RESEARCH ARTICLE

Trends in Incidence of Breast Cancer among Women under 40 in Asia

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Abstract

Background: The aim of this study was to evaluate trends in incidence of breast cancer in women less than 40 years in Asia. Materials and Methods: Registered cases of female breast cancer age less than 40 years and corresponding person years were ascertained from the CI5plus for 10 registries in Asia for the duration of 1970-2002. Cases were categorized into three age groups: 16-40, 16-29, and 30-40. The 16-40 age group was adjusted to world age population structure. Joinpoint regression analysis was conducted to determine the annual percent of change (APC) and the average annual percent of change (AAPC) for each age group. Results: A total of 23,661 cases of breast cancer occurred in the 10 registries during the 32 years (1970-2002) of follow-up. The overall age adjusted (16-40 group) breast cancer incidence rate increased from 2.28-4.26 cases per 100,000 population corresponding to an AAPC of 2.6% (95%CI 2.1, 3.0). The trend in incidence for the age group 16-29 increased from 0.45-1.07 corresponding to an AAPC of 2.8% (95%CI 1.9, 3.7). In age group 30 to 40, the incidence ranged from 13.3 in year 1970 to 24.8 in year 2002 corresponding to an AAPC of 2.7% (95% CI 2.3, 3.1). There were two statistically significant changing points in the regression line for the age groups 30-40 and 16-40: one point in the year 1975 with an APC of 6.1 (5.1, 7.1), and the other in 1985 with an APC of 0.4% (0.01, 0.8). Conclusions: Our study proved that: 1) the incidence of breast cancer in young women has increased in Asian population during the study period; 2) the rate of increase was very high during the period of 1980-1990.

Keywords: Breast cancer in young women - trend - Asia - population-based registries

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Introduction

The epidemiology of breast cancer in young women (BCYW) is poorly understood and it is suspected that the disease is not part of the normal spectrum of breast cancer which is determined by a strong endogenous hormonal influence (Bleyer et al., 2008). Specific studies addressing risk factors for BCYW, though limited, indicate different hormonal events compared to main stream breast cancer; the effect of oral contraceptive use and induced abortion has already been implicated to being more related to BCYW than to the main stream breast cancer (Daling et al., 1994; White et al., 1994). The increase in incidence of breast cancer has been documented in many populations for the main stream breast cancer (breast cancer in age group >40); but data on the incidence in young women is scant and limited (Afsharfard et al., 2013; Harhra & Basaleem, 2012; Igissinov et al., 2011). Recent studies have established that the incidence of breast cancer in young women has increased in countries with qualified cancer registry such as in Europe and US (Colonna et al., 2008; Gabriel and Domchek, 2010; Leclere et al., 2013). The aim of this study was to utilize the incidence data of the Cancer in Five Continent for the population of Asia and to evaluate the trends in occurrence of breast cancer in young women in this population for the period of 1970 to 2002.

Materials and Methods

The Data

Patients and population: Registered cases of female breast cancer with age less than 40 years and corresponding person years were ascertained from the CI5plus, Cancer Incidence in Five Continents Annual Dataset (a online data repository of International Agency on Research on Cancer, IARC) for 10 registries in Asia (Appendix 1) for the duration of 1970-2002 (CANCERMondial). Cases and their corresponding person years for the 10 registries were pooled. To estimate age specific trends, age was categorized into 16-29, 30-40, and overall 16-40 age groups.

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Appendix 1. The Registries and Starting Year and Durtion of Contrinuting Data

Registry	Starting year	Duration of followup
China, Shanghai	1988	14
China, Hong Kong	1983	19
India, Mumbai	1978	24
India, Chennai	1983	19
Japan, Miyagi Prefecture	1978	24
Japan, Osaka Prefecture	1970	32
Japan, Yamagata Prefecture	1983	19
Philippines, Manila	1983	19
Singapore: Chinese	1970	32
Singapore: Malay	1983	19

Statistical analysis

Statistical analysis was conducted by joinpoint regression using the software provided by the Surveillance Research Program of USA National Cancer Institute (Kim et al., 2000). joinpoint uses linear regression and permutation to estimate trends and changing points in trends. In joinpoint the trend is defined as the linear slope of (in log scale) regression line fitted to the rates across the study period. Any changing point in the slope is determined as a joinpoint with a new slope and regression line parameters. In our analysis we started with zero joinpoint (no changes in the slope of trend) and accepted up to three joinpoints. The joinpoint software reports two measures of trend: 1) the annual percent change (APC) as a linear trend where, during the study period, any statistically significant changes in the magnitude of trend is presented as a joint point, and 2) the average annual percent changes (AAPC) where the APCs are averaged over the study period (no joint point is presented). The first measure identifies more details of the trend but the second measure provides an overall trend. In this paper we report both measures to increase the interpretability of the result.

Results

A total of 23,661 cases of breast cancer occurred in the 10 registries during the 32 years (1970-2002). Twelve percents (2827 cases) occurred in age group younger less than 30 years and 88% occurred in age group 30-40. The incidence in all age groups combined (16-40) ranged from 3.21 in 1971 to 8.03 cases per 100 000 in 2001. Among the age group less than 30 years, the incidence ranged from 0.34 in 1971 to 1.25 cases per 100 000 in year 2000. Among the age group 30 to 40, the incidence ranged from 12.42 in 1975 to 27.38 cases per 100 000 in 1997. The overall age adjusted (adjusted to world population structure) incidence ranged from a low of 2.20 in 1974 to a high of 4.68 cases per 100 000 in 1997. Table 1 presents the yearly incidences based on different age groups for duration of the study.

Between 1970 and 2002 the overall age (16-40 years) adjusted breast cancer incidence rate increased from 2.28-4.26 cases per 100 000 population corresponding to an AAPC of 2.6% (95%CI 2.1, 3.0). There were two statistically significant changing points in the regression line for the age group 16-40: one in the year 1975 with the incidence increasing up to the year 1985 with an APC of 6.3% (Table 1, Figure 1), and the other one in 1985 with incidence increasing with a APC of 0.4% (95%CI 0.01, 0.8). The trends in incidence for the age group 16-29 increased from 0.45-1.07 corresponding to an AAPC of 2.8% (95%CI 1.9, 3.7). The trend for the age group 16-29, included one jointpoint in the year 1984 when the rate of increase changed from an APC of 7.2% to a slight reduction of statistically not significant APC of -0.1 (95%CI-1.7, 1.6) Table 2 and Figure 2. In age group 30-40, the trends in incidence ranged from 13.34 in year 1970 to 24.78 in year 2002 corresponding to an APC of 2.7%

Table 1. The Incidence of Breast Cancer in Young Women Based on Age Group, 1970 to 2002

YEAR	16-29	30-40	16-40	ASR*
1970	0.45	13.34	3.31	2.28
1971	0.34	13.13	3.23	2.26
1972	0.67	12.92	3.49	2.28
1973	0.52	13.57	3.57	2.38
1974	0.33	12.98	3.34	2.20
1975	0.89	12.42	3.67	2.25
1976	0.79	14.00	4.06	2.54
1977	0.72	15.18	4.38	2.76
1978	0.67	15.02	3.97	2.67
1979	1.04	15.10	4.31	2.84
1980	0.73	17.34	4.64	3.04
1981	1.03	17.46	4.90	3.16
1982	0.91	20.51	5.51	3.56
1983	0.99	22.36	5.50	3.95
1984	1.17	21.79	5.59	3.89
1985	1.29	23.13	6.06	4.13
1986	1.19	23.99	6.23	4.24
1987	1.07	25.80	6.60	4.47
1988	1.06	24.96	6.94	4.34
1989	1.11	24.99	7.08	4.39
1990	1.08	24.24	7.00	4.23
1991	1.08	25.01	7.28	4.32
1992	1.08	24.74	7.28	4.24
1993	0.99	24.32	7.07	4.16
1994	1.05	24.38	7.11	4.19
1995	1.16	26.06	7.62	4.49
1996	1.00	25.03	7.24	4.26
1997	1.26	27.38	8.03	4.68
1998	1.08	26.76	7.76	4.54
1999	1.11	26.91	7.84	4.56
2000	1.25	26.35	7.81	4.52
2001	1.23	26.93	8.03	4.62
2002	1.07	24.78	7.41	4.21

* Age (world population) standardized rate

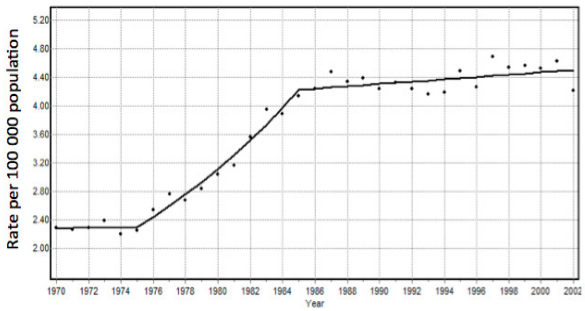

Figure 1. Trend in the Age Standardized Breast Cancer Incidence Rates, Age Group 0-40, 1970-2002

Table 2. The Overall Trends in Incidence Rates for Each Age Group

Age group	Period	Rates		Joinpoint	APC* (95% CI)
		Starting	Endinging		
16-29	1970-1984	0.43	1.13		7.2 (4.6, 9.8)
	1984-2002	1.13	1.11	First	-0.1 (-1.7, 1.6)
30-40	1970-1975	13.33	12.86		-0.7 (-3.3, 1.9)
	1975-1985	12.86	24.64	First	6.1 (5.1, 7.1)
	1985-2002	24.64	26.36	Second	0.4 (-0.01, 0.9)
16-40	1970-1975	2.28	2.29		0.1 (-2.3, 2.6)
	1975-1985	2.29	4.22	First	6.3 (5.2, 7.4)
	1985-2002	4.22	4.5	Second	0.4 (-0.01, 0.8)

*Average Annual percentage of change

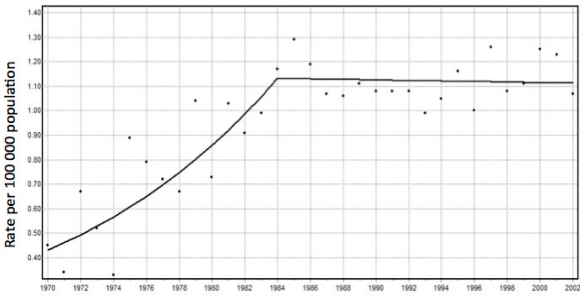

Figure 2. Trend in the Age Standardized Breast Cancer Incidence Rates, Age Group 0-29, 1970-2002

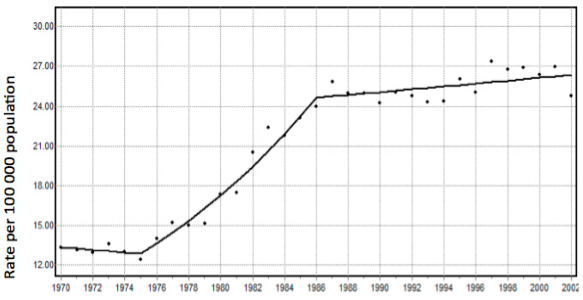

Figure 3. Trend in the Age Standardized Breast Cancer Incidence Rates, Age Group 30-40, 1970-2002

(95%CI 2.3, 3.1).). There were two statistically significant changing points in the regression line for this age group: one in the year 1975 with the incidence increasing up to the year 1985 with an APC of 6.1 (5.1, 7.1) and the other one in 1985 with incidence increasing up to 2002 with a APC of 0.4% (0.01, 0.8), Table 2 and Figure 3.

Discussion

Our 32-year population-based analysis of incidence rates of breast cancer in young women indicated a steady increase in the overall and age specific rates of breast cancer in young women among the Asian population. Increase in incidence and mortality rates of breast cancer has been reported in different countries especially western countries (Sriplung et al., 2006; Jung et al., 2010; Harhra and Basaleem, 2012; Hussain et al., 2012; Afsharfard, et al., 2013; Mousavi-Jarrrahi et al., 2013). While there are lots of report on trend in the incidence of breast cancer in older age, trend in incidence of breast cancer among young women has not been assessed in details or in different populations. A very recent study looking at trend in breast cancer in European countries using pooled data from different countries of Europe reported an overall increase of 1.19% per year from 1990 till 2008 (Leclere et al., 2013). This study reported the rise in incidence was greater for women under 35 compared 36-40 years age. Another study in France studied trend in the incidence of breast cancer in young women under 40 years and reported a slow and steady increase during the period of 1983-2002 (Colonna et al., 2008). The trend analysis of data from the Seattle-Puget Sound Surveillance, Epidemiology, and End Results cancer registry reported an annual increase of 2.5% for the young women in Washington State, USA during the period 1974-1984 (White et al., 1987). There is no trend data in the incidence of breast cancer in young women in developing countries; however, a study in Goiania, brazil reported a annual increase of 5.22% in the incidence of breast cancer among age group 30-40 years during the period of 1988-2003 (Freitas et al., 2010).

Consistent with our study, the published reports on the trend in the incidence of breast cancer in young women indicate a steady increase in incidence during recent decades. The increase in the incidence in our study included two inflections or changing point in the regression line fitted to trend (indicating a sharp increase in rates in the period 1975-1985). The sharp increase in rates during the 1975-1985 compared to the period before and after presents a challenge in interpreting the trend in Asian population.

Any change in trend of any disease especially breast cancer can be attributed to either an underlying change of some risk factors, the result of an improvement in registration activities or, due to screening practice. The changing pattern of increase in incidence in our study may not be fully explained by introduction of screening as no screening program recommends screening for age group less than 40 years plus the mass mammographic screening was introduced in Asian countries in early 1990 (Wang, 2003; Morimoto et al., 2004), far after the sharp increase in incidence. The changing pattern of trend in our study cannot be attributed to improving of registration procedures because our data came from the IARC data repository where the data quality meets certain degrees of accuracy. Attributing the change and increase in incidence to changing risk profile among the population needs knowledge of how the risk factors are distributed in the community. The increase in the rate of main stream breast cancer in Asian population, has been mainly attributed to "western lifestyle" characterized (Gerber et al., 2003; McTiernan, 2003) by the combination of early menarche, decreased parity, delayed childbearing, and a sedentary lifestyle (Gao et al., 2009; 2013; Jayalekshmi et al., 2009). Nominally, the risk factors for breast cancer in young women are similar to risk factors for breast cancer in older women (except for body mass index and risk factor related to post menopausal status such as hormone replacement therapy) still some suggest hypothesis that breast cancer in young women may be etiologically different from breast cancer in older women (Bleyer et al., 2008). There are some distinct characteristics with breast cancer in young women that support this hypothesis such as: an aggressive course of clinical presentation, an early

onset breast cancer and related to genetic factors, a higher rate of germ line mutation in BRCA 1&2 (Malone et al., 2000; Gonzalez et al., 2009; Laudico et al., 2009; Joseph et al., 2011), distinct estrogen and progesterone receptor impressibility, and over expression of human epidermal growth factor receptor (Bleyer et al., 2009; Gnerlich et al., 2009; Gabriel and Domchek, 2010). A younger age at onset among the Asian population has been reported and it has been attributed to a cohort effect that has been decreasing in recent decades (Mousavi-Jarrrahi et al., 2013). Such a cohort effect cannot explain the changing points in the incidence seen during the period of 1975-1984. While the overall increase in the incidence seen in our data follows the pattern of increase among the older breast cancer patients that has been attributed to changing life style among the Asian population, the inflection seen in the trend lines (from 1985-1995) especially in age group 30-40 in this population needs further study for a sound explanation.

In conclusion, our study proved that: 1) the incidence of breast cancer in young women has increased in Asian population during the study period; 2) the rate of increase was very high during the period of 1980-1990.

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