RESEARCH COMMUNICATION

Analysis of Female Breast Cancer Descriptive Epidemiology in Tianjin, China

Xi-shan Hao[1], Ke-xin Chen[2], Hong Liu[3]

Abstract

To take effective measures for prevention and achieve the goal of reducing the incidence and mortality rate from breast cancer, the method of descriptive epidemiology was used to study the situation regarding female breast cancer in Tianjin. There is an increasing trend for the incidence rate (increasing 51% during the period from 1981 to 1997), though the absolute value is still low in comparison with the developed countries in the world. Furthermore, the mortality rate of breast cancer has been decreasing constantly (decreasing 38% during the same period), while the 5-year, 10-year and 15-year survival rate increased. This may be mostly attributable to work leading to early detection and early diagnosis of breast cancer.

Key Words: Breast cancer - incidence - mortality and survival rates

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Introduction

Although the incidence rate of female breast cancer in China is comparatively lower than in the developed countries in the world, it is still one of the most common malignant tumors that have threatened Chinese women's health over the last two decades. The incidence rate for breast cancer in Tianjin now ranks second, only after lung cancer. Meanwhile, the incidence rate keeps increasing and the age of the incidence peak has become younger. Therefore, an epidemic analysis of breast cancer over the last two decades in Tianjin was here made for the purpose of determining possible risk factors, with the aim of providing a basis for measures for prevention and control, and finally trying to reduce the incidence rate of the disease.

Materials and Methods

All cases come from the Cancer Registry Center in Tianjin that is located in Tianjin Cancer Institute and Hospital, Tianjin Medical University, China. It is one of the members of the International Association of Cancer Registries (IARC) of the World Health Organization, The data cover more than 3.7 million people of the Tianjin urban area. The tumor registry data of Tianjin from 1981 to 1997 have been included in volumes V, VI and VII of Cancer Incidence in Five Continents issued by WHO (Muir et al., 1987; Parkin et al., 1992; Parkin et al., 1997).

All physicians and medical staff of the hospitals and clinics in the registry area are responsible for filling out the report form for every new case diagnosed as having a malignant tumor. Death certificates for malignant tumors have to be registered at the local police station and the residential file is checked against this source. All cancer cases with insufficient information are traced to his/her family, clinic and employer. Tianjin Cancer Registry Center periodically conducts an active re-checking program to review all patient records on cancers that were not registered in this period. The morphology code of ICD-O-1(World Health Organization, 1976) and the fourth digit of ICD-9 (World Health Organization, 1977) topography code were used in the present study.

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For the purpose of data management and processing, Tianjin Cancer Registry Software Package, developed at the registry center, was used and revised periodically. Each data item is checked as being an allowable code and certain selected combinations of items are checked. Possible duplicate records from different sources are identified by computer as well as by hand.

A total of 15 data items, including serial number, name, sex code, age, occupation code, working unit code, address code, cancer site code, code of diagnosis basis, year of diagnosis, month of diagnosis, medical unit code, year of death, month of death and reporting source code, was input and computerized.

The population material in Tianjin derives from Tianjin Police Bureau. The data needed for the research were calculated with reference to the total population, divided by two, for the last two decades by the date of Dec 31. The following chart is the age distribution of the female population in 1997 in Tianjin (Figure 1). The world standard population in 1964 was used to calculate the age-standardized rate.

The data of clinical stage, pathological type, duration of survival, lymphatic metastasis and information of molecular epidemiology of the breast cancer cases come from Tianjin Cancer Institute and Hospital. Since seventy percent of the breast cancer cases of the Tianjin urban area are treated in this hospital, the data used here are quite typical.

Incidence or mortality rates per year by site, sex and age group are presented as several indexes such as age-standardized population rate (ASR), crude incidence rate (CR), and accumulative incidence rates.

Results

A. Epidemiological trend of breast cancer

Incidence trend:

From 1981 to 1997, the new breast cancer cases in Tianjin urban area totaled 8208, with a constantly increasing trend every year. The incidence rate, from 17.38 per hundred thousand in 1981 to 26.32 per hundred thousand in 1997, has been increasing 51 percent (Table 1).

Mortality trend:

A total of 2094 mortality cases of breast cancer were registered during 1981-1997 in Tianjin urban area. Although the incidence rate has kept rising annually, the mortality rate, from 4.72 per ten thousand in 1997 to 7.58 per ten thousand in 1981, revealed a big drop of 38 percent in this eighteen years (Table 2).

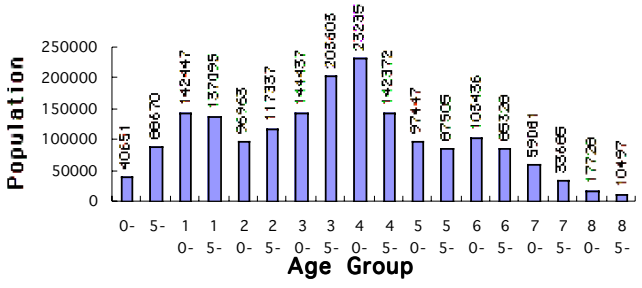

Figure 1. Female Population Age Distribution in Tianjin

Table 1. Breast Cancer Incidences in Tianjin 1981-1997 (/100000)

Year	Cases	ASR	CR*	Age 0-64 accumulated %	Age 0-74 accumulated %
81	267	17.4	18.3	1.3	1.9
82	321	19.9	20.9	1.5	2.1
83	355	21.7	2.70	1.5	2.5
84	348	20.3	21.8	1.5	2.2
85	350	19.3	21.5	1.6	2.1
86	433	23.3	26.0	1.8	2.5
87	439	23.0	25.9	1.8	2.5
88	510	26.2	29.9	2.0	2.7
89	529	26.2	30.7	2.1	2.8
90	539	26.5	30.8	2.1	2.8
91	498	23.3	28.0	1.8	2.5
92	510	23.0	28.5	1.8	2.5
93	574	24.3	31.5	2.0	2.3
94	563	23.2	30.8	1.8	2.2
95	602	24.0	32.8	2.0	2.3
96	681	26.3	37.2	2.2	2.5
97	689	26.3	37.4	2.2	2.5
Total	8208				

Table 2. Breast Cancer Mortality Rates in Tianjin 1981-1997 (/100000)

Year	Cases	ASR	CR	Age 0-64 accumulated %	Age 0-74 accumulated %
81	114	7.6	7.6	0.5	0.8
82	112	7.0	7.2	0.4	0.8
83	134	8.7	8.6	0.5	1.1
84	122	7.4	7.7	0.4	0.8
85	106	6.1	6.5	0.3	0.7
86	121	6.4	7.3	0.5	0.6
87	133	7.2	7.9	0.5	0.8
88	120	6.1	7.0	0.4	0.7
89	118	5.6	6.8	0.4	0.6
90	125	5.9	7.1	0.4	0.7
91	124	5.8	7.0	0.4	0.7
92	124	5.6	7.0	0.4	0.7
93	129	6.0	7.1	0.4	0.5
94	122	4.8	6.3	0.3	0.4
95	127	5.3	6.7	0.3	0.5
96	143	5.4	7.8	0.3	0.8
97	120	4.7	6.3	0.3	0.4
Total	2094				

B. The age-specific incidence of breast cancer

Along with age increase, breast cancer incidence rate had been increasing accordingly. It reached a peak and then dropped gradually. However, the value and age groups at peak periods varied greatly. In 1997 the incidence rate peaked at the 50 age group. Compared with the 75 age group in 1981 it clearly demonstrated a younger trend. In the 1990's the incidence rate peaked at an obviously much lower age than in the 1980's (Table 3).

C. Change of breast cancer rank

The incidence rate of breast cancer in the Tianjin urban area ranks second among all the female malignant cancers, only after lung cancer. Its mortality rate ranks No. 4. This order has remained unchanged over the past twenty years (Table 4).

D. Area differences in breast cancer incidence rates

Compared with other Chinese cities:

Since there are only a few cities and areas in China that have a cancer registry, epidemiological observations and analysis have been somewhat limited. Here only the incidence rate in different periods in Shanghai, Beijing and Tianjin are compared (Table 5). According to the Table 5, the conclusion can be drawn that the incidence trend in these three cities is the same, and the incidence of breast cancer is increasing. Shanghai has the highest incidence rate, whereby breast cancer ranks the first among female malignant cancers. The incidence rate in Tianjin is lower than in Beijing and

Table 3. Breast Cancer Specific Incidence Rates with Reference to Age in Tianjin (/100000)

Year	Age-group													
	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80-	85-
1981	1.0	2.5	10.4	26.7	34.6	44.9	46.1	43.8	48.5	66.0	61.4	70.7	37.8	0.0
1982	0.5	1.4	8.0	31.8	52.2	34.5	61.4	61.6	58.7	75.3	48.5	71.3	71.2	50.3
1983	1.0	4.4	8.3	25.0	47.0	51.8	46.3	52.0	70.6	83.4	84.2	87.3	42.8	0.0
1984	0.5	4.0	14.9	30.1	49.1	42.2	48.4	53.9	61.0	86.9	79.9	46.8	42.2	22.3
1985	0.0	3.2	10.0	27.2	38.2	55.8	54.0	64.2	74.2	67.4	66.3	69.3	37.9	0.0
1986	1.8	4.5	15.3	33.3	57.4	68.9	67.3	61.3	70.1	66.6	79.1	59.1	18.1	57.2
1987	0.7	5.5	20.0	30.5	73.3	73.0	59.6	64.7	71.6	68.6	68.2	70.4	34.9	0.0
1988	0.8	7.4	18.3	28.2	70.1	68.2	60.5	64.2	77.0	70.1	66.8	72.1	76.8	0.0
1989	2.7	3.9	15.1	39.0	69.3	74.4	77.1	69.9	65.3	72.6	70.9	59.4	60.3	15.6
1990	1.9	2.1	16.0	34.6	70.2	91.1	73.6	62.1	79.6	74.1	81.8	80.6	70.3	0.0
1991	0.9	6.8	15.9	27.1	54.5	73.2	78.5	51.3	71.5	48.8	66.9	70.2	67.3	14.0
1992	3.5	1.3	18.5	33.6	63.7	80.3	70.5	69.8	52.9	51.0	80.1	74.5	71.0	0.0
1993	0.9	3.5	13.0	24.0	57.7	82.9	75.0	74.4	61.8	49.9	78.6	78.4	26.6	12.2
1994	2.8	3.9	12.5	22.1	38.1	82.1	62.0	68.5	62.6	87.6	69.1	68.8	44.0	34.2
1995	0.0	5.5	8.2	23.3	55.8	69.0	76.9	79.2	68.7	70.6	59.6	60.3	48.7	0.0
1996	0.0	4.5	15.7	33.4	53.4	78.0	87.6	83.1	66.1	84.3	57.8	79.1	47.6	0.0
1997	0.0	6.0	14.5	23.6	53.4	82.9	90.6	72.0	73.5	69.1	77.9	50.5	22.6	57.2

Table 4. The Most Common Cancer Incidence and Mortality Rates among Females in Tianjin 1993-1997 (/100000)

	Incidence				Mortality		
Site	No. of cases	ASR	Rank	Site	No. of cases	ASR	Rank
lung	4978	39.4	1	lung	3762	29.3	1
breast	3117	25.5	2	liver	942	7.5	2
stomach	1281	10.1	3	stomach	864	6.8	3
liver	1142	9.1	4	breast	641	5.2	4
colon	748	5.9	5	oesophagus	409	3.2	5
rectum	731	5.8	6	pancreas	370	2.9	6
ovary	626	5.3	7	brain, and	327	2.7	7
brain, and	510	4.4	8	nervous system			
nervous system				rectum	368	2.7	8
oesophagus	525	4.1	9	colon	330	2.6	9
cervix uteri	311	2.4	10	cervix uteri	168	1.3	10

Table 5. Female Breast Incidence Rates(ASRs) in the Different Time Periods in Beijing, Tianjin and Shanghai, China (/100000)

Area Year	1983-1987	1988-1992	1993-1997
Beijing	22.4	25.4	27.8
Shanghai	21.2	26.5	30.1
Tianjin	21.5	24.6	25.5

Shanghai (Parkin et al., 1992; Li et al., 2001; Wang et al., 2001; Department of Epidemiology in Shanghai Cancer Institute, 2000; Wang et al., 2000).

Compared with the world:

The developed areas of the world, such as the United States, Europe and Oceania have high incidence rates for breast cancer. The accumulative incidence rate is 12% for the 0-74 age group. However, in Asia and Africa, incidence rates for breast cancer are much lower, at below 5% in the same age group. In Tianjin, the incidence rate is only 2.6 % in the same age group (Table 6) (Parkin et al., 1997).

E. Survival analysis of breast cancer

A follow-up survey on all the breast cancer cases diagnosed during 1954-1990 in Tianjin Cancer Institute and Hospital was made. The data showed that the 5-year, 10-year and 15-year survival rates in different periods and different stage had all increased with time (Ning et al., 2001). (Tables 7, 8).

Discussion

Presently, although the incidence rate of breast cancer in Tianjin is still lower than that of developed countries, it has shown a rapid increase over the past two decades. It now ranks No. 2 among the female malignancies in Tianjin urban area. Therefore, there will be severe consequences if the study of appropriate prevention and better treatment of breast cancer in Tianjin is not emphasized. To decrease the incidence of breast cancer primary prevention of breast cancer should be especially strengthened, which means an emphasis on protective factors and control of risk factors. Thus it is essential to ascertain the influential factors causing breast cancer. These can be roughly divided into two main varieties: one is related to physiological, generational and hereditary factors (Yuan et al., 1988; Ronseer et al., 1994; Howe et al., 1989; Henderson et al., 1985; Newcomb et al., 1994; Calle et al., 1993), while the other is environmental factors (including dietetic habits, smoking and physical exercise, etc) (Boyd et al., 1993; Lubin et al., 1986; Howe et al., 1990; Baghurst and Rohan, 1994; Van et al., 1995; Nasca et al., 1994; Calle et al., 1994).

Public education related to controlling risk factors of breast cancer in Tianjin has just started for women, which includes reduction in the intake of fat, increasing the intake of high-fiber food (such as grains, vegetables and fruit), promoting breast-feeding, doing regular physical exercise and so on. Moreover, regular screening should be going on. At the same time, through early detection and early diagnosis, the mortality rate of breast cancer is declining, with the survival rate is increasing.

Table 6. Female Breast Incidence Rates in Different Areas in the World 1988-1992(1/100000)

Country	Cases	CR	ASR	Age 0-74 Accumulative %
Bamako:Mali	100	5.4	10.2	--
Brazil:Belem	409	19.5	30.2	3.5
Canada:British Columbia	9903	119.5	84.3	9.8
America:California, Los Angeles Country:Non-Hispanic White	15823	172.6	103.7	12.1
China:Shanghai	6084	35.0	26.5	2.8
China:Tianjin	2586	29.3	24.6	2.6
Hong Kong	5392	38.5	34.0	3.7
Korea:Kangwha county	23	8.7	7.1	0.8
Japan:Miyagi Prefecture	2440	42.7	31.1	3.3
Singapore:Chinese	2187	41.8	39.5	4.2
India:Bombay	3864	17.8	28.2	3.2
Israel:All Jews	8628	88.4	77.4	8.7
Estonia	2200	52.9	36.5	4.0
France:Bas-Rhin	2621	106.8	78.8	9.0
UK, England,Oxford Region	7328	114.6	80.9	9.1
Italy:Genoa	2608	141.9	72.3	8.0
Western Australia	3462	86.9	72.9	8.0

Table 7. The Survival Rates for Breast Cancer Patients in the Different Periods in Tianjin (%)

Period	5-year	10-year	15-year
54-60	48.4	37.3	30.8
61-70	62.5	50.9	43.9
71-80	69.9	59.8	50.7
81-90	79.0	64.7	

Table 8. Survival Rates for Breast Cancer Patients in the Different Periods in Tianjin (%)

Period	5-year				10-year				15-year			
54-60	80.0	56.8	40.5	40.0	80.0	44.2	28.3	20.0	60.0	35.8	22.5	20.0
61-70	86.3	70.9	50.2	15.4	79.2	56.8	40.6	15.4	70.8	49.8	32.4	15.4
71-80	90.9	78.0	53.5	58.3	83.7	65.8	43.0	42.1	76.8	56.3	35.2	30.0
81-90	93.7	82.3	66.8	100	84.5	67.2	49.4	45.3				

First, in the past years several screening programs in Tianjin Urban area have been conducted. Especially the screening work of 130,000 people in Tianjin urban area from 1986 to 1990 was performed. Since there is such a large female population in China, the incidence rate of breast cancer is relatively low, women mostly have small breasts, and screening costs are high, mammography can not be considered as the first detection means for breast cancer. So the concensus method of breast cancer adopted in Tianjin is for the most part a comprehensive method. All women of over 30 age are recommended to accept breast examination by the combining method of self-examination and doctor's palpitation. If there are suspicious findings, the doctors will do further tests (including X-rays, ultrasound and others) . The results of our research revealed that breast cancer patients who received this recommendation, compared with those who did not, enjoyed the advantages of smaller tumors (the mean tumor diameters were 2.67cm and 3.21cm, respectively), earlier clinical staging (75% at stages I & II, as compared to 67.6% of those who did not receive the survey), and longer survival time (10-year survival rates of 79.4% and 54.5%, respectively).

Second, we have been now engaging in a research in relation to increasing early diagnosis by screening high-risk groups for breast cancer. A total of 34 cases of first-degree relatives of the breast cancer patients have been followed up and tested for predisposing genes of breast cancer (BRCA1, BRCA2) by molecular epidemiological methods. This study showed that the deletion of an allel-e of the BRCA1 gene has been shown in patients who developed breast cancer at a relatively early age, so that testing for BRCA1 may play an important role in the early diagnosis of breast cancer.

Lastly, distant metastasis of breast cancer is the main cause of the treatment failure. Almost half of the diagnosed patients suffer this situation. Therefore, screening these early patients who are in the potential danger of metastasis is the key point to the improvement of the curative effect of breast cancer.

Though great advances in the early detection and diagnosis of breast cancer in Tianjin have been achieved, the patients with early pathological types is still very small. For example, it is only 2.1% (Li, 2000) for ductal carcinoma in situ (DCIS), while the data in the U.S.A point to an almost 30% proportion (Frykberg and Bland, 1993). Research related to this problem is now under way.

Conclusions

In the future we should strenuously introduce and popularize knowledge about the risk factors for breast cancer, advocate healthy ways of living and sound diets, and promote physical exercise. As well, we should enhance efforts for early detection of breast cancer, especially the screening of groups at high-risk. Molecular biological technology should be further strengthened for revealing the original causes of breast cancer and exploring biological indexes concerning prognosis. More emphasis also should be placed on improving therapeutic approaches for breast cancer. We will make every effort to control its incidence and to decrease the mortality rate.

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References

Baghurst PA, Rohan TE (1994). High-fiber diets and reduced risk of breast cancer. *Int J Cancer*, **56**, 173.

Boyd NF, Martin LJ, Nottel M, et al (1993). A meta-analysis of studies of dietary fat and breast cancer risk. *Br J Cancer*, **68**, 627.

Calle EE, Martin LM, Thun MJ, et al (1993). Family history, age, and risk of fatal breast cancer. *Am Epidemiol*, **138**, 675.

Calle EE, Miracle-McMahill HL, Thun MJ, et al (1994). Cigarette smoking and risk of fatal breast cancer. *Am J Epidemiol*, **139**, 1001.

Department of Epidemiology in Shanghai Cancer Institute (2000). The cancer incidence in Shanghai in 1997. *Tumor*, **20**, 158.

DM Parkin, SL Whelan, J Ferlay, et al (1997). Cancer Incidence In Five Continents. Vol. 7.Lyon, France; International Agency for Research on Cancer, IARC Sci. Pub.

Frykberg ER, Bland KI (1993). In situ breast carcinoma. *Adv Surg*, **26**, 29.

Henderson BE, MD, Ross RK, et al (1985). Do regular ovulatery cycles increase breast cancer risk? *Cancer*, **56**, 1206.

Howe G, Hirohata T, Hislop T, et al (1990). Dietary factors and risk of breast cancer combined analysis of 72 case-control studies. *J Natl Cancer Inst*, **82**, 561.

Howe HL, Senie RT, Helen Bzduch, et al (1989). Early abortion and breast cancer risk among women under age 40. *Inter J Epidemiol*, **18**, 300.

Li lian-di, Rao Ke-qin, et al (2001). Incidence Rate and Mortality Rate of Malignant Tumor in China. *China Medicine and Technological Publication*, 26.?

Li Shu-ling (2000). Breast Oncology. *Scientific and Technical Document Publishing House*, 559.

Lubin F, Wax Y, Modan B (1986). Role of fat animal protein and dietary fiber in breast cancer etiology: a case-control study. *J Natl Cancer Inst*, **77**, 605.

Muir CS, Waterhouse J, Mack T, et al (1987). Cancer Incidence In Five Continents. Vol. 5. Lyon, France; International Agency for Research on Cancer, IARC Sci. Pub.

Nasca PC, Simin Liu, Baptiste MS, et al (1994). Alcohol consumption and breast cancer: Estrogenreceptor status and

histology. *Am J Epidemiol*, **140**, 980.
Newcomb PA, Storer BE, Longnecker MP, et al (1994). Lactation and arreduced risk of pre-menopausal breast cancer. *New Engl J Med*, **330**, 81.
Ning Lian-cheng, Lang Yi-fang, Fu Xi-lin, et al (2001). Improvement in survival of breast cancer with time. *Journal of Tianjin Medical University*, **7**, 246-8.
Parkin DM, Muir CS, Whelan SL, et al (1992). Cancer Incidence In Five Continents. Vol. 6. Lyon, France; International Agency for Research on Cancer, IARC Sci. Pub.
Ronseer B, Colditz GA, Willett WC (1994). Reproductive risk factors in approspective study of breast cancer: the Nurse's Health Study. *Am J Epidemiol*, **139**, 819.
Van den Brandt, Alexandra Goldbohm, Pieter Van't Veer, et al (1995). Alcohol and breast cancer: results from the Netherlands cohort study. *Am J Epidemiol*, **141**, 907.
Wang Qi-jun, Zhu Wei-xing, Xing Xiu-mei, et al (2001). The trend of cancer incidence in urban Beijing from 1982 to 1997. *Bull Chinese Cancer*, **10**, 507-9.
Wang Qing-sheng, Hao Xi-shan, Yu Shi-bei, et al (2000). The cancer incidence in Tianjin from 1993 to 1997. *Chin J Clin Oncol*, **27**, 870.
World Health Organization (1976). International Classification of Disease for Oncology, First Edition. Geneva, Switzerland: WHO.
World Health Organization (1977). International Classification of Disease, Ninth Revision. Geneva, Switzerland: WHO.
Yuan JM, Mimi Yu, Rose RK, et al (1988). Risk factors for breast cancer in Chinese women in Shanghai. *Cancer Res*, **48**, 1949.

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