Epidemiology of Breast Cancer in Japan and the US

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Abstract

A comparison of breast cancer occurring in American and Japanese women reveals that both the incidence and mortality rates are markedly higher in the US. However, both the age-adjusted incidence and mortality rates have been increasing in Japan. On the other hand, in the US, where the age-adjusted incidence rate tended to increase before the 1990s, the rate has tended to decline after reaching a peak in the late 1990s. The age-adjusted mortality rate has also tended to decline since the 1980s in the US.

Risk factors for breast cancer include early menarche, late menopause, and late first delivery. The higher frequencies of these risk factors in American women than in Japanese women may explain the higher incidence and mortality rates of breast cancer in the US. The recent increase in the incidence and mortality rates of breast cancer in Japan seems to be a reflection of a trend toward late marriage and declining birthrates in this country. The recent decrease in the mortality rate from breast cancer in the US may be attributable to the spread of screening by mammography and improved therapeutic modalities. Major risk factors for breast cancer are difficult to control at the individual level, and effective prevention of the disease is unlikely. Improvement in the screening rate will be necessary for achieving a decrease in the mortality from breast cancer.

Key words Mortality, Incidence, Risk factors

Introduction

Although the incidence and mortality rates of breast cancer among women in Japan are lower than those in western countries, they have been increasing recently. In Japan in 1994, the age-adjusted breast cancer incidence rate ranked first among cancer incidence rates by site of cancer. Understanding the trends in the incidence and mortality rates and established risk factors for breast cancer, and considering Japan's differences from the US, where the incidence and mortality rates have been decreasing, has important implications for the future prevention of breast cancer in Japan.

Descriptive Epidemiology

Number of new cases and incidence rate of breast cancer

Information on cancer morbidity in Japan is available from the Research Group for the Population-Based Cancer Registry in Japan, whereas that in the US is available from the Surveillance Epidemiology and End Results (SEER) and the National Program of Cancer Registries (NPCR). However, it should be noted that Japanese data include cases of carcinoma in situ.

In 2001, there were 40,675 women with breast cancer in Japan (ranking second among cancer cases by site of cancer), accounting for 16.7% of all cases of cancer. In 2002, the number of American women with breast cancer was 168,632

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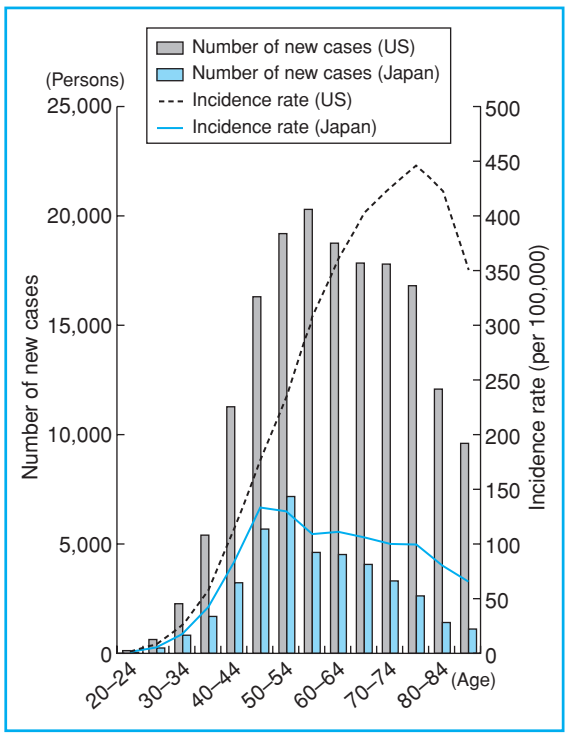
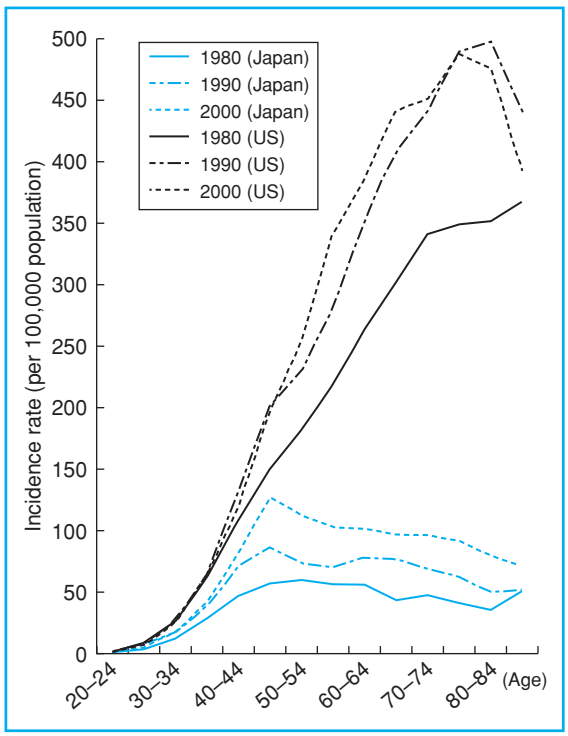


(Japan: Research Group for the Population-Based Cancer Registry in Japan,* US: US Cancer Statistics**)
* Including carcinoma in situ.
** Excluding Connecticut, Hawaii, Iowa, Kansas, Maryland, Mississippi, New Mexico, South Dakota, Tennessee, Utah, Virginia, and Wyoming.

Fig. 1 The number of breast cancer new cases and incidence rates by age group in Japan (2001) and the US (2002)



(Japan: Research Group for the Population-Based Cancer Registry in Japan, US: SEER database)

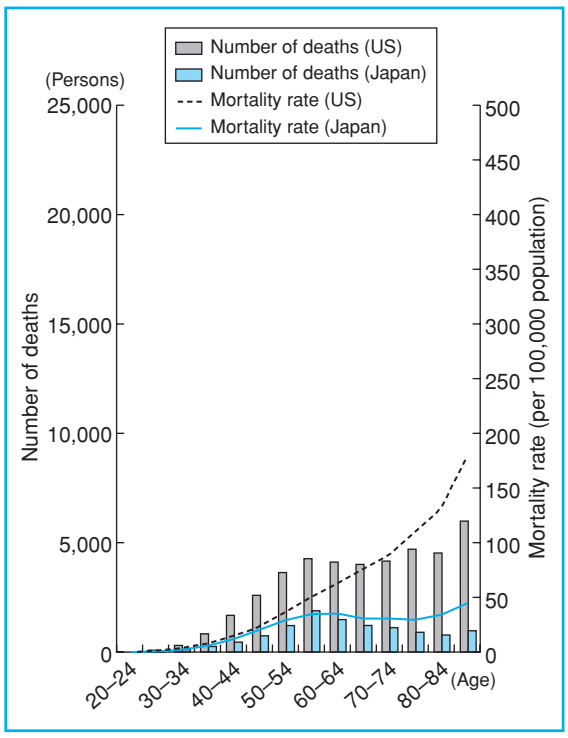
Fig. 2 Breast cancer incidence rates by age group

(ranking first among cancer cases by site of cancer), accounting for 30.4% of all cases of cancer.

The age-adjusted incidence rate has been increasing in Japan since 1975, with the 1985 model population being used as the reference population. The incidence rate of breast cancer was third highest (21.7 per 100,000 population) among various cancers in 1975, following stomach cancer and uterine cancer. After reaching a peak (101.4 per 100,000 population) in 1999, the incidence rate has been declining, showing a figure of 89.8 per 100,000 population in 2004.

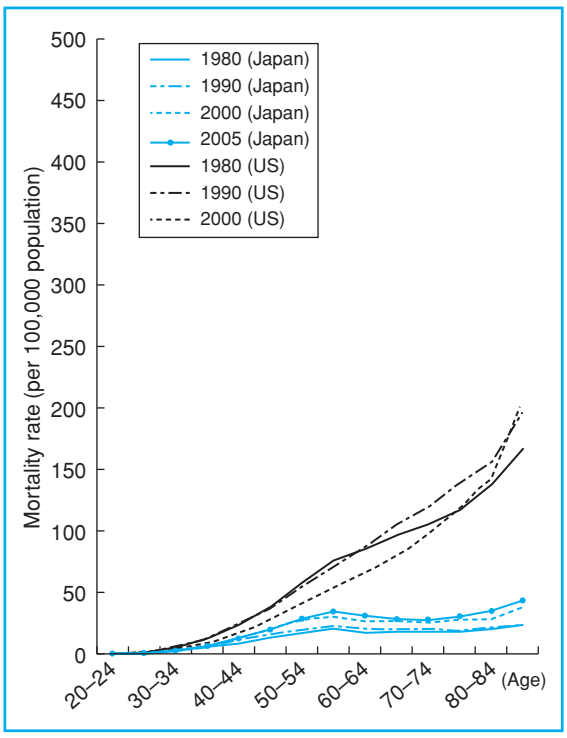
Figure 1 shows the number of new cases and incidence rates by age group in Japan (2001) and the US (2002). In both countries, the number of new cases began to increase after the age of 20 years, reaching a peak at the age of 50–59 and declining thereafter. Breast cancer was most frequent in women 50–54 years of age in Japan, whereas the corresponding age was 55–59 years in the US. The incidence rate began to increase after 20 years of age in both Japan and the US, continuing to increase similarly until 45–49 years. However, the incidence rate reached a peak (133.7 per 100,000 population) at the age of 45–49 years in Japan, whereas there was a continuous increase (446.8 per 100,000 population) until 75–79 years in the US.

Figure 2 shows the trend in the incidence rates of breast cancer by age group at 10-year intervals. In Japan, the peak incidence rate was found in women aged 50–54 (59.8 per 100,000) in 1980, and in those aged 45–49 (86.4 and 126.4 per 100,000 in 1990 and 2000, respectively). The peak has been even more dramatic in recent years. In addition, regardless of age group, the incidence rate has been higher in recent years. In the US, the incidence rate was higher in women of more advanced age in 1980. The peak incidence rate was found in women aged 80–84 (497.7 per 100,000) in 1990, and in those aged 75–79 (487.4 per 100,000) in 2000. Although there was a marked increase in the incidence rate of breast



(Japan: Vital statistics of Japan, Ministry of Health, Labor and Welfare; US: WHO database)

Fig. 3 The number of breast cancer deaths and mortality rates by age group in Japan (2006) and the US (2004)



(Japan: Vital statistics of Japan, Ministry of Health, Labor and Welfare; US: WHO database)

Fig. 4 Breast cancer mortality rates by age group

cancer from 1980 to 1990, no substantial changes were noted from 1990 to 2000.

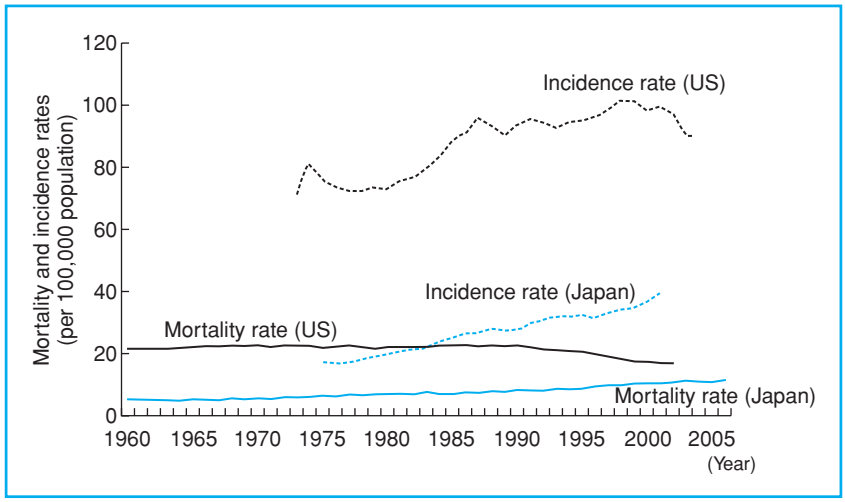
Trends in the number of deaths and the mortality

Data on cancer mortality in Japan were obtained from the Vital Statistics by the Ministry of Health, Labor and Welfare, and data on cancer mortality in the US were obtained from the Vital Statistics of the United States.

In 2006, the number of breast cancer deaths in Japan was 11,174 (ranking fourth by site of cancer), accounting for 8.5% of all cancer deaths. The number of cancer deaths in the US in 2004 was 40,954 (ranking second by site of cancer), accounting for 15.3% of all cancer deaths, about two-fold higher than in Japan. The age-adjusted breast cancer mortality rate in Japan has tended to increase since 1960; although the mortality rate ranked fifth (5.1 per 100,000) in 1960, following stomach cancer, uterine cancer, liver cancer, and colorectal cancer. In 2006, it ranked third (11.7 per 100,000) together with lung cancer, following colorectal cancer and stomach cancer. In the US, the breast cancer mortality rate was ranked first (21–22 per 100,000) from 1960 to 1986, but it has dropped to second place since 1987, having been replaced by lung cancer, which had increased rapidly.

Figure 3 shows the number of deaths and mortality rates of breast cancer in Japan (in 2006) and the US (in 2004) by age group. The number of deaths began to increase in individuals after 30 years of age both in Japan and the US. Deaths were most frequent in women aged 55–59 (1,897 individuals) in Japan. In contrast, in the US, a peak was found in those aged 55–59 (4,282 individuals), but breast cancer deaths were most frequent (5,986 individuals) in those aged 85 years old or older. The mortality rate tended to be higher with advancing age in both Japan and the US, although there was a peak at age 60–64 in Japan. Differences in the mortality rate between Japan and the US were noteworthy in women after 50 years of age.

Figure 4 presents breast cancer mortality rate



[Incidence rates (Japan: Research Group for the Population-Based Cancer Registry in Japan*; US: SEER database), Mortality rates (Japan: Vital statistics of Japan, Ministry of Health, Labor and Welfare; US: WHO database)]
*Including carcinoma in situ.

Fig. 5 Trends in the age-adjusted breast cancer mortality and incidence rates (age adjusted for world population)

by age group at 10-year intervals. In Japan, the mortality rates have been higher in more recent years in all age groups. On the other hand, in the US, although there were no marked changes in the mortality rates in women aged 75 years or older, the mortality rates tended to be lower in 2000 than in 1990 in all of the age groups from 20–74 years.

The proportions of particular age groups to overall breast cancer deaths were influenced by the increased population of elderly individuals both in Japan and the US. Women in their 50s and those aged 75 years or older accounted for higher proportions among all patients who died of breast cancer in Japan, whereas the group 75 years or older accounted for a higher proportion in the US. The percentage of Japanese women in the 50s remained at 25–30% during the period from 1960 to 2006. Those aged 75 years or more accounted for 12% in 1960, but increased to 24% in 2006. In the US, the proportion of women aged 75 years or older was 18.8% in 1960, and increased to 37.2% in 2004.

Comparison of incidence and mortality rates

Figure 5 shows the trends in the age-adjusted breast cancer incidence and mortality rates in Japan and the US (the reference population is world population). Although both breast cancer incidence and mortality rates among Japanese women have been tending to increase, the incidence/mortality ratio increased from 3.4 in 1975 to 4.2 in 2001. In the US, although the mortality rate declined after 1990, and the incidence rate has decreased since 2000, the incidence/mortality ratio increased from 2.9 in 1973 to 4.8 in 2004.

Survival rate

According to data on survival from population-based cancer registries in Japan, the 5-year relative survival rate for women with breast cancer diagnosed from 1993 to 1996 was 83.1%.[1] On the other hand, according to the SEER database in the US, the 5-year relative survival rate for patients diagnosed from 1993 to 1995 was 86.6%.

Risk Factors

Reproductive factors

Estrogen plays an important role in the development of breast cancer. Many of the established risk factors for breast cancer are known to influence endogenous estrogen levels. It is apparent that prolonged exposure to estrogen increases the risk of breast cancer, as in cases of early menarche, late menopause, late first delivery, low parity, and absence of breast-feeding.[2,3]

Exogenous hormones

Although it is apparent that postmenopausal hormone replacement therapy increases the risk of breast cancer, most previous studies have focused on estrogen-progestin combined therapy. No consistent results have been obtained from reports on estrogen-only therapy. High postmenopausal blood estrogen levels and high premenopausal blood IGF-I levels are also established risk factors.[2]

In regard to oral contraceptives, it has been reported that the rate of oral contraceptive use and the risk of developing breast cancer are higher among Japanese and other Asian immigrants in the US than among women in their home countries.[4] However, a relation between the use of oral contraceptives and the increased risk of breast cancer has not been established.

Nutritional factors and physical activity

While attention has been given to fat, fiber, fruits and vegetables, and soy isoflavones as possible prophylactic factors for breast cancer, only alcohol is a clearly established risk factor for premenopausal breast cancer. For postmenopausal breast cancer, fat as well as alcohol are regarded as established risk factors.[4]

Physical activity may be associated with a reduction in the risk of postmenopausal breast cancer.[4]

Anthropometric factors

Being tall and postmenopausal obesity are established risk factors. However, it has been reported that obesity is associated with a reduced risk in premenopausal women.[4]

Genetic and familial susceptibility

A family history of breast cancer in a first-degree relative is an established risk factor, and BRCA1 and BRCA2 are known to be the responsible genes. However, BRCA abnormality may not be the only cause of familial breast cancer; it is possible that environmental factors in the family are involved.

Prevention

It is difficult to modify such risk factors as reproductive factors, genetic and familial susceptibility of breast cancer, for the purpose of preventing breast cancer. However, it is possible to cut down on alcohol consumption or to exercise regularly. Early detection of breast cancer by mammographic screening also helps reduce deaths from breast cancer.

Differences between Japan and the US as Related to Risk Factors

Both the incidence and mortality rates of breast cancer are considerably lower in Japan than in the US. This may be explained by the higher proportion of obese people in the US than in Japan and differences between people in the two countries in eating habits, physical features, age at menarche, and reproductive history.

The age-adjusted incidence rates in the US had been increasing until 2000, partly because mammographic screening became widespread in the 1980s. It is reported that the percentage of women aged 40 years of age or over who received screening within the previous 2 years was 29.1% in 1987, but increased to 70.1% in 2000.[5] Improved therapeutic efficacy may be involved in the decrease in the mortality rate in the US after 1990, because there was improvement in survival rates in addition to the benefit of early detection by screening and early treatment after screening. In recent years, tamoxifen has been widely used since its efficacy as an agent for postoperative chemotherapy was demonstrated. The decrease in the age-adjusted incidence rates after 2000 in the US may be partially attributable to a decrease in women who were receiving postoperative hormone replacement therapy, a risk factor for breast cancer.[6]

In contrast to the decrease in the incidence and mortality rates in the US, both the incidence and mortality rates have been increasing in Japan. This may be explained by an increased population of women at risk of breast cancer due to an overall tendency to late marriage and declining birthrates as well as changes in the lifestyle and physical features of the Japanese people. A clinical breast physical examination had been carried out in women aged 30 years or more as a part of the cancer screening based on the Health and Medical Services Laws for the aged since 1987. Mammography began to be used for women aged 50 years or more in 2000, and for those aged 40 or more in 2005. The screening rate, however, was 12.4% for breast cancer screenings conducted

by municipal governments in 2002, with the mammographic screening rate as low as 2.1%,[7] showing hardly any influence on the incidence rate or mortality rate. The breast cancer screening rate increased to 17.6% in 2005,[8] and it is expected that, if the screening rate continues to increase, it may lead to a reduction in the breast cancer mortality rate.

Breast Cancer in Men

The crude mortality rate of breast cancer in men was 0.2 (per 100,000 population) in Japan in 2006, and 0.3 (per 100,000 population) in the US in 2004. The mortality rates were 85- to 90-fold higher in women than in men in both Japan and the US. Risk factors of breast cancer in men are also unclear.

Conclusion

The increase in the breast cancer incidence and mortality rates in Japan may be attributable to changes in eating habits and physical features, the tendency to marry late, and decreased birthrates. On the other hand, the recent decrease in the breast cancer mortality rate in the US may be due to early detection of the disease by mammographic screening, implementation of early treatment, and the efficacy of tamoxifen therapy. To decrease the breast cancer incidence rate, it is important to modify lifestyle, e.g., to decrease alcohol consumption and to practice adequate exercise. To increase the screening rate is important in decreasing the mortality rate.

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