RESEARCH COMMUNICATION

Risk Assessment of Breast Cancer in Guangdong, China: A Community-based Survey

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Abstract

Objectives: Compared with Western countries, the incidence rates for breast cancer in China are still low. However, breast cancer appears to be hitting Chinese women at a much younger age, with a peak between 40 and 50 years. Furthermore, breast tumors of Asian women have molecular and genetic characteristics that are different from those of Caucasian women. Methods: A community-based study was designed to evaluate the relationship between lifestyles and breast cancer risk in Chinese women residing in Guangzhou. 16,314 subjects completed the questionnaire. Potential confounding factors included sociodemographic characteristics. Results: 33 individuals reported a history of breast cancer, yielding a prevalence rate of 202.3/100000. Associations between subjects' demographic and breast cancer risk factors were assessed. Breast cancer is associated with family history of breast cancer, X-rays received, benign breast disease and hyperlipoidemia or hypercholesteremia with elevated odds ratios. Conclusions: Family history of breast cancer, X-ray received benign breast disease and hyperlipoidemia or hypercholesteremia were significantly associated with risk of breast cancer and may havepotential for breast cancer risk assessment.

Keywords: Breast cancer - association - risk assessment - China

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Introduction

Although breast cancer death rates have been declining since the early 1990s, according to the most recent data published by the National Center for Health Statistics of the United State, breast cancer is still the most common cancer in women, which alone is expected to account for 29% of all new cancer cases and reductions in death rates account for 34% of the total decline among women (Siegel et al., 2012). In 2011, it is projected that there will be 230,480 new cases of invasive breast cancer and 57,650 new diagnoses of in situ breast cancer. In the 1970s to 1980s, many epidemiological studies have found some risk factors for breast cancer such as delayed childbearing, having fewer children, oral contraceptive use and menopausal hormone use (Lilienfeld et al., 1975; Lyle et al., 1980; McPherson et al., 1987). A few studies reported vegetables or fruits intake are associated with a reduction in breast cancer risk recently (Gaudet et al., 2004; Lissowska et al., 2008). However, most of these studies have been performed in Western countries.

Compared with Western countries, the incidence rates for breast cancer in China are still lower. Studies showed high intake of soy protein or fiber may be one of the reasons (Zhu et al., 2011). In our population, use of both oral contraceptives and menopausal hormone were uncommon compared with the United States. However the incidence is rising steeply, almost twice as much as the worldwide rate, and associated with increased mortality. In addition, breast cancer is hitting Chinese women at a much younger age. Study showed the peak age for breast cancer is between 40 and 50 years in the Asian countries, which is about 10 years younger than in the West (Leong et al., 2010).

Being a vast country with over 1.3 billion people, life style, dietary availability and behavior habits vary substantially across the different geographic regions of China. To date, there is no global epidemiological statistics for breast cancer besides risk factor in China. Guangzhou city is located in the Southern part of China with 10 millions residents. As the third largest city in China, breast cancer is the leading cancer in females in Guangzhou and the incidence is catching up with rates in western world at present (Cao et al., 2008). According to Chinese Cancer Registry Annual Report, the incidence age-standardized rate (world) of female breast cancer in Guangzhou city was 34.72 in 2004, 47.76 in 2006, 44.92 in 2007. Unhealthy lifestyles, high-fat diets, lack of exercise and the pressure of heavy workloads can increase the risk of breast cancer. The change of risks for breast cancer associated with social and economic development in China will be applicable to many developing countries worldwide.

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Table 1. Demographic Factors of Females in a Community of Guangzhou

	Case (n=20) 122.8/100000	Control (n=16281) 99.9%	Total (n=16301) 100%	p
Age(yr)	45.8±11.5	38.5 ± 11.9	38.5±12.0	<0.001
Mean±SD				<0.001
<20	0 (0.0%)	320(1.97%)	320	
20 – 34	4 (20.0%)	6432 (39.50%)	6436	
35 – 49	8 (40.0%)	6276(38.55%)	6284	
50 – 64	6(30.0%)	3100 (19.04%)	3106	
>=65	2 (10.0%)	153 (0.94%)	155	
Marital status (n, %)				0.607
Unmarried	3 (15.0%)	3434 (21.09%)	3437	
Married	15 (75.0%)	12139 (74.56%)	12154	
Widowed	1 (5.0%)	250 (15.33%)	251	
Seperated	0 (0.0%)	95 (0.58%)	95	
Divorced	1 (5.0%)	363(2.23%)	364	
Educational Status (n, %)				0.804
Below Primary School	0 (0.0%)	63(0.39%)	63	
Primary School	2 (10.0%)	621 (3.82%)	623	
Junior High School	3 (15.0%)	2940 (18.06%)	2943	
Senior High School/Secondary Technical School	7 (35.0%)	5492 (33.73%)	5499	
College	4 (20.0%)	3884 (23.85%)	3888	
Bachelar Degree or Above	4 (20.0%)	3281(20.15%)	3285	
Occupation (n, %)				0.534
Administrator/Other White				
Collar Worker	13(65.0%)	9607(59.01%)	9620	
Blue Collar Worker	4(20.0%)	4290(26.35%)	4294	
Farmer/Other	3(15.0%)	2384(14.64%)	2387	

This community-based study was designed to evaluate the relationship between lifestyles and breast cancer risk in Chinese women residing in Guangzhou.

Materials and Methods

Study Population

The community based prospective cross sectional analysis was conceived in the twelve community area of Yuexiu district of Guangzhou. Potential subjects were recruited during June 2010- October 2010. Inclusion criteria were female subjects aged 18 to 70 years and natives of the province of Guangzhou or having lived in Guangzhou for at least 3 years. Exclusion criteria were: 1) not available when investigator visited or called, 2) diagnosis of any prior or concurrent cancers other than breast cancer, 3) refused to participate. A total of 22,908 women were interviewed. The initial eligibility to participate in the study was determined by potential participants themselves using the criteria stated above. After obtaining consent, more detailed baseline information was collected by the investigator. Finally 16,314 (71.2%) cases were eligible and finished the questionnaire.

Data Collection

Participants were recruited by several strategies. Firstly, flyers and brochures were posted to explain the purpose and procedure of the study in the public community areas. Then staff from neighborhood committee called to make the appointment of face-to-face or telephone interviews. After obtaining the consent, trained interviewers conducted face-to-face or telephone interviews using a structured questionnaire to collect information on lifestyles and potential confounding factors. The data were gathered by undergraduate medical students of Sun Yat-Sen University after trained by faculty of The School of Public Health of Sun Yat-Sen University. The subjects took, on average, 30 minutes to complete the questionnaire. The main part consist of nine headings: 1) previous medical history and treatment (including a self-reported history of breast disease, diabetes, hypertension, or high cholesterol), 2) menstrual and reproductive histories, 3)contraceptive choices, use of exogenous hormone and health care supplements, 4) active and passive smoking, alcohol and tea use, 5) physical activity, 6) diet, 7) occupation, 8) family history, 9) current body weight and height measures. Potential confounding factors included sociodemographic characteristics (age, residence, marital status, education, occupation).

Statistical analysis

The data were input into the database created by Epidata3.0 and analyzed using software SPSS 13.0. Associations between variables were analyzed by the Student's t-test and chisquare test. Unconditional logistic regression models were used to estimate the odds ratios (ORs) and 95% confidence intervals (95% CI) for the association of risk and breast cancer. After selection based on comparison of baseline characteristics between two groups, age and family history of breast cancer in a first-degree relative were adjusted for as potential confounding factors. All p values were two-sided and statistical significance was determined at the $p < 0.05$ level.

Results

Characteristics of study population

The survey sample comprised 16,314 women aged 18–70 years. The median age was 37 years. Finally, 33 individuals had a history of breast cancer, yielding a prevalence rate of 202.3/100000. The median age of

Table 2. The Odds Ratios of Risk Factors for Breast Cancer Obtained from Univariate and Multiple Logistic Regression Analysis

Risk Factor	Crude OR (95%CI)			Adjusted OR (95%CI)		
	OR	95%CI	P	OR	95%CI	P
Age(years)	1.09	1.06-1.12	<0.001	1.01	0.93-1.10	0.783
Family History of Cancer						
Yes	1.00			1.00		
No	4.13	1.57-10.86	0.004	0.91	0.12-7.17	0.928
Menapausal						
Premenopausal	1.00			1.00		
Postmenopausal	4.16	1.96-8.87	<0.001	7.56	0.82-70.18	0.075
Receiving X ray in Last 10 Years (Trend Test)	2.11	1.61-2.76	<0.001	1.56	0.97-2.52	0.069
None						
1-9 times						
10-14 times						
>=15 times						
Benign Breast Diseases						
None	1.00			1.00		
Lobular hyperplasia	7.22	1.46-35.80	0.016	2.62	0.20-33.95	0.461
Fibroadenoma	198.30	53.27-738.12	<0.001	231.77	28.53-1883.09	<0.001
Cyst	57.21	11.48-284.98	<0.001	32.51	2.30-459.76	0.010
Others	132.89	29.44-599.76	<0.001	109.63	11.46-1048.47	<0.001
Hyperlipoidemia /Hypercholesteremia						
No	1.00			1.00		
Yes	9.95	3.01-32.93	<0.001	8.05	1.02-63.86	0.048

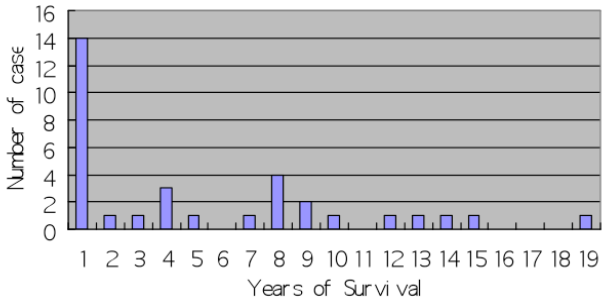

Figure 1. Years of Survival of the 33 Individual with Breast Cancer

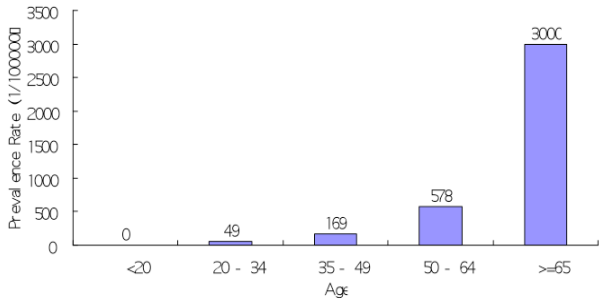

Figure 2. Age-specific Prevalence Rate of Breast Cancer

breast cancer cases was 54 years, and median age at diagnosis was 46 years. Only 33.3% of the breast cancer subjects were postmenopausal when diagnosis was made. 14 subjects were diagnosed in less than one year. The longest survivor got breast cancer 19 years before (Figure 1). Figure 2 shows the age-specific prevalence rate. The prevalence rate was 49 per 100,000 women among women aged 20 – 34 years, 169 among women aged 35 – 49 years, 478 among women aged 50 – 64 years, and 3,000 among women aged 65 years and older. Twenty patients receiving diagnosis in 5 years before the interviews were included. Another interview was reviewed to obtain the information at the time when diagnoses of breast cancer were first made. All of the above variables were considered potential confounders and adjusted for the subsequent analyses. No significant differences were found between the case and control subjects in sociodemographic factors including educational level, occupational status, and marital status (Table 1).

Risk factor for breast cancer

The results obtained from univariate and multiple logistic regression analysis are shown in Table 2. Women with older age (OR=1.09), family history of cancer (OR=4.13), receiving multiple X-ray (OR=2.11), benign breast diseases including lobular hyperplasia (OR=7.22), fibroadenoma (OR=198.3), cyst (OR=57.21) and others (OR=132.89), hyperlipoidemia and hypercholesteremia (OR=9.95) were at higher risk of developing breast cancer. After adjusting OR, benign breast diseases including fibroadenoma and cyst, hyperlipoidemia and hypercholesteremia significantly contributed to the observed differences.

Discussion

Incidence rates of breast cancer in most countries of Asia, including China are currently low compared with those in Western countries. One-fifth of the world's women live in China.

Established beneficial effects for breast cancer in women are earlier first birth, higher parity, and later age at menarche. Colditz showed history of benign breast disease is associated with a 57% increase in cumulative risk of breast cancer by age 70 years. Use of postmenopausal estrogen without progestin from ages 50-60 years increases risk of breast cancer to age 70 by 23% compared with a woman who never uses hormones. Ten years of use of estrogen plus progestin increases risk to age 70 years by 67%. Compared with never drinking alcohol, one

drink per day from age 18 years increases risk to age 70 by 7% (Colditz and Rosner, 2000). Studies conducted in countries whose incidence is high (Wales and the United States), moderate (Brazil, Greece, and Yugoslavia), and low (Japan and Taiwan) demonstrated 1) Incidence rates jump to a higher level after first childbirth, but then increase with age more slowly thereafter. 2) Rates increase with age more slowly after menopause than before. 3) Rates change quadratically with body mass index among all women, although the main trend varies: rates decrease with body mass index among premenopausal women in high-risk countries, but increase with body mass index in all other groups of women (Pathak and Whittemore, 1992). This international study supported the hypothesis that all of these risk factors are likely to be common to women of all ethnicities, including Chinese women. Despite variations in the overall absolute rates of breast cancer, the associations between these factors and the risk of breast cancer were similar across different ethnic groups.

However, when the Rosner-Colditz log-incidence breast cancer model that was developed in white American women was applied to 74,942 Chinese women, was only able to explain as much as 76% of the difference in rates between American and Chinese women. The model overestimated Chinese breast cancer incidence rates by approximately 40% by using information on risk factors that are common to women of all ethnicities (Linos et al., 2008). There are differences between white American women and Chinese women in diet, genetics, body shape or other breast cancer risk factors that may reflect systematic differences in breast cancer screening programs. Furthermore, breast tumors of Asian women have molecular and genetic characteristics that are different to those of white women.

The distribution of risk factors for breast cancer among Chinese women has changed with China economic and social development. High body mass index (BMI) has been associated with an increased risk for breast cancer (Shi J et al., 2010). Meanwhile, increases in the number of Chinese women in the workforce as well as decreases in fertility have greatly changed the underlying distributions of reproductive factor associated with the risk of breast cancer. However, the average BMI in our study was only 21.8±2.9. The percentage of women drinking alcohol (at least once per week and lasting for at least 3 months regardless of the type of drink) was 4.22%, and taking cigarette (at least once per day and lasting for at least 3 months) was 0.84%. As to the hormone replacement therapy, only 0.12% of the postmenopausal women were receiving. We think all of the above data was too little to make any significant difference.

The average age at menarche decreased from 13.9 years in the 1980s to recently 13.5 years (Mao et al., 2011). The average birth rate among Chinese women decreased from 2.9 in 1979 to 1.7 in 2004, with a rate of 1.3 in urban areas and just under 2.0 in rural areas (Hesketh et al., 2005). The birth rate of women in our study was 1.5. The decline in fertility in China is associated with economic and social development. As the worldwide trend that many countries have had substantial declines in fertility during the past 25 year, it is not attributable to any single policy measure. It is reasonable to speculate that there would have been a further decline in China.

Up to date, mammography is still not a routine screening program of breast cancer for Chinese women. It is thought that the fact that mammographic screening rates are very low in China may underestimate the incidence. Although mammography has been beneficial for reducing the health burden of malignant breast cancers in Western countries, ultrasound has a higher sensitivity than mammography in women with dense breast tissue (Ravert and Huffaker, 2010). Also, cost-effectiveness analyses in Hong Kong suggest that mammography may not be cost-effective for Asian population (Woo et al., 2007).

Finally, this study, as many investigations, showed elevated odds ratios for breast cancer associated with family history of breast cancer, X-ray received, benign breast disease and hyperlipoidemia or hypercholesteremia. However, there are limitations in this community-based study. Further investigations on the regional patterns of breast cancer incidence, including possible differences between urban and rural areas, with larger sample sizes, are needed to guide screening policy.

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