Original Article Open Access

Archives Of Breast Cancer

DOI: 10.19187/abc.201853122-128

Breast Cancer Trend, Incidence, and Mortality in Kerman, Iran: A 14-Year Follow-up

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ARTICLE INFO

Received:
26 June 2018
Revised:
18 July 2018
Accepted:
24 July 2018

Key words:
Breast cancer,
Incidence,
Mortality,
Trends,
Iran

ABSTRACT

Background: The present study aimed to investigate breast cancer trend, incidence, and mortality among Iranian women and was one of the first provincial and population-based studies to investigate breast cancer changes during 14 years in the largest province of Iran, Kerman.

Methods: This was a population-based longitudinal study. Information about women diagnosed with breast cancer from 2001 to 2014 was obtained from the Cancer Registry of Kerman University of Medical Sciences. Independent-samples t test, one-way analysis of variance, linear regression, time series graphs, and fitted line plots were performed using SPSS 22 and Minitab 17.

Results: A total of 2771 women were diagnosed with breast cancer in Kerman province from 2001 to 2014. The mean age of female patients was 49.52±12.88 years. The total incidence rate was 13.5 per 100,000 women and there was an increasing trend for incidence and age at diagnosis. Also, 254 women died from breast cancer during these 14 years and the mean mortality age was 54.16±14.33 years. There was also an increasing trend for mortality and age of death.

Conclusion: There is an increasing trend for incidence and mortality from breast cancer in Kerman province and this requires interventions such as appropriate screening programs. Also, enabling physicians and increasing patient awareness to identify breast cancer symptoms is necessary.

Introduction

Cancer, with 8.8 million deaths, was the second leading cause of mortality in 2015, as 1 out of 6 deaths in the world was caused by cancer.[1] Approximately, 70% of cancer deaths occur in low- and middle-income countries,[1] and cancer incidence and mortality is increasing in developing countries.[2] Breast cancer is the second most common cancer worldwide,[3] the most common cancer in women,[4, 5] and the leading cause of death from cancer in women.[5] In 2015, 2.4 million new cases of breast cancer were diagnosed and 523 000 deaths from breast cancer were reported in the world.[6] Although more than half of the global burden of breast cancer is currently from developed countries, its incidence is rapidly increasing in developing countries.[7] Also, more than half of the deaths and about half of the new breast cancer cases occur in developing countries based on 2008 GLOBOCAN estimates.[8]

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Breast cancer is also the most common cancer in Iranian women.[4,9] It was the leading type of cancer in Iranian women, accounting for 24.6% of all cancers.[10] The mean age of breast cancer diagnosis for Iranian women is 10 to 15 years lower than that for developed and Western countries.[11,12] The mean age of diagnosis for American female breast cancer patients from 2008 to 2012 was 61 years.[13] However, in Iran, most women diagnosed with breast cancer are younger than 50 years [10,12,14,15]and most are diagnosed with invasive cancer at advanced stages.[4,10]

Studies done in Iranian women showed that low levels of knowledge[16,17] and insufficient awareness about breast cancer symptoms were among the most important factors causing delays in breast cancer diagnosis.[18] Further studies in Iran showed that empowering women through education can increase early detection of breast cancer.[19]

In developed and Western countries, such as the US, most deaths from breast cancer occur among women older than 50 years.[13] In Iran, not only are deaths from breast cancer on the rise, but a large number of deaths happen among women younger than 50 years.[20]

The present study aimed to investigate breast cancer trend, incidence, and mortality among Iranian women and was one of the first provincial and population-based studies to investigate the trends of breast cancer during 14 years in the largest province of Iran, Kerman.

Methods

This was a longitudinal and population-based study. Information about women diagnosed with breast cancer was inquired from the Cancer Registry of Kerman Province from 2001 to 2014. This study was approved by the Deputy of Research (No: 93/460) and Ethics Committee of Kerman University of Medical Sciences (No: K/93/636).

Variables including age at diagnosis, year of diagnosis, residential location, stage and grade at diagnosis, and status (being alive or not) were extracted. Hospital medical records were used to complete the information. Death dates were obtained from the Death Registration at Kerman University of Medical Sciences. Other unknown information was collected by contacting the patient or her family.

In order to estimate the annual incidence rates, the number of new breast cancer cases for each year was divided by the total number of females in the same year. National census data for 1996, 2006, and 2011 and population growth rates were used to calculate the female population of the province in each year.

Descriptive statistics, independent-samples t-test, one-way analysis of variance, linear regression, time series graphs, and fitted line plots were performed with Excel 2016, SPSS 22, and Minitab 17.

Results

Totally, 2771 women were diagnosed with breast cancer in Kerman province from 2001 to 2014. The mean and median ages at diagnosis were 49.52 ± 12.88 and 48 years, respectively. Also, 254 patients died of breast cancer during these 14 years, and the mean and median ages at death were 54.16 ± 14.33 years and 54 years, respectively.

Patients from rural areas ($P < 0.001$) and those with grade 3 at the time of diagnosis ($P = 0.035$), had a significantly lower age at diagnosis. Although the mean age of patients with stage III at diagnosis was also lower than the other stages, the difference was not statistically significant (Table 1).

The trend in age at diagnosis for female breast cancer patients in Kerman province during the 14 years is shown in Figure 1. As shown in the figure, the mean age at diagnosis did not show a significant trend ($P = 0.16$).

Table 1. Female Breast Cancer Patient's Characteristics in Kerman Province, Iran

Variable		Frequency (%)	Age at diagnosis, Mean ± SD	P value
Location	City	1677 (58.8)	49.92 ± 12.87	< 0.001
	Rural	439 (15.4)	46.83 ± 12.37	
	Unknown	735 (25.8)	50.25 ± 12.98	
	Total	2851 (100)	49.52 ± 12.87	
Stage at diagnosis	0	14 (0.5)	50.21 ± 16.52	0.132
	I	135 (4.7)	48.73 ± 10.78	
	II	567 (19.9)	48.64 ± 11.30	
	III	395 (13.9)	47.94 ± 11.86	
	VI	89 (3.1)	51.52 ± 13.42	
	Unknown	1651 (57.9)	50.17 ± 13.67	
	Total	2851 (100)	49.52 ± 12897	
Grade at diagnosis	1	290 (10.2)	50.05 ± 12.89	0.035
	2	893 (31.3)	50.01 ± 12.759	
	3	402 (14.1)	48.09 ± 12.72	
	Unknown	1266 (44.4)	49.51 ± 12.98	
	Total	2851 (100)	49.52 ± 12.87	

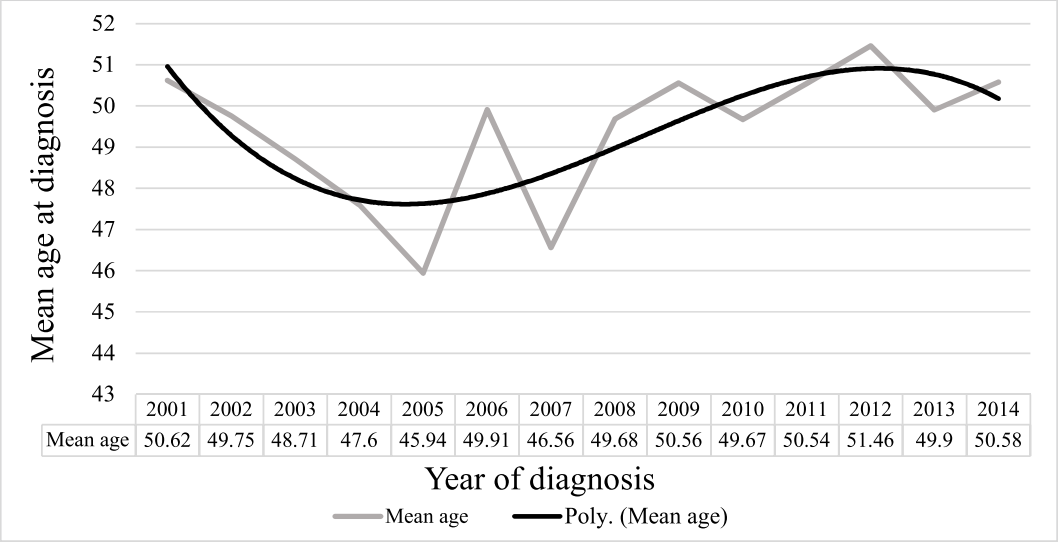


Figure 1. Age at Diagnosis for Female Breast Cancer in Kerman Province From 2001 to 2014

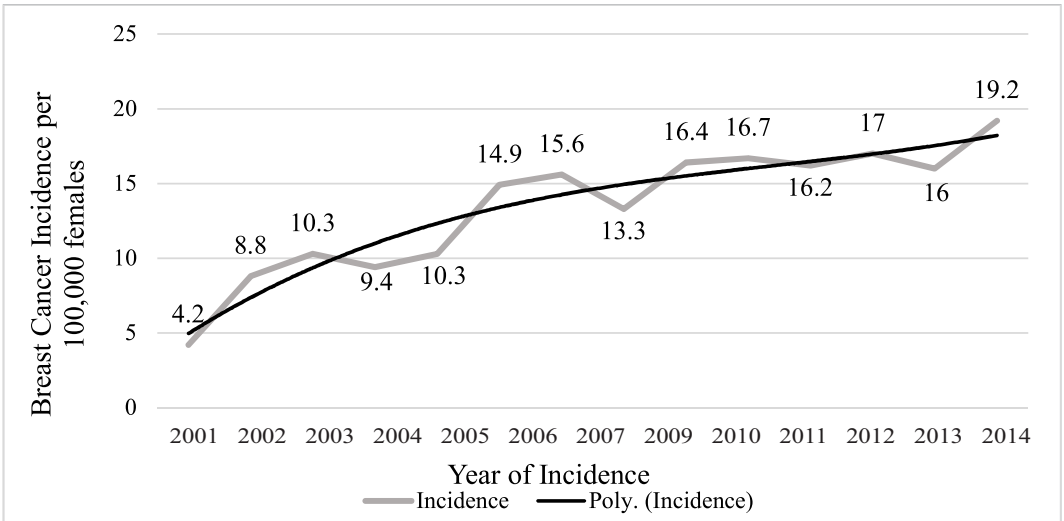
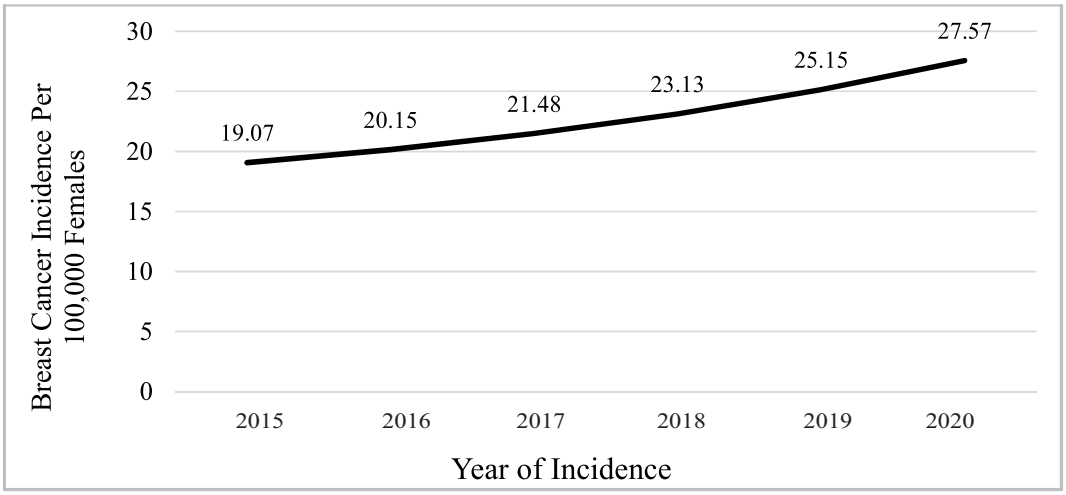


Figure 2: a. Breast Cancer Incidence in Kerman Province From 2001 to 2014



b. Forecasting Breast Cancer Incidence in Kerman Province up to 2020

Incidence = 2.094 + (3.110 × Time) − (0.2520 × Time2) + (0.008009 × Time3)

The trend in breast cancer incidence in Kerman province from 2001 to 2014 is shown in Figure 2a. As shown in the figure, breast cancer incidence has been increasing in Kerman province ($P < 0.001$).

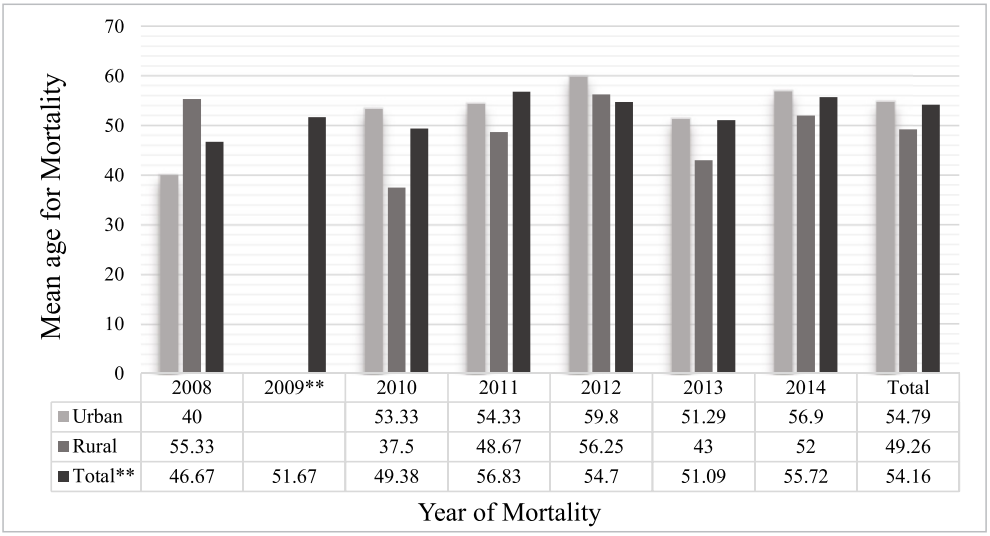
The forecast of breast cancer incidence in Kerman province up to 2020 is shown in Figure 2b. The best fit for the data was a third-degree model. If the incidence of breast cancer increases as predicted in Figure 2b, about 27 cases of breast cancer will happen per 100000 females in Kerman province by 2020.

Figure 3 shows the mean age of death due to female breast cancer during the 7 years in urban and rural areas of Kerman province. The mean age of death among rural women was nonsignificantly lower than that of women living in cities (P = 0.074).

A large percentage of data was missing from 2001 to 2007 (91.9%), and because of this, data for these years were not included in Figures 4 and 5.

The trend in breast cancer mortality in Kerman province from 2008 to 2014 is shown in Figure 4. Breast cancer mortality did not show a significant trend during these 7 years (P = 0.063).

The trend in mortality age for female breast cancer patients in Kerman province from 2008 to 2014 is shown in Figure 5. The mean age of death due to breast cancer had an increasing trend from 2008 to 2014 (P = 0.046).



	2008	2009**	2010	2011	2012	2013	2014	Total
Urban	40		53.33	54.33	59.8	51.29	56.9	54.79
Rural	55.33		37.5	48.67	56.25	43	52	49.26
Total**	46.67	51.67	49.38	56.83	54.7	51.09	55.72	54.16

Figure 3. Age of death Due to Female Breast Cancer in Urban and Rural Areas of Kerman Province (2008-2014)
** *Including unknown*

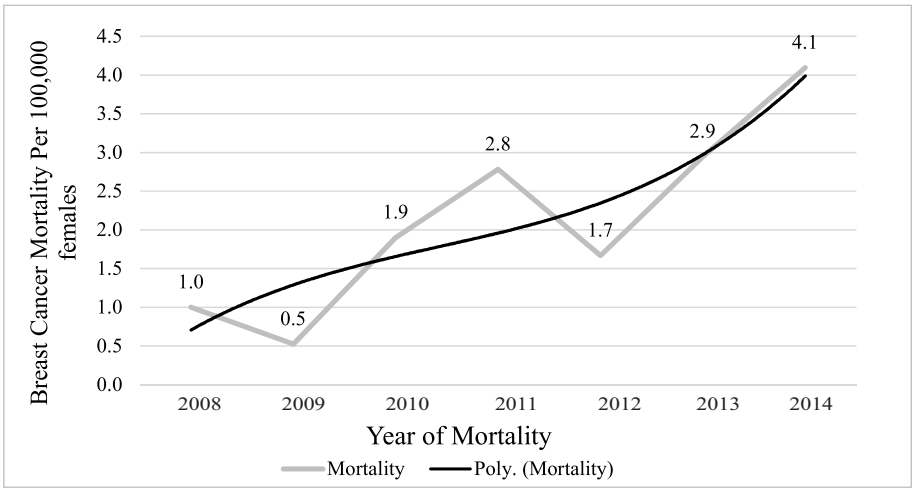
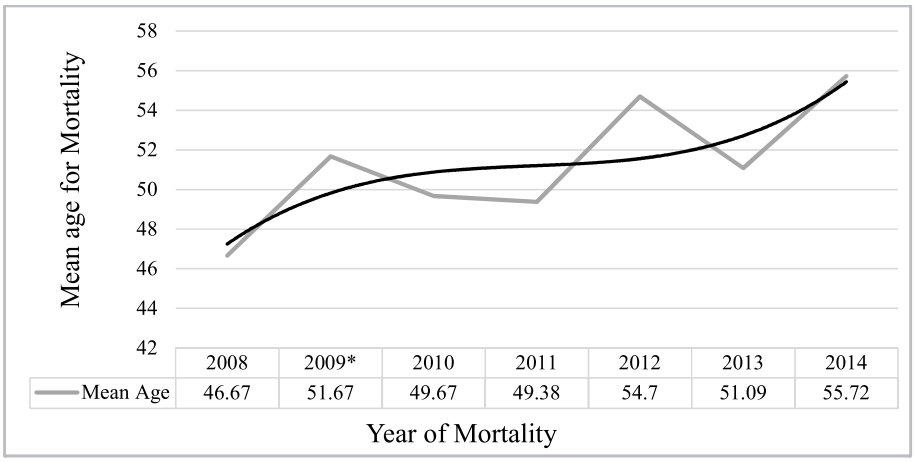


Figure 4. Female Breast Cancer Mortalities in Kerman Province From 2008 to 2014



	2008	2009*	2010	2011	2012	2013	2014
Mean Age	46.67	51.67	49.67	49.38	54.7	51.09	55.72

Figure 5. Age at Death Due to Female Breast Cancer in Kerman Province From 2008 to 2014
* *Including unknown*

Discussion

The mean age at diagnosis for breast cancer was about 50 years among women in Kerman province. This age is lower in comparison with a developed country such as England, where the highest incidence of breast cancer happens after the age of 55.[21]

In the present study, the age-specific incidence rate was highest among women aged 40 to 55 years (46.22 per 100 000 females), and the median age of diagnosis was 48 years. However, according to the US National Cancer Institute, most women diagnosed with breast cancer in America were 55 to 64 years old and the median age of diagnosis of breast cancer was 62 years.[22] Also, Mousavi *et al.*, in a population-based study of the data from Tehran Cancer Registry in Iran from 1998 to 2001, showed that the mean age at diagnosis was 51 years and that although 36% of patients were aged under 40 years, the highest incidence rate was reported among women aged more than 60 years.[23]

In the present study, the incidence rate for 2012 (17 per 100 000 females) was lower than the average standardized rate for the world (43 per 100 000 females) and Asian countries including Japan, South Korea (both 52 per 100 000 females) and Singapore (65 per 100 000 females).[24]

The results of the present study showed that the age at diagnosis was significantly lower among women who lived in rural areas. In contrast, Mitchel et al, who studied breast cancer during 1999 in Australia, showed that there was no significant relationship between age at diagnosis and residential areas.[25]

The incidence rates of breast cancer in the present study was 16.7 to 19.2 per 100 000 females from 2010 to 2014, and these results were lower than a developed country such as the USA, where the average incidence was 124.9 per 100 000 females from 2010 to 2014.[22]

It seems that, compared with women in developed countries, Iranian women develop breast cancer at younger ages and visit doctors at more advanced stages of the disease. This needs more attention and appropriate screening programs.[4]

Lifestyle and behavioral and nutritional habits are risk factors for many noncommunicable diseases and cancers, including breast cancer.[26-28] In the last two decades, breast cancer has rapidly increased in the less developed regions of the world.[7, 8] Likewise, in the present study, breast cancer incidence showed an increasing trend, and this needs proper interventions including screening and periodical breast examinations.

A total of 1 426 (96.8%) BC cases undergoing mastectomy were pathologically staged. Of this number, 39.1% were stage III. The majority of cases were in stages III and IV combined (62.8%) (Figure 3). Only of 47 (3.2%) cases were residual cancers.

A total of 202 (13.7%) of the BC cases undergoing mastectomy were incompletely excised.

In the present study, although breast cancer mortality increased from 1 to 4.1 per 100 000 females from 2008 to 2014, that rate was still less than developed countries such as England and Wales.[29] The mortality rate in England showed a decreasing trend from 2002 to 2006, but the adjusted mortality rate for different age groups was 30 per 100 000 females, which is much more than Iran.[29] Also, according to the US National Cancer Institute, the mean breast cancer mortality rate in the US was 21.2 per 100 000 females from 2010 to 2014,[22] while we found a breast cancer mortality rate of 1.9 to 4.1 per 100 000 females over the same period in Kerman province—although underestimations may have occurred due to low-quality data collection in Iran.

The results of the present study showed that although the mean age of death among women who lived in the rural areas was lower, this difference was not significant. In Europe in 2014, the mortality rate decreased by 9% compared with 2009,[30] while, Taghavi *et al.* reported that breast cancer mortality had increased from 1995 to 2004 in Iran, with the increase being greater for women younger than 50 years.[20] According to Rastad *et al.*, lack of breast cancer awareness, not considering themselves at risk, fear of being diagnosed with cancer, and incorrect diagnosis and relief by physicians were among the most important factors for the delay in seeking treatment for breast cancer in Iran.[18]

Considering the growing trend in breast cancer mortality and lower age of breast cancer death in Kerman province, as well as the results of previous studies,[16] more appropriate measures should be taken to improve early diagnosis by enabling physicians and increasing patient awareness about breast cancer symptoms.

A limitation of this study was its missing data. About half of the cases had missing data on stage and grade.

In conclusion, breast cancer incidence is growing in Kerman province, and this needs appropriate interventions including screening, early detection, enabling physicians, and empowering patients to identify breast cancer symptoms. Also, providing greater access to facilities for early diagnosis and treatment of breast cancer patients in rural areas should also be considered.

Funding

This project was supported by Kerman University of Medical Sciences.

Conflict of interest

The authors have no conflict of interest.

Acknowledgment

The authors acknowledge Kerman University of Medical Sciences and Kerman Cancer Registry, especially Ms Sadeghi and Ms Rezaei for their

assistance with data collection.

References

1. World-Health-Organization. Fact sheet: Cancer 2017. Available from: [http://www.who.int/mediacentre/factsheets/fs297/en/.]
2. Jemal A, Center MM, DeSantis C, Ward EM. Global patterns of cancer incidence and mortality rates and trends. Cancer Epidemiology and Prevention Biomarkers. 2010;19(8):1893-907.
3. Ferlay J, Soerjomataram I, Dikshit R, Eser S, Mathers C, Rebelo M, *et al.* Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. International journal of cancer. 2015;136(5): E359-E86.
4. Harirchi I, Kolahdoozan S, Karbakhsh M, Chegini N, Mohseni S, Montazeri A, *et al.* Twenty years of breast cancer in Iran: downstaging without a formal screening program. Annals of oncology. 2011;22(1):93-7.
5. Torre LA, Bray F, Siegel RL, Ferlay J, Lortet-Tieulent J, Jemal A. Global cancer statistics, 2012. CA: a cancer journal for clinicians. 2015;65(2):87-108.
6. Fitzmaurice C, Allen C, Barber RM, Barregard L, Bhutta ZA, Brenner H, *et al.* Global, regional, and national cancer incidence, mortality, years of life lost, years lived with disability, and disability-adjusted life-years for 32 cancer groups, 1990 to 2015: a systematic analysis for the global burden of disease study. JAMA oncology. 2016.
7. Ferlay J, Héry C, Autier P, Sankaranarayanan R. Global burden of breast cancer. Breast cancer epidemiology: Springer; 2010:1-19.
8. Ma J, Jemal A. Breast cancer statistics. Breast Cancer Metastasis and Drug Resistance: Springer; 2013:1-18.
9. Mousavi SM, Gouya MM, Ramazani R, Davanlou M, Hajsadeghi N, Seddighi Z. Cancer incidence and mortality in Iran. Annals of Oncology. 2009;20(3):556-63.
10. Jazayeri SB, Saadat S, Ramezani R, Kaviani A. Incidence of primary breast cancer in Iran: Ten-year national cancer registry data report. Cancer Epidemiol. 2015;39(4):519-27.
11. Vostakolaei FA, Broeders MJ, Rostami N, Van Dijck JA, Feuth T, Kiemeney LA, *et al.* Age at diagnosis and breast cancer survival in Iran. International journal of breast cancer. 2012;2012.
12. Mousavi SM, Montazeri A, Mohagheghi MA, Jarrahi AM, Harirchi I, Najafi M, *et al.* Breast cancer in Iran: an epidemiological review. The breast journal. 2007;13(4):383-91.
13. AmericanCancerSociety. Breast Cancer Facts &Figures 2015-2016. Available from: [https://www.cancer.org/ content/dam/cancer-org/research/cancer-facts-and-statistics/breast-cancer-facts-and-figures/breast-cancer-facts-and-figures-2015-2016.pdf.]
14. Babu GR, Samari G, Cohen SP, Mahapatra T, Wahbe RM, Mermash S, *et al.* Breast cancer screening among females in Iran and recommendations for improved practice: a review. Asian Pac J Cancer Prev. 2011;12(7):1647-55.
15. Vahdaninia M, Montazeri A. Breast cancer in Iran: a survival analysis. Asian pacific journal of cancer prevention. 2004;5(2):223-5.
16. Khanjani N, Noori A, Rostami F. The knowledge and practice of breast cancer screening among women in Kerman, Iran. Al-Ameen J Med Sci. 2012;5(2):221-6.
17. Asgarabad AA, Khanjani N, Saber M, Jalili S, Khedmati E. Knowledge and attitude of students at Alzahra University about breast self-examination, Iran. Journal of Health and Development. 2012;1(2):112-0.
18. Rastad H, Khanjani N, Khandani BK. Causes of delay in seeking treatment in patients with breast cancer in Iran: a qualitative content analysis study. Asian Pacific Journal of Cancer Prevention. 2012;13(9):4511-5.
19. Sabbagh MQ, Khanjani N, Fadakar M, Iranpour A. Empowerment of women visiting the health centers of Kerman by teaching Self Breast Examination in the presence of Behvarz. Iranian Journal of Breast Disease. 2014;7(1):41-51 [persian].
20. Taghavi A, Fazeli Z, Vahedi M, Baghestani AR, Pourhoseingholi A, Barzegar F, *et al.* Increased trend of breast cancer mortality in Iran. Asian Pacific Journal of Cancer Prevention. 2012; 13(1):367-70.
21. Mehdi I, Monem EA, Al Bahrani BJ, Al Kharusi S, Nada AM, Al Lawati J, *et al.* Age at diagnosis of female breast cancer in Oman: Issues and implications. South Asian journal of cancer. 2014;3(2):101.
22. NationalCancerInstitute. Cancer Stat Facts: Female Breast Cancer. Available from: [https://seer.cancer.gov/statfacts/html/breast.html.]
23. Mousavi SM, Mohaghegghi MA, Mousavi-Jerrahi A, Nahvijou A, Seddighi Z. Burden of breast cancer in Iran: a study of the Tehran population based cancer registry. Asian Pacific Journal of Cancer Prevention. 2006;7(4):571.
24. Youlden DR, Cramb SM, Yip CH, Baade PD. Incidence and mortality of female breast cancer in the Asia-Pacific region. Cancer biology & medicine. 2014;11(2):101-15.
25. Mitchell K, Fritschi L, Reid A, McEvoy S, Ingram D, Jamrozik K, *et al.* Rural–urban differences in the presentation, management and survival of breast cancer in Western Australia. The Breast. 2006;15(6):769-76.
26. Armstrong T, Bonita R. Capacity building for an integrated noncommunicable disease risk factor

surveillance system in developing countries. Ethnicity & disease. 2002;13(2 Suppl 2):S13-8.
27. Murray CJ, Lopez AD. Measuring the global burden of disease. New England Journal of Medicine. 2013;369(5):448-57.
28. Khazaei S, Rezaeian S, Khazaei Z, Molaeipoor L, Nematollahi S, Lak P, *et al.* National breast cancer mortality and incidence rates according to the human development index: an ecological Study. Advances in Breast Cancer Research. 2016;5(01):30.
29. Autier P, Boniol M, LaVecchia C, Vatten L, Gavin A, Héry C, *et al.* Disparities in breast cancer mortality trends between 30 European countries: retrospective trend analysis of WHO mortality database. Bmj. 2010;341:c3620.
30. Malvezzi M, Bertuccio P, Levi F, La Vecchia C, Negri E. European cancer mortality predictions for the year 2014. Annals of Oncology. 2014:138.