

## RESEARCH ARTICLE

# Epidemiology, Incidence and Mortality of Breast Cancer in Asia

Mahshid Ghoncheh<sup>1</sup>, Neda Mahdavi<sup>2</sup>, Efat Darvishi<sup>3</sup>, Hamid Salehiniya<sup>4,5\*</sup>

### Abstract

Breast cancer is the most common malignancy in women in Asia and its incidence is rapidly increasing. Information on the incidence and mortality of breast cancer is essential for planning health and more studies. This study aimed to investigate the age-specific incidence and mortality of breast cancer in Asia in 2012. A total of 639,824 cases of breast cancer were recorded in Asian countries, those with the five highest standardized incidence rates being Israel, Lebanon, Armenia, Singapore, and Kazakhstan. The highest number of deaths was observed in India, China, Indonesia, Pakistan, and Japan, respectively. With increasing income and improving living standards in developing countries, the incidence of breast cancer increases. This may be due to longer life, higher exposure to risk factors, eating more fatty foods and obesity, and lower pregnancy rates. The variation in incidence rates of breast cancer is very pronounced in Asia (from 80.5 in Israel to 4.6 in Bhuta). A similar situation exists for mortality rates (from 1.8 in Bhutan to 25.2 in Pakistan).

**Keywords:** Incidence – mortality – epidemiology - breast cancer - Asia

*Asian Pac J Cancer Prev*, 17, Cancer Control in Western Asia Special Issue, 47-52

### Introduction

Breast cancer is the most common cancer in women and is the second cause of cancer death after Lung cancer in Asia (Kwong et al., 2015). In the United States of America, from each eight women one is diagnosed to have breast cancer during her life and new cases in this area were 226,000 people in 2012 (Siegel et al., 2012).

Breast cancer is the most common cancer in women of less developed nations (883,000) than developed ones (794,000). It is estimated that 59% of breast cancer cases occurred in developed countries (north of America, Europe, Australia, New Zealand and Japan) in 1990. These areas have less than one-fourth of world female population. A noticeable change in dissemination of breast cancer has happened in 2008 and new diagnosis numbers have been divided equally between less developed and developed countries (Jemal et al., 2011; Youlden et al., 2012). It is estimated that most (53%) of breast cancer cases were in less developed countries up to 2012 (Ferlay et al., 2013b). Because still the incidence remains much higher in developed countries, and this shift is important in global distribution of breast cancer, this cancer is proposed as major health problem for women in Asia, Africa and South America. Asia and Pacific Ocean Area, which includes East and South-East Asia and Oceania (Ferlay J, 2013b), are diverse mixes of geography, economy and culture, and contain almost one third (32%) of the world's

female population (United Nations and Division, 2011). Because of the annual increase in the incidence of breast cancer in some parts of Asia and the Pacific until 1990, this area is mentioned eight times more than the global average (Parkin et al., 2005; Green and Raina, 2008). Since the information about incidence and mortality rate of breast cancer can be useful for health programs and research activities, this study aimed to determine the incidence and mortality rates of breast cancer in Asia.

### Material and Methods

In this study, data about the age-specific incidence and mortality rate (ASIR) of breast cancer for every Asian country for year 2012 were acquired from global cancer project available on (<http://globocan.iarc.fr/Default.aspx>) (Ferlay et al., 2013a).

#### *Age-Specific Incidence Rate (ASIR)*

The methods of estimation are country specific and the quality of the estimation depends upon the quality and the amount of information available for each country. In theory, there are as many methods as countries, and because of the variety and the complexity of these methods, an overall quality score for the incidence and mortality estimates combined is almost impossible to establish. However, an alphanumeric scoring system which independently describes the availability of incidence

<sup>1</sup>Department of Epidemiology & Biostatistics, School of Public Health, Hamadan University of Medical Sciences, Hamadan, <sup>2</sup>Health Promotion Research Center, Department of Epidemiology & Biostatistics, School of Public Health, Zahedan University of Medical Sciences, Zahedan, <sup>3</sup>Ahvaz Jundishapur University of Medical Sciences, Ahvaz, <sup>4</sup>Zabol University of Medical Sciences, Zabol, <sup>5</sup>Department of Epidemiology & Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran. \*For correspondence: alesaleh70@yahoo.com

and mortality data has been established at the country level. The combined score is presented together with the estimates for each country with an aim of providing a broad indication of the robustness of the estimation.

The methods to estimate the sex- and age-specific incidence rates of cancer for a specific country fall into one of the following broad categories, in priority order:

- 1- Rates projected to 2012 (38 countries),
- 2- Most recent rates applied to 2012 population (20 countries),
- 3- Estimated from national mortality by modelling, using incidence mortality ratios derived from recorded data in country-specific cancer registries (13 countries)
- 4- Estimated from national mortality estimates by modelling, using incidence mortality ratios derived from recorded data in local cancer registries in neighboring countries (9 European countries)
- 5- Estimated from national mortality estimates using modelled survival (32 countries)
- 6- Estimated as the weighted average of the local rates (16 countries)
- 7- One cancer registry covering part of a country is used as representative of the country profile (11 countries)
- 8- Age/sex specific rates for “all cancers” were partitioned using data on relative frequency of different cancers (by age and sex) (12 countries)
- 9- The rates are those of neighboring countries or registries in the same area (33 countries) (Ferlay J, 2013a)

*Age-specific mortality rate (ASMR)*

Depending of the degree of detail and accuracy of the national mortality data, six methods have been utilized in the following order of priority: 1-Rates projected to 2012 (69 countries)-2- Most recent rates applied to 2012 population (26 countries)-3- Estimated as the weighted average of regional rates (1 country)-4- Estimated from national incidence estimates by modelling, using country-specific survival (2 countries)-5- Estimated from

national incidence estimates using modelled survival (83 countries)-6-The rates are those of neighboring countries or registries in the same area (3 countries)

**Results**

In 2012, 639,824 cases of breast cancer were recorded in Asian countries. Five Asian countries with the highest number of cases were China (187,213 cases), India (144,937 cases), Japan (55,710 cases), Indonesia (48,998 cases, and Pakistan (34,038 cases), respectively. The five countries included 470,896 cases (59.7%) of the cases in Asia.

In Asian countries, 5 countries with the highest standardized incidence rate of breast cancer (per 100,000) were Israel (80.5), Lebanon (78.7), Armenia (74.1), Singapore (65.7), and Kazakhstan (73.5), respectively. Five countries that had the lowest standardized incidence rate of breast cancer (per 100,000) included Butane (4.6), Mongolia (9.4), Nepal (13.7), Lao PDR (19), and Cambodia (19.3), respectively (Table1, Figure 1).

In 2012, 228,926 deaths occurred due to breast cancer in Asia. The highest number of deaths was observed in India, (70,218 cases), China (47,984 cases), Indonesia (19,750 cases), Pakistan (16,232 cases), and Japan (13,801 cases), respectively. A total of 167,985 cases (73.4%) of the deaths occurred in just five countries.

In Asian countries, 5 countries with the highest standardized death rates (per 100,000) from breast cancer were Pakistan (25.2), Armenia (24.2), Lebanon (24), Jordan (21.8), and Syria (21.5), respectively. Five countries have the lowest standardized mortality from breast cancer (per 100,000) included Butane (1.8), Mongolia (4.2), China (5.4), Republic of Korea (1.6), and Nepal (2.7), respectively (Table 1, Figure 2 2).

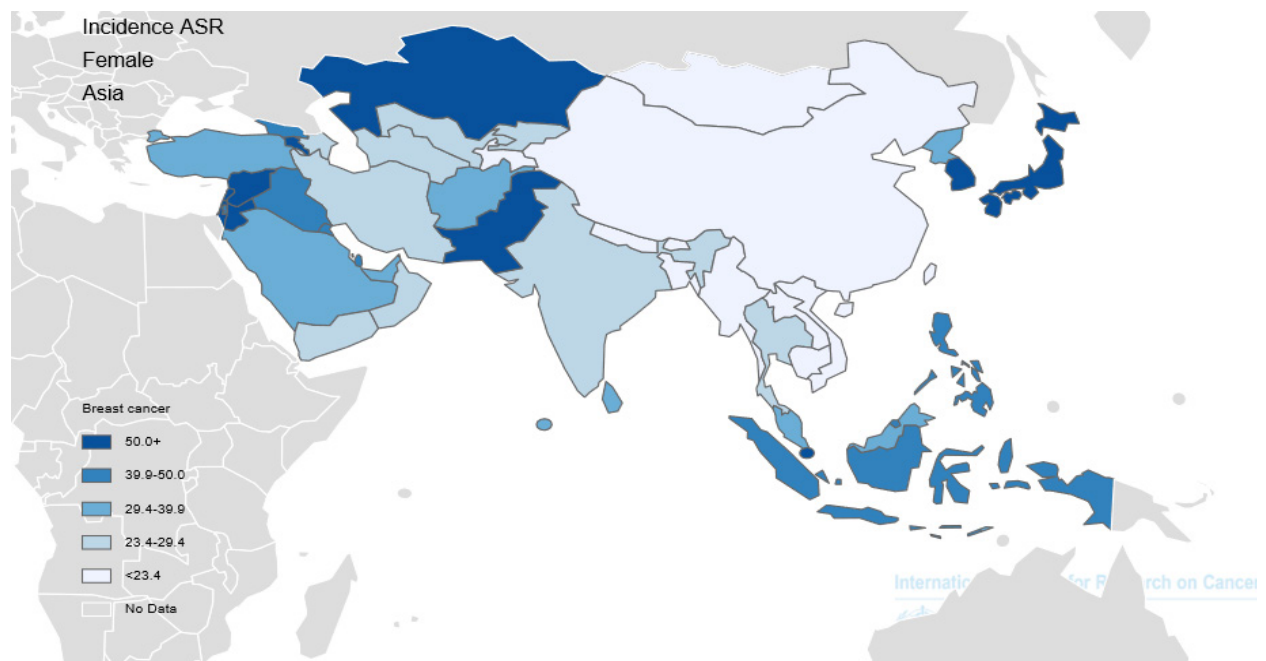


Figure 1. Distribution of the Standardized Incidence Rate of Breast Cancer in Asia at 2012 (Extracted from Globocan)

Table 1. Incidence and Mortality of Breast Cancer in Asia by Country

country	Numbers	Crude Rate	ASIR	country	Numbers	Crude Rate	ASMR
Israel	4,010.0	103.0	80.5	Pakistan	16,232.0	18.3	25.2
Lebanon	1,934.0	88.0	78.7	Armenia	609.0	36.7	24.2
Armenia	1,704.0	102.5	74.1	Lebanon	599.0	27.3	24.0
Singapore	2,524.0	96.8	65.7	Jordan	426.0	13.6	21.8
Kazakhstan	6,252.0	73.5	63.0	Syrian Arab Republic	1,623.0	15.6	21.5
Jordan	1,237.0	39.4	61.0	Afghanistan	1,695.0	10.5	20.6
Syrian Arab Republic	4,140.0	39.7	52.5	Iraq	1,983.0	11.8	19.3
Korea, Republic of	17,140.0	70.3	52.1	Malaysia	2,572.0	17.8	18.9
Japan	55,710.0	85.9	51.5	State of Palestine	223.0	10.6	18.3
Pakistan	34,038.0	38.4	50.3	Kazakhstan	1,865.0	21.9	18.0
Brunei	83.0	40.6	48.6	Philippines	6,621.0	13.8	17.8
Philippines	18,327.0	38.1	47.0	Kuwait	103.0	8.8	17.3
Kuwait	314.0	26.9	46.7	Israel	990.0	25.4	17.3
Qatar	148.0	31.6	46.1	Indonesia	19,750.0	16.1	16.6
State of Palestine	578.0	27.5	44.0	Timor-Leste	52.0	8.9	16.4
Georgia	1,541.0	67.7	44.0	Singapore	628.0	24.1	15.5
Iraq	4,542.0	27.1	42.6	Yemen	997.0	7.9	14.9
Bahrain	177.0	34.7	42.5	Korea, Democratic Republic of	2,340.0	18.7	14.3
Indonesia	48,998.0	39.9	40.3	Turkey	5,199.0	13.9	13.4
United Arab Emirates	568.0	22.8	39.2	Georgia	530.0	23.3	13.2
Turkey	15,230.0	40.8	39.1	India	70,218.0	11.5	12.7
Malaysia	5,410.0	37.4	38.7	Maldives	14.0	8.7	11.5
Korea, Democratic Republic of	5,707.0	45.7	36.8	Brunei	18.0	8.8	11.3
Afghanistan	3,108.0	19.3	35.1	Myanmar	2,792.0	11.3	11.3
Timor-Leste	108.0	18.6	32.6	Kyrgyzstan	265.0	9.6	11.2
Maldives	41.0	25.5	31.6	Qatar	31.0	6.6	11.2
Sri Lanka	3,955.0	36.8	30.9	Bahrain	42.0	8.2	11.1
Saudi Arabia	2,791.0	21.7	29.5	Bangladesh	7,142.0	9.5	11.0
Thailand	13,653.0	38.4	29.3	Thailand	5,092.0	14.3	11.0
Iran, Islamic Republic of	9,795.0	26.3	28.1	Uzbekistan	1,269.0	9.0	10.6
Yemen	1,963.0	15.5	27.4	United Arab Emirates	124.0	5.0	10.5
Kyrgyzstan	662.0	24.0	27.3	Sri Lanka	1,361.0	12.6	10.3
Uzbekistan	3,370.0	23.9	27.1	Viet Nam	4,671.0	10.3	9.9
Turkmenistan	656.0	25.0	26.8	Iran, Islamic Republic of	3,304.0	8.9	9.9
Oman	195.0	16.4	26.0	Japan	13,801.0	21.3	9.8
India	144,937.0	23.8	25.8	Turkmenistan	224.0	8.5	9.6
Azerbaijan	1,413.0	29.7	25.4	Oman	65.0	5.5	9.5
Viet Nam	11,067.0	24.4	23.0	Cambodia	585.0	7.9	9.3
China	187,213.0	28.6	22.1	Lao PDR	222.0	7.0	9.3
Myanmar	5,648.0	22.9	22.1	Saudi Arabia	795.0	6.2	9.1
Bangladesh	14,836.0	19.7	21.7	Tajikistan	210.0	5.8	8.7
Tajikistan	520.0	14.4	20.4	Azerbaijan	471.0	9.9	8.6
Cambodia	1,255.0	17.0	19.3	Nepal	865.0	5.5	7.2
Lao PDR	472.0	14.8	19.0	Korea, Republic of	2,274.0	9.3	6.1
Nepal	1,716.0	11.0	13.7	China	47,984.0	7.3	5.4
Mongolia	125.0	8.7	9.4	Mongolia	50.0	3.5	4.2
Bhutan	13.0	3.7	4.6	Bhutan	5.0	1.4	1.8

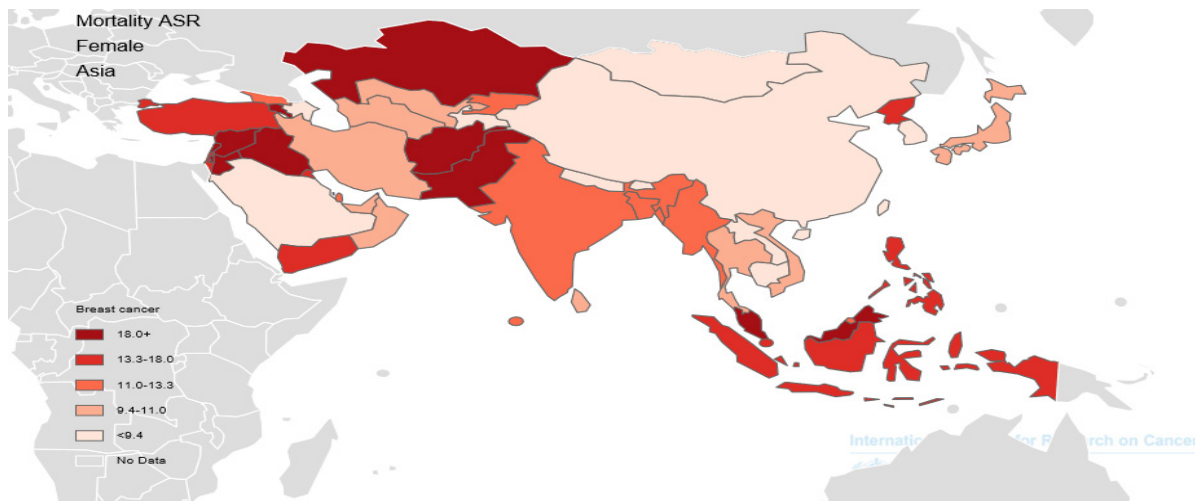


Figure 2. Distribution of Standardized Breast Cancer Mortality Rates in Asia 2012 (Extracted from Globocan)

## Discussion

Breast cancer is one of the most common cancers in Asia. The incidence of breast cancer is rapidly increasing almost everywhere, especially in undeveloped countries (Youlten et al., 2014). Although the incidence in Asian countries is lower than European and American ones (incidence has increased in India and Japan), the increase in breast cancer deaths in Asia is significant compared to European and American countries (approximately 6-23 per 100,000) (Jemal et al., 2011; DeSantis et al., 2015).

A study on young women under 40 years in Asia from 1970 to 2002 showed that the standardized incidence rate of 2.3 has increased to 4.3 per 100,000 people (Keramatinia et al., 2014). National population-based cancer registration program does not exist in most Asian countries, so the incidence rate is reported less than reality (WHO, 2014).

The mortality rate has increased in Brazil, Egypt, Guatemala, Kuwait, Mauritius, Mexico, and Moldova (DeSantis et al., 2015). This unfavorable trend, is due to the increased risk factors (Reduced fertility and breast feeding, increased exposure to exogenous hormones, and Harmful changes in diet and lifestyle, including obesity and low physical activity) (Parkin and Fernández, 2006).

It is estimated that approximately 1.7 million cases of breast cancer are diagnosed worldwide. Overall, the incidence is in developed countries (more than 80 cases per 100,000) and undeveloped areas (less than 30 per 100,000). Breast cancer is the fifth leading cause of cancer death (225,000) while it is the most common cause of cancer death among women in less developed areas (324,000 deaths, 14.3% of total) and is the second leading cause of cancer death in more developed regions (198,000 deaths, 15.4% of all) (<http://globocan.iarc.fr/old/FactSheets/cancers/breast-new.asp>).

In our study, 5 Asian countries, which have the highest standardized incidence of breast cancer are as follows respectively: Israel, Lebanon, Armenia, Singapore, and Kazakhstan. And 5 countries with the lowest standardized rates of breast cancer are: Bhutan, Mongolia, Nepal, Lao PDR and Cambodia.

Also from analysis of 15 breast cancer registry data, we understood that the highest incidences were in China, Japan, Philippines, Singapore, South Korea, Taiwan and Thailand (Shin et al., 2010). In areas where the incidence is rapidly increasing, the incidence is seen in all ages but where the speed of increase is less, it occurs in women 50 years and older (Troisi et al., 2012). A notable feature is that the distribution of diagnosis age in many Asian countries is in range of 45-50 years while in most western countries is 55-60 (CH, 2009; Leong et al., 2010; Toi et al., 2010). Thus, the incidence age-specific rate of breast cancer is considerably higher in Australia and New Zealand compared with other Asian countries among younger women (Liu et al., 2011). Lots of cases and control studies showed that the main risk factors for breast cancer in Asian women are: early menstruation, late menopause, high age at first delivery and fewer full-term pregnancies (Nagata et al., 1995; Suh et al., 1996; Gao et al., 2000; Liu et al., 2011; Yanhua et al., 2012). The prevalence of these reproductive risk factors in Asia is increasing (Lertkhachonsuk et al., 2013). For example, in recent decades family plans resulted in continuous decline in infertility rate across the region (Fan et al., 2009; Bongaarts and Sinding, 2011). Also in our study, 5 Asian countries with the highest standardized death rates from breast cancer are as follows respectively: Pakistan, Armenia, Lebanon, Jordan and the Syrian Arab Republic. Similarly, 5 countries which have the lowest Standardized mortality rate from breast cancer include: Bhutan, Mongolia, China, the Republic of Korea and Nepal. In other studies, according to current patterns, 3-fold increase in breast cancer mortality is predicted in South Korea from 1983 to 2020 (Choi et al., 2005).

These patterns can be different for each country (Guo et al., 2012). However, the mortality rate has already been reduced in many European countries and the US due to efforts for early detection, the introduction of mammography screening, detection of smaller tumors in early stages and progress in treatment (Parkin et al., 2005). The patients' survival differ all over the world and it reaches to more than 80 percent in North America, and less than 40 percent in low-income countries. Low

survival of patients in developing countries is more related to lack of diagnostic and therapeutic facilities ([Online]; Ghoncheh et al., 2015). Early detection of breast cancer plays an important role in reducing the mortality rate and improving the prognosis of the disease (Rahimzadeh et al., 2013). The difference in mortality rates in various regions of the world is due to more suitable survival. It is 6 cases per 100,000 in West, to 20 per 100,000 in Eastern Africa and Africa (<http://globocan.iarc.fr/old/FactSheets/cancers/breast-new.asp>).

Between years 1997-2001 and 2007-2009, a 20% increase in mortality rate of breast cancer in China's rural areas is observed compared with a 7% decline in urban areas, although mortality rate still remains higher in urban areas. Primary prevention strategies which aimed weight control and breastfeeding, trying to increase the delivery of high-quality screening, diagnosis and treatment may also reduce mortality due to breast cancer in China (Zeng et al., 2014). In management of breast cancer in Asia and Pacific, there are multi-cultural nature and economic barriers such as: misunderstanding about this disease (e.g. the false idea of surgery that results in faster cancer cell distribution), geographic isolation, lack of awareness, lack of proper diagnostic equipment and treatment facilities, health care competition, and reliance on traditional solutions (Agarwal et al., 2007; Green and Raina, 2008; CH, 2009). Other reasons for the disparity in survival are: race, a combination of socio-economic status, cultural factors, response to treatment and difference in lifestyles (Bhoo-Pathy et al., 2012).

Breast cancer is one the most common cancers in Asia. Its incidence is higher in more developed countries and its death is higher in less developed ones. Therefore, educational programs, raising awareness in women about this cancer and programs to deal with that are among health priorities in these areas.

## References

- Agarwal G, Pradeep P, Aggarwal V, et al (2007). Spectrum of breast cancer in Asian women. *World J Surg*, **31**, 1031-40.
- Bhoo-Pathy N, Hartman M, Yip C-H, et al (2012). Ethnic differences in survival after breast cancer in South East Asia. *PLoS One*, **7**, e309-95.
- Bongaarts J, Sinding S (2011). Population policy in transition in the developing world. *Science*, **333**, 574-6.
- CH Y (2009). Breast Cancer in Asia. In: Verma M. eds. *Methods in Molecular Biology, Cancer Epidemiol. Totowa, NJ: Springer Science*, **471**, 51-64.
- Choi Y, Kim YJ, Shin HR, et al (2005). Long-term prediction of female breast cancer mortality in Korea. *Asian Pac J Cancer Prev*, **6**, 16-21.
- DeSantis CE, Bray F, Ferlay J, et al (2015). International variation in female breast cancer incidence and mortality rates. *Cancer Epidemiol Biomarkers Prev*, **24**, 1495-506.
- Fan L, Zheng Y, Yu KD, et al (2009). Breast cancer in a transitional society over 18 years: trends and present status in Shanghai, China. *Breast Cancer Res Treat*, **117**, 409-16.
- Ferlay J SI, Ervik M, Dikshit R, et al. 2013a. Globocan 2012 v1.0, Cancer Incidence and Mortality Worldwide: IARC CancerBase No. 11 [Internet]. Lyon, France: International Agency for Research on Cancer [Online]. Available: Available from: <http://globocan.iarc.fr>, accessed on 7/
- JUNE/2015.
- Ferlay J SI, Ervik M, Dikshit R, et al (2013b). GLOBOCAN 2012 v1.0, Cancer Incidence and Mortality Worldwide: IARC CancerBase No. 11 [Internet]. Lyon, France: International Agency for Research on Cancer. International Agency for Research on Cancer.
- Gao YT, Shu XO, Dai Q, et al (2000). Association of menstrual and reproductive factors with breast cancer risk: results from the Shanghai Breast Cancer Study. *Int J Cancer*, **87**, 295-300.
- Ghoncheh M, Mohammadian-Hafshejani A, Salehiniya H (2015). Incidence AND MORTALITY OF BREAST CANCER AND THEIR RELATIONSHIP TO DEVELOPMENT in Asia. *Asian Pac J Cancer Prev*, **16**, 6081-7.
- Green M, Raina V (2008). Epidemiology, screening and diagnosis of breast cancer in the Asia-Pacific region: current perspectives and important considerations. *Asia Pac J Clin Oncol*, **4**, S5-S13.
- Guo P, Huang Z, Yu P, et al (2012). Trends in cancer mortality in China: an update. *Ann Oncol*, **23**, 2755-62. <http://globocan.iarc.fr/old/FactSheets/cancers/breast-new.asp>.
- Jemal A, Bray F, Center MM, et al (2011). Global cancer statistics. *CA Cancer J Clin*, **61**, 69-90.
- Keramatinia A, Mousavi-Jarrahi SA, Hiteh M, et al (2014). Trends in incidence of breast cancer among women under 40 in Asia. *Asian Pac J Cancer Prev*, **15**, 1387-90.
- Kwong A, Mang OW, Tam AH, et al (2015). Abstract P3-07-32: Breast cancer in Hong Kong, Southern China: The population-based, ten-year analysis of epidemiological characteristics, stage-specific, cancer-specific, & disease-free survival in breast cancer patients: 1997-2006. *Cancer Res*, **75**, P3-07-32-P3-07-32.
- Leong SP, Shen ZZ, Liu TJ, et al (2010). Is breast cancer the same disease in Asian and Western countries. *World J Surg*, **34**, 2308-24.
- Lertkachonsuk Aa, Yip CH, Khuhaprema T, et al (2013). Cancer prevention in Asia: resource-stratified guidelines from the Asian Oncology Summit 2013. *Lancet Oncol*, **14**, e497-e507.
- Liu YT, Gao CM, Ding JH, et al (2011). Physiological, reproductive factors and breast cancer risk in Jiangsu province of China. *Asian Pac J Cancer Prev*, **12**, 787-90.
- Nagata C, Hu YH, Shimizu H (1995). Effects of Menstrual and Reproductive Factors on the Risk of Breast Cancer: Meta-analysis of the Case-Control Studies in Japan. *Cancer Science*, **86**, 910-5.
- Parkin DM, Bray F, Ferlay J, et al (2005). Global cancer statistics, 2002. *CA Cancer J Clin*, **55**, 74-108.
- Parkin DM, Fernández LM (2006). Use of statistics to assess the global burden of breast cancer. *Breast J*, **12**, S70-S80.
- Rahimzadeh M, Baghestani AR, Gohari MR, et al (2013). Estimation of the cure rate in Iranian breast cancer patients. *Asian Pac J Cancer Prev*, **15**, 4839-42.
- Shin H-R, Joubert C, Boniol M, et al (2010). Recent trends and patterns in breast cancer incidence among Eastern and Southeastern Asian women. *Cancer Causes Control*, **21**, 1777-85.
- Siegel R, Naishadham D, Jemal A (2012). Cancer statistics, 2012. *CA Cancer J Clin*, **62**, 10-29.
- Suh JS, Yoo KY, Kwon OJ, et al (1996). Menstrual and reproductive factors related to the risk of breast cancer in Korea. *J Korean Med Sci*, **11**, 501-8.
- Toi M, Ohashi Y, Seow A, et al (2010). The Breast cancer working group presentation was divided into three sections: the epidemiology, pathology and treatment of breast cancer. *Jpn J Clin Oncol*, **40**, i13-i8.
- Troisi R, Altantsetseg D, Davaasambuu G, et al (2012). Breast cancer incidence in Mongolia. *Cancer Causes Control*,

23, 1047-53.

- United Nations DoEaSA, Division P ( 2011). United Nations, Department of Economic and Social Affairs, Population Division. World Population Prospects: The 2010 Revision, CD-ROM Edition; 2011. World Population Prospects.
- WHO (2014). World Health Organization - Noncommunicable Diseases (NCD) Country Profiles, 2014. 2014 [cited 2015; Available from: [http://www.who.int/nmh/countries/fji\\_en.pdf?ua=1](http://www.who.int/nmh/countries/fji_en.pdf?ua=1). Online.
- Yanhua C, Geater A, You J, et al (2012). Reproductive variables and risk of breast malignant and benign tumours in Yunnan province, China. *Asian Pac J Cancer Prev*, **13**, 2179-84.
- Youlden DR, Cramb SM, Dunn NA, et al (2012). The descriptive epidemiology of female breast cancer: an international comparison of screening, incidence, survival and mortality. *Cancer Epidemiol*, **36**, 237-48.
- Youlden DR, Cramb SM, Yip CH, et al (2014). Incidence and mortality of female breast cancer in the Asia-Pacific region. *Cancer Biol Med*, **11**, 101.
- Zeng H, Zheng R, Zhang S, et al (2014). Female breast cancer statistics of 2010 in China: estimates based on data from 145 population-based cancer registries. *J Thorac Dis*, **6**, 466.