.0 进行数据的整理和分析。计算构成比、发病率、年龄别发病率、死亡率、年龄别死亡率，并使用 2000 年中国标准人口进行标化。性别及分型间率的比较采用 χ^2 检验。时间趋势分析使用 Joinpoint Regression Software 4.4.0.0 版本，以年份为自变量，发病率和死亡率为因变量，建立对数线性模型进行 Joinpoint 回归分析。分段趋势模型量化指标用年度变化百分比（annual percent change，APC）及 95% 可信区间（confidence interval，CI），95% CI 不包括 0，表示变化趋势具有统计学意义，反之无统计学意义。

2　结果

2.1　发病情况及变化趋势

2013 年至 2019 年沈阳市儿童白血病新发病例 90 例，发病率 3.34/10 万，标化发病率 3.16/10 万。其中男 47 例，发病率 3.37/10 万，标化发病率 3.22/10 万。女性 43 例，发病率 3.31/10 万，标化发病率 3.10/10 万。男女性别比 1.09∶1，男女发病率之间的差异无统计学意义（χ^2 = 0.007，P > 0.05）。

2.1.1　性别、年龄别发病率　90 例新发病例中 0 ~ 4 岁儿童 50 例，占比高达 55.56%，发病率最高（4.74/10 万），其中男性 26 例（4.77/10 万），女性 24 例（4.70/10 万）。5 ~ 9 岁 16 例（1.75/10 万），男性 8 例（1.69/10 万），女性 8 例（1.82/10 万）。10 ~ 14 岁 24 例（3.31/10 万），男性 13 例（3.46/10 万），女性 11 例（3.15/10 万），见表 1。

2.1.2　主要分型的发病趋势　2013 年至 2019 年沈阳市儿童白血病主要以淋巴样白血病和髓样白血病为主，淋巴样白血病发病率为 1.93/10 万，标化率 1.76/10 万。髓样白血病发病率 0.67/10 万，标化率 0.78/10 万。淋巴样白血病是髓样白血病发病率的 2.89 倍，差异具有统计学意义（χ^2 = 30.509，P < 0.05）。淋巴样白血病发病率从 2013 年的 0.60/10 万上升至 2019 年的 3.77/10 万，APC 为 35.84%（95% CI：22.8% ~ 50.3%），趋势有统计学意义。髓样白血病在 2013 年和 2014 年均未见发病，从 2015 年的 1.66/10 万下降至 2019 年的 0.89/10 万，APC 为 - 15.16%（95% CI：- 42.6% ~ 25.4%），趋势无统计学意义。经标准人口标化后，淋巴样白血病标化率的APC为28.94%（95%CI：11.6% ~ 49.0%），趋势有统计学意义。髓样白血病标化率的 APC 为 - 15.41%（95% CI：- 51.3% ~ 47.1%），趋势无统计学意义，见表 2。

表 1 2013 年至 2019 年沈阳市儿童白血病年龄别发病率(1/10^5)及构成(%)

Tab. 1 Age specific incidence (1/10^5) and proportion (%) of childhood leukemia in Shenyang from 2013 to 2019

Age group (years old)	Male			Female			Total		
	Cases	Proportion	Incidence	Cases	Proportion	Incidence	Cases	Proportion	Incidence
0~4	26	55.32	4.77	24	55.81	4.70	50	55.56	4.74
5~9	8	17.02	1.69	8	18.60	1.82	16	17.78	1.75
10~14	13	27.66	3.46	11	25.58	3.15	24	26.67	3.31
Total	47	100.00	3.37	43	100.00	3.31	90	100.00	3.34

表 2 2013 年至 2019 年沈阳市儿童白血病主要分型发病趋势(1/10^5)

Tab. 2 Incidence trend of main types of childhood leukemia in Shenyang from 2013 to 2019 (1/10^5)

Year	Lymphoid leukemia		Medullary leukemia	
	Incidence	ASIRC	Incidence	ASIRC
2013	0.60	0.89	0.00	0.00
2014	0.85	1.09	0.00	0.00
2015	1.38	1.22	1.66	2.16
2016	1.33	0.79	0.53	0.31
2017	1.51	1.23	0.75	0.54
2018	3.32	2.77	0.71	1.17
2019	3.77	3.59	0.89	1.06
Total	1.93	1.76	0.67	0.78
APC(%)	35.84	28.94	-15.16	-15.41
95% CI(%)	22.8~50.3	11.6~49.0	-42.6~25.4	-51.3~47.1
P	<0.05	<0.05	>0.05	>0.05

2.1.3 发病率的变化趋势 2013 年至 2019 年沈阳市儿童白血病发病率总体呈上升趋势,从 2013 年的 0.90/10 万上升至 2019 年的 5.33/10 万,APC 为 19.64%(95% CI: 2.6%~39.6%),变化趋势具有统计学意义。男性发病率从 2013 年的 1.16/10 万上升至 2019 年的 5.57/10 万,APC 为 15.32%(95% CI: -2.9%~37.0%),变化趋势无统计学意义。女性发病率以年均 22.77% 的速度增长(95% CI: 0.4%~50.1%),变化趋势具有统计学意义。标化后,合计标化发病率及男性标化发病率的 APC 分别为 16.39%(95% CI: -2.5%~38.9%)、10.67%(95% CI: -10.8%~37.3%),趋势无统计学意义。女性标化发病率的 APC 为 24.17%(95% CI: 1.9%~51.3%),趋势有统计学意义,见表 3、图 1。

表 3 2013 年至 2019 年沈阳市儿童白血病发病情况(1/10^5)

Tab. 3 Incidence of childhood leukemia in Shenyang from 2013 to 2019 (1/10^5)

Year	Male		Female		Total	
	Incidence	ASIRC	Incidence	ASIRC	Incidence	ASIRC
2013	1.16	1.70	0.62	0.95	0.90	1.34
2014	3.30	3.63	1.18	1.31	2.28	2.52
2015	3.74	4.10	4.01	3.59	3.87	3.87
2016	1.54	0.94	2.75	1.58	2.12	1.26
2017	3.40	2.26	3.64	3.45	3.52	2.81
2018	4.12	3.36	4.91	5.27	4.50	4.24
2019	5.57	5.68	5.06	4.51	5.33	5.14
Total	3.37	3.22	3.31	3.10	3.34	3.16
APC(%)	15.32	10.67	22.77	24.17	19.64	16.39
95% CI(%)	-2.9~37.0	-10.8~37.3	0.4~50.1	1.9~51.3	2.6~39.6	-2.5~38.9
P	>0.05	>0.05	<0.05	<0.05	<0.05	>0.05

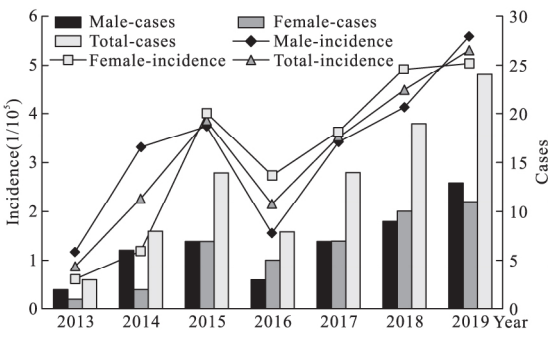

图 1 2013 年至 2019 年沈阳市儿童白血病发病率随时间变化趋势

Fig. 1 Trend of incidence of childhood leukemia over time in Shenyang from 2013 to 2019

2.2 死亡情况及变化趋势

2013 年至 2019 年沈阳市儿童白血病死亡病例 41 例,死亡率 1.52/10 万,标化死亡率 1.56/10 万。其中男性 27 例,死亡率 1.94/10 万,标化死亡率 2.06/10 万。女性 14 例,死亡率 1.08/10 万,标化死亡率 1.03/10 万。男女性别比 1.93∶1,男女死亡率之间差异无统计学意义(χ^2=3.257,*P*>0.05)。

2.2.1 性别、年龄别死亡率 41 例死亡病例中 0~4 岁 19 例(1.80/10 万),其中男性 11 例,女性 8 例。5~9 岁 8 例(0.88/10 万),男性 6 例,女性 2 例。10~14 岁 14 例,死亡率最高(1.93/10 万),男性 10 例,女性 4 例,见表 4。

表 4　2013 年至 2019 年沈阳市儿童白血病年龄别死亡率（1/10^5）及构成（%）

Tab. 4　Age - specific mortality rate (1/10^5) and proportion (%) of childhood leukemia in Shenyang from 2013 to 2019

Age group (years old)	Male			Female			Total		
	Cases	Proportion	Mortality	Cases	Proportion	Mortality	Cases	Proportion	Mortality
0 ~ 4	11	40.74	2.02	8	57.14	1.57	19	46.34	1.80
5 ~ 9	6	22.22	1.27	2	14.29	0.46	8	19.51	0.88
10 ~ 14	10	37.04	2.66	4	28.57	1.14	14	34.15	1.93
Total	27	100.00	1.94	14	100.00	1.08	41	100.00	1.52

2.2.2　死亡率变化趋势　沈阳市儿童白血病死亡率由 2013 年的 1.50/10 万下降至 2019 年 1.11/10 万，APC 为 -3.80%（95% CI：-19.4% ~ 14.8%），变化趋势无统计学意义。其中，2014 年和 2018 年是儿童白血病死亡率的两个高峰，死亡率分别为 2.28/10 万、2.13/10 万，标化死亡率分别为 2.34/10 万、1.96/10 万。2017 年死亡率最低为 0.75/10 万，标化死亡率为 1.02/10 万。男性死亡率的 APC 为 -6.25%（95% CI：-27.8% ~ 21.8%），变化趋势无统计学意义。女性死亡率的 APC 为 7.07%（95% CI：-10.7% ~ 28.3%），变化趋势无统计学意义。合计、男性及女性标化死亡率的 APC 分别为 -2.53%（95% CI：-18.5% ~ 16.6%）、-8.57%（95% CI：-28.3% ~ 16.6%）、15.47%（95% CI：-8.5% ~ 45.7%），趋势均无统计学意义，见表 5、图 2。

表 5　2013 年至 2019 年沈阳市儿童白血病死亡情况（1/10^5）

Tab. 5　Death of childhood leukemia in Shenyang from 2013 to 2019 (1/10^5)

Year	Male		Female		Total	
	Mortality	ASMRC	Mortality	ASMRC	Mortality	ASMRC
2013	2.32	1.71	0.62	0.38	1.50	1.06
2014	3.30	3.83	1.18	0.69	2.28	2.34
2015	2.13	2.39	0.57	0.55	1.38	1.51
2016	1.54	2.21	1.65	1.80	1.59	2.03
2017	0.49	0.82	1.04	1.22	0.75	1.02
2018	3.20	2.76	0.98	1.13	2.13	1.96
2019	0.86	1.05	1.38	1.36	1.11	1.21
Total	1.94	2.06	1.08	1.03	1.52	1.56
APC (%)	-6.25	-8.57	7.07	15.47	-3.80	-2.53
95% CI (%)	-27.8 ~ 21.8	-28.3 ~ 16.6	-10.7 ~ 28.3	-8.5 ~ 45.7	-19.4 ~ 14.8	-18.5 ~ 16.6
P	> 0.05	> 0.05	> 0.05	> 0.05	> 0.05	> 0.05

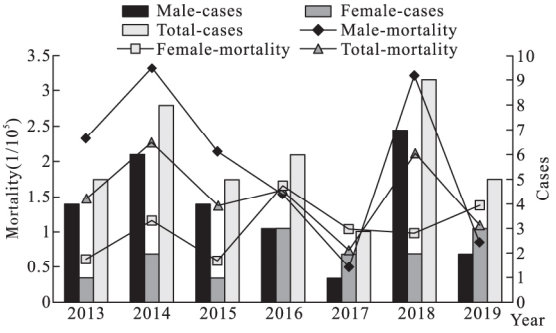

图 2　2013 年至 2019 年沈阳市儿童白血病死亡率随时间变化趋势

Fig. 2　Trend of childhood leukemia mortality over time in Shenyang from 2013 to 2019

3　讨论

研究显示，2013 年至 2019 年沈阳市儿童白血病粗发病率 3.34/10 万，标化发病率 3.16/10 万，低于上海市浦东新区（3.85/10 万）[2]，高于河北省（2.42/10 万）[3] 的报道。7 年间发病率总体呈上升趋势，年均增长 16.39%，增速低于重庆市（19.6%）[4]，高于昆明市（12.87%）[5]、四川巴中（15.8%）[6]。由此可见，沈阳市儿童白血病发病率仍处于较高水平，情况不容乐观。有研究认为白血病的发生与遗传、环境和生活习惯等因素有关，其中环境污染是白血病发生最重要的危险因素[7]。男性发病率在 1.16 ~ 5.57/10 万之间波动，变化趋势不明显。女性发病率从 2013 年的 0.62/10 万上升至 2019 年的 5.06/10 万，呈明显上升趋势，提示女性应该成为沈阳市儿童白血病防治的重点。2013 年至 2019 年沈阳市儿童淋巴样白血病粗发病率为 1.93/10 万，并正以每年 35.84% 的速度快速增长。髓样白血病粗发病率 0.67/10 万，7 年间发病率相对稳定。有学者认为母亲产前居住在新装修房屋和使用农药是儿童淋巴样白血病的危险因素，应加以预防[8]。

随着科学研究和医疗技术的进步，临床医生针对白血病不同分型的生物学特征制定相应治疗方案取得了良好的效果，我国儿童白血病死亡率有下降趋势[9-10]。本研究结果表明，沈阳市 2013 年至 2019 年儿童白血病粗死亡率 1.52/10 万，在 0.75 ~ 2.28/10 万之间波动。标化死亡率 1.56/10 万，高于江苏省南通市（0.34/10 万）[11]、安徽省（1.44/10 万）[12] 的死亡率水平，与天津市（1.55/10 万）[13] 儿童白血病死亡率相近。这可能与不同地区的医疗水平及卫生资源配置存在差异有关。女性死亡率由 2013 年的 0.62/10 万上升至 2019 年的 1.38/10 万，可能与其发病率呈上升趋势存在联系。男性死亡率介于 0.49 ~ 3.30/10 万之间并呈双峰分布，2014 年和 2018 年死亡率均较高分别为 3.30/10 万和 3.20/10 万，2015 年至 2017 年死亡率明显下降。与女性相比，男性死亡率波动幅度较大，具体原因有待进一步研究。

儿童白血病发病与死亡各年龄组均有发生，呈现“V”型

分布的特点。对各年龄组发病率进行比较发现,0 ~ 4 岁年龄组发病率最高,与吴铮等[14]研究结果相同,提示沈阳市儿童白血病发病高危年龄是 0 ~ 4 岁。可能是因为儿童年龄小、免疫系统尚未完全发育,并且大部分时间都在室内度过,所以更易受室内环境污染的影响。在各年龄组死亡率比较中,10 ~ 14 岁年龄组死亡率最高,与潘秀丹等[15]研究结果一致。有研究表明,诊断年龄是影响儿童白血病预后的重要因素,在调整了细胞遗传学和其他预后因素的影响后,诊断时年龄≥10 岁的儿童死亡风险高于 10 岁前诊断的儿童[16]。因此,应该提醒家长重视儿童的产前检查和早期诊断,以实现儿童白血病的早发现、早诊断和早治疗。一旦发现儿童有不明原因的贫血、鼻出血及皮肤瘀斑等症状时,应立即就医。

综上所述,沈阳市儿童白血病 7 年间死亡率相对稳定,而发病率则呈上升趋势,尤其是女性和淋巴样白血病,应引起相关部门的高度重视。须从儿童出生前和出生后两个方面对白血病进行预防,出生前的预防主要是通过开展白血病防治知识的健康教育讲座,使母亲了解白血病防治的相关知识,在受孕前及妊娠期尽量避免暴露于农药、杀虫剂等白血病发病相关的危险因素[17]。出生后的预防主要是培养儿童良好的饮食习惯,提高免疫力,避免儿童吞食含铅、苯等有毒有害物质的玩具或者暴露于含有毒有害物质的环境中。

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