The Economic Burden of Breast Cancer in Iran

Rajabali DAROUDI 1, 2, Ali AKBARI SARI 2, Azin NAHVJOU 1, Bita KALAGHCHI 1, Massoomeh NAJAFI 1, *Kazem ZENDEHDEL 1, 3

1. Cancer Research Center, Cancer Institute of Iran, Tehran University of Medical Sciences, Tehran, Iran
2. Dept. of Health Economics and Management, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran
3. Cancer Research Models Center, Cancer Institute of Iran, Tehran University of Medical Sciences, Tehran, Iran

*Corresponding Author: Email: kzendeh@tums.ac.ir

(Received 21 Dec 2014; accepted 10 Apr 2015)

Abstract

Background: Although breast cancer imposes a considerable economic burden on high-income countries, there is limited knowledge about its economic burden in low- and middle-income countries (LMCs), including Iran. In this study, we estimated the economic burden of breast cancer in Iran in 2010.

Methods: We used the prevalence-based approach and estimated the direct and indirect costs of all breast cancer cases in 2010. We used several data sources, including national cancer registry reports, hospital records, occupational data, and interviews with experts.

Result: The economic burden of breast cancer was US$947,374,468. Most of the cost (77%) pertained to the productivity lost due to breast cancer deaths and the direct medical cost accounted for 18.56% of the estimated total cost. Out of the US$175,860,607 as the direct medical cost, the chemotherapy cost constituted the main part ($76,755,740), of which prescriptions of trastuzumab accounted for 41% ($31,529,280).

Conclusion: The economic burden of breast cancer in Iran is substantial and is expected to increase significantly due to the increasing incidence rate. Strategies for the prevention and early detection of breast cancer should be prioritized in the national cancer control program.

Keywords: Breast cancer, Economic burden, Iran

Introduction

Breast cancer is the most common cancer among women in both developed and developing countries. The incidence rate of this cancer is increasing, especially in developing countries (1, 2). Breast cancer imposes a considerable economic burden on societies (3–5). For instance, the total cost of breast cancer was more than three times the total cost of prostate cancer, the most common cancer in men (6). In addition, the average lifetime cost (ten years) for the breast cancer patient was higher than that for cervical, liver, lung and colorectal cancer in Taiwan (7).

Policy makers and health planners are interested in understanding the economic costs of illnesses to assess the allocation of health resources to disease categories and to evaluate the potential costs and benefits of public health interventions (3). Cost of illness (COI) studies show the importance of a particular disease, provide a baseline for assessing new interventions and determine the medical research priorities (8). Regional estimation of the economic cost of breast cancer is essential to assess alternative strategies and plan for preventing and controlling this disease in developing countries. Nevertheless, currently, an estimation of the economic burden of breast cancer in these countries is lacking (9).

In order to calculate the economic burden of a disease, the direct costs, resulting from the use of the resources for medical care, and the indirect
costs, resulting from the loss of economic resources and opportunities associated with disease and treatment, are calculated (10). Direct costs are usually divided into two groups: direct medical costs and direct non-medical costs. Direct medical costs include costs for hospitalization, surgery, outpatient visits, radiation therapy and chemotherapy/immunotherapy. The direct non-medical costs borne by patients and their families include the costs of transportation to health-care centers, housekeeping services, alterations to property and costs for complementary and alternative medicine (5, 10, 11).

Similar to other developing countries, the incidence rate of breast cancer has increased in Iran in recent years and it is the most common cancer in women (12), but there is limited knowledge of the cost of breast cancer. In Iran, the average direct medical cost per breast cancer patient per month for stages I to IV was US$222.17, 224.61, 316.51 and 828.52, respectively (13). However, the economic burden (direct and indirect cost) of breast cancer has not been estimated in Iran. This study provides an estimate of the economic burden of breast cancer in Iranian women in 2010.

Materials and Methods

‘Prevalence-based’ and ‘incidence-based’ methods are the two main approaches to the estimation of the economic burden of cancer (5, 14). In this study, we used the prevalence-based approach to estimate the economic burden imposed by breast cancer in the year 2010.

Estimation of incidence and prevalence
We used national cancer registry data to estimate the breast cancer incidence and prevalence in Iran in 2010. The Ministry of Health of Iran launched its cancer registry program in 2003 and has published annual reports since then. We used data from the last report of the cancer registry, which provides cancer statistics for the year 2009, to estimate the incidence and prevalence of breast cancer in 2010. The details of our estimation are described elsewhere (15). In brief, after correcting for the underestimation of the incidence and mortality rate of breast cancer, we estimated the prevalence for 2010 using the annual percentage change (APC) and survival rates. Data on the survival rate for breast cancer were obtained from a systematic review of the published reports from different parts of the country (15).

Direct medical costs
To estimate the direct medical costs, we categorized the whole disease process into three phases: initial care, continuous care and terminal care (7). The initial care costs included the cost of diagnosis, surgery, chemotherapy and radiotherapy. The continuing care costs included the cost of hormonal therapy, outpatient visits and routine laboratory and radiology services, such as mammography. The terminal care cost was the cost of the last year of life.

To estimate the total direct medical costs, we estimated the average cost of each treatment in each phase and the number of patients who received the treatment in the country in 2010. The average cost for each treatment in each phase was then multiplied by the number of patients treated in the corresponding phase in 2010.

To estimate the average cost of inpatient care, including surgery, chemotherapy and radiotherapy, we reviewed the medical records of patients who were treated at the Cancer Institute of Iran in 2010, the largest referral cancer hospital in the country, which admits patients from the entire country. Because the tariff of medical services is identical across Iran, the results from this center can be generalized to the country. The costs of chemotherapy drugs were not recorded in patients’ records, so we calculated these costs according to the type of chemotherapy regimen. We extracted the patients’ chemotherapy regimen from the records and calculated the frequency of each regimen. The average cost of each regimen was computed according to the drugs’ price and the prescription dose.

Since trastuzumab is an expensive drug in the treatment of breast cancer and places a major economic burden on almost all countries, we paid particular attention to the cost of this drug in this project. To estimate the cost of trastuzumab for

Available at:  http://ijph.tums.ac.ir
breast cancer patients, we used the trastuzumab guideline published by the Ministry of Health of the I.R. of Iran. According to this guideline, trastuzumab is recommended for early-stage breast cancer patients who are HER2 positive. The initial dose is 8 mg/kg and the subsequent doses are 6 mg/kg every 3 weeks for 1 year (a 52-week regimen) or 9-week treatment with an initial dose of 4 mg/kg and subsequent doses of 2 mg/kg with an appropriate chemotherapy regimen. For metastatic breast cancer patients, it is recommended to combine trastuzumab with an appropriate chemotherapy regimen. We performed a sensitivity analysis to estimate trastuzumab's cost based on the 52-week regimen.

We used expert opinion, the medical tariff and clinical practice guidelines (CPGs) in Iran to estimate the average cost of outpatient care, including diagnostic tests, follow-up visits, laboratory and radiology services and hormonal therapies. Since the tariff of medical services in the private sector differs from that in the public sector in Iran, we estimated the patients who are treated in the private sector and used the private tariff for them. The cost of terminal care is about two to three times more than that of initial care (7, 14, 17, 18). Because we could not estimate the average terminal cost of breast cancer in Iran, we assumed that the average terminal care cost was twice as much as the average initial care cost.

The number of patients who received each of the treatments in 2010 was estimated using the current clinical practice guidelines and according to the epidemiological and pathological patient characteristics, such as the stage of the disease, patient age, menopausal status, tumor size, involvement of lymph nodes and hormone receptor and HER2/neu status. These data were extracted from previous studies (12) and the Cancer Institute of Iran.

**Direct non-medical costs**

Considering the lack of studies and data about the non-medical costs of cancer patients, including breast cancer patients, we estimated the transportation costs for the patients in the initial and continuing phases. Other direct non-medical costs were not included in our analyses. The cost of transportation to health-care centers was estimated based on a survey of 100 breast cancer patients. We used the clinical practice guidelines in Iran and interviewed experts to estimate the average number of journeys made by each patient.

**Indirect cost**

We used the human capital approach to estimate the indirect costs, assuming that the monetary value of productivity lost due to morbidity or premature death caused by an illness equals the current wage (10). As breast cancer patients are usually able to perform their daily activities, the morbidity costs were not calculated for them (6).

**Patient time costs**

We estimated these costs for five-year prevalence cases. Since we were unable to estimate the exact time lost for the patients, we used medical records and the clinical practice guidelines in Iran and obtained expert opinion to estimate the average number of days that each patient lost due to receiving care in the initial and continuing phases. Then we multiplied the average number of lost days by the average daily wage. We used different daily wages for employed and unemployed patients. For non-employed patients, we used the minimum daily wage approved by the Iranian Ministry of Cooperation, Labor and Social Welfare in 2010. The data on daily wages were extracted from the Ministry’s websites (19). The data on the employment rate of breast cancer patients was extracted from previous studies in Iran (20, 21). Usually a family member accompanies the patient during visits; thus, we estimated the time costs for a family member as the patient, assuming that the family members are unemployed.

**Mortality cost**

The estimation of the mortality costs requires three parameters, including the number of deaths,
the years of potential life lost and the value of the productivity lost (6). We used data from a previous study to estimate the number of deaths in different 5-year age groups due to breast cancer in Iran in 2010 (22). To estimate the potential years of life lost, defined as the remaining life expectancy at the age of death, we used the World Bank 2010 report on Iranian women’s life expectancy (23). We used the employment rate in breast cancer patients and the annual average earnings to estimate the value of the productivity lost. For unemployed women and those who are older than 60 years, we used the minimum daily wage to estimate the annual average earnings and assumed that the current pattern of the employment rate remains constant over time and that there is a 10% increase in the annual wage according to the inflation rate in previous years (24). A 5% discount rate was considered to convert the stream of lifetime earnings into a present value. All the costs were converted to US dollars (US $) using the average annual 2010 exchange rate (US$1=Rial 12,290) (25).

Results

We estimated that the number of new breast cancer cases was about 10,000 and the 5-year prevalence was 39,316 in 2010. We present the components of the direct medical costs of breast cancer in Table 1. Since diagnostic and surgical procedures were performed for almost all patients, the expenditure on these procedures was calculated for all the incidence cases. The numbers of cases receiving radiotherapy and chemotherapy in 2010 were 8120 and 9500. Based on studies conducted in Iran, 2400 cases were eligible to receive trastuzumab (16).

Table 1: The direct medical cost of breast cancer in the I.R. of Iran, 2010 (estimated in US dollars)

| Procedures                  | Number of patients | Mean cost, $US | Total cost, $US | Total cost (percent) |
|-----------------------------|--------------------|----------------|-----------------|----------------------|
| Diagnosis/staging           | 10000              | 158.91         | 1,589,100       | 0.90                 |
| Surgery                     | 10000              | 1287.85        | 12,878,500      | 7.32                 |
| Radiotherapy                | 8120               | 923.48         | 7,498,658       | 4.26                 |
| Chemotherapy                | 9500               | 4760.68        | 45,226,460      | 25.72                |
| Trastuzumab                 | 2400               | 13137.20       | 31,529,280      | 17.93                |
| Hormone Therapy & Fallow-up | 34756              | 632.64         | 21,988,036      | 12.50                |
| Terminal care               | 3867               | 14261.85       | 55,150,574      | 31.36                |
| Total                       | -                  | -              | 175,860,607     | 100.00               |

The greatest part of the direct medical cost (43.65%) was the cost of chemotherapy ($76,755,740). The most commonly used chemotherapy regimens were 4AC4T, TAC and CEF, with 46%, 19% and 16%, respectively. An amount of $31,529,280 of the chemotherapy cost (41.07%) was related to trastuzumab. The result of the sensitivity analysis for the trastuzumab cost showed that the mean cost for the 52-week regimen was $60,249 individually and $144,596,563 for all the patients.

The terminal care costs ($55,150,574) were the second-highest medical costs (31.36%) of the total medical cost (Table1). Patients spent $21,606,293 on transportation during their treatment. The average transportation for patients in the initial care phase consisted of about 50 trips, and it was about 7 trips for patients in the second year onwards. The mean cost per journey was estimated to be about $29.

The mean time of absence from work was 23.63 days. Since the mean daily wage for employed and

Available at:  [http://ijph.tums.ac.ir](http://ijph.tums.ac.ir)
unemployed women was $22.35 and $9.67, respectively, we estimated that the patient’s time cost was about $20,441,309 in 2010 (Table 2).

In Table 3, we provide the age-specific mortality rate and the cost due to mortality of breast cancer. The mortality of breast cancer in 2010 in Iran was 3898 cases. Most patients who died were in the age groups of 40–49 and 50–59 years and the total mortality cost was $729,467,259.

Overall, the economic burden of breast cancer in 2010 was $947,375,468. The main components of the cost were mortality (77%) and the direct medical cost (18.56%) (Fig.1).

![Fig. 1: The economic burden of breast cancer in Iran, 2010](image)

### Table 2: The patient time cost for breast cancer in the I.R. of Iran, 2010

| Status                  | Number of patients | Mean of missed work days | Total of missed work days | Mean Cost per days, $US | Total cost, $US |
|-------------------------|--------------------|--------------------------|---------------------------|-------------------------|-----------------|
| Employed patients       | 8256               | 23.63                    | 195,089                   | 22.35                   | 4,360,245       |
| Unemployed Patients     | 31060              | 23.63                    | 733,948                   | 9.67                    | 7,097,275       |
| Accompanies             | 39316              | 23.63                    | 929,037                   | 9.67                    | 8,983,789       |
| Total                   | 8,983,789          | 23.63                    | 20,441,309                |                         |                 |

### Table 3: The mortality cost for breast cancer in the I.R. of Iran, 2010

| Age Group (yr) | Number of death | Mean mortality cost, $US | Total Cost, $US |
|----------------|-----------------|--------------------------|-----------------|
| ≤ 20           | 4               | 1,038,808                | 4,155,232       |
| 20-29          | 84              | 727,680                  | 61,125,120      |
| 30-39          | 487             | 464,534                  | 226,228,058     |
| 40-49          | 994             | 270,247                  | 268,625,518     |
| 50-59          | 960             | 137,414                  | 131,917,440     |
| 60-69          | 682             | 50,876                   | 34,697,432      |
| 70 ≤           | 687             | 3,957                    | 2,718,459       |
| Total          | 3898            |                          | 729,467,259     |

### Discussion

To the best of our knowledge, this is the first economic burden study of breast cancer in Iran. We showed that the economic burden of breast cancer in Iran was $947,375,468 in 2010 and most of this cost was attributed to productivity losses.

The chemotherapy cost accounted for the main part of the direct medical costs. This point was confirmed in another retrospective study (13). Another study in Vietnam, a middle-income country, showed that the chemotherapy cost was the dominant cost in the medical costs of breast cancer (26). However, in the USA and Canada, inpatient
and surgical costs were the largest part of the breast cancer direct medical costs (6, 27). The medical costs of breast cancer in developing countries are lower than those in developed countries (26). The cost of health-care services in Iran is less than in some other Middle Eastern countries and developed countries (28). In Iran, the tariff of outpatient and inpatient services in the public sector is much lower than that in the private sector. For example, the hospitalization tariff in private hospitals is at least three times higher than in public hospitals (29). The cost of surgery for breast cancer in Iran in the private sector is 4.7-fold higher than in the public sector, while the cost of medication is equal in the public and private sectors (13). The public services tariff in Iran is unreal and is much lower than the cost price of services (30), indicating that the public service tariff and the cost of cancer treatment will increase in the near future.

The different result in this study from other studies from the USA and Canada might be due to the low price of services in Iran and, on the other hand, the high prices of new chemotherapy drugs, which are based on the international price. In 2006, the cost of treatment with trastuzumab in the USA was $70,000 (6); this cost in Iran in 2010 was $13,137 for the 9-week regimen and $60,249 for the 52-week regimen. We found that 17.93% of the total medical cost of breast cancer was attributed to the 9-week trastuzumab treatment. Using the 52-week regimen, which is prescribed in western countries, would increase the share of this treatment to 50% of the total medical cost.

Our result showed that terminal care costs were the second-highest direct medical cost after the chemotherapy cost. Because of the lack of data on terminal care costs, we assumed that this part of the cost was twice as much as the initial care cost. In the USA, the cost of breast cancer patients in the final year of life was three times more than the initial care cost (up to 12 months after diagnosis) (17). In Taiwan, the cost of the final year was 5.7 times the cost of the first 6 months after diagnosis (7). Warren et al. estimated the monthly mean cost paid by Medicare for elderly women with early-stage breast cancer. They showed that the pay-
Breast cancer is a costly disease and imposes a large economic burden on Iran and many other low- and middle-income countries (LMCs). It seems that, in accordance with the growing trend of postmenopausal breast cancer incidence in LMCs and the importing of new and expensive medication, such as Trastuzumab, the costs of breast cancer, especially the direct cost, will increase in the future. To prevent this, policy makers should conduct some interventions to reduce the incidence and mortality of breast cancer. Since many studies have shown that, the costs of breast cancer in the early stages are lower than those in the advanced stages are (7, 13, 14), early detection can reduce the mortality and thus the cost of breast cancer. According to the suggestions of WHO and the Breast Health Global Initiative (BHGI), low- and middle-income countries should prioritize the efforts to downstage breast cancer through population awareness and improved equitable access to care (37). International experts evaluated the national cancer control status in Iran in 2011 and recommended developing a national strategy for the early detection of cancer and developing evidence-based early detection guidelines for those cancers that are amenable to early detection through screening, including breast cancer (37). We recommend a comprehensive plan including public awareness program, training of the healthcare providers and establishment of prevention and early detection clinics in the country to decrease the burden of breast cancer through prevention and down staging of the detected cancers. Although WHO recommends mammographic screening for women after the age of 50 years (38), it is important to estimate cost-effectiveness of the screening program before starting a national program in each country. The result of this study can provide data for such studies and appropriate estimation of the disease burden with and without screening.

The strength of this study was its use of several databases to gather the required data. Considering that LMCs usually lack high-quality data at the individual or national level, our methods can be used as an alternative for the estimation of costs in many LMCs. However, this study had some limitations. First, our result may be underestimated; as we mentioned, the treatment tariff in Iran may not reflect the real cost imposed on the health-care system and the tariff will increase to meet the real cost in the near future. Second, we used the human capital approach to calculate the indirect cost. Although this method is still widely used, the value of life for some groups, like children, women and retired people, are underestimated (10). Third, because of the inaccessibility of appropriate data, we could not estimate some kinds of expenditure, like the cost of local recurrence of disease and the cost of patients and their family (the cost of care at home, informal and complementary therapies and intangible costs like pain and depression); furthermore, due to the lack of valid data, we had to rely on expert opinion. This study was conducted based on the data of patients hospitalized in 2010. However, we have used prevalence approach for this analysis and prevalence of breast cancer will not change considerably in a short time period so the results can be generalized to the subsequent years.

Conclusion

The economic burden of breast cancer in Iran is substantial and is expected to increase significantly due to the increasing incidence rate. Strategies for the prevention and early detection of breast cancer should be prioritized in the national cancer control program.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

Acknowledgements

This work was supported by cancer research center of the Cancer Institute of the I.R. of Iran. The authors declare that there is no conflict of interests.
References

1. Bray F, McCarron P, Parkin DM (2004). The changing global patterns of female breast cancer incidence and mortality. *Childhood, 4(5)*: 229-239.

2. Ferlay J, Soerjomataram I, Ervik M, Dikshit R, Eser S, Mathers C, Rebelo M, Parkin DM, Forman D, Bray F. GLOBOCAN 2012 v1.0, cancer incidence and mortality worldwide: IARC cancerbase no. 11 (internet). Lyon, France: International agency for research on cancer; 2013. Available from: Http://globocan.Iarc.Fr, accessed on 30/06/2014.

3. Kim SG, Hahm MI, Choi KS, Seung NY, Shin HR, Park EC (2008). The economic burden of cancer in korea in 2002. *Eur J Cancer Care, 17*(2): 136-144.

4. Lamerato L, Havstad S, Gandhi S, Jones D, Nathanson D (2006). Economic burden associated with breast cancer recurrence. *Cancer, 106*(9): 1875-1882.

5. Yabroff KR, Lund J, Kepka D, Mariotto A (2011). Economic burden of cancer in the united states: Estimates, projections, and future research. *Cancer Epidemiol Biomarkers Prev, 20* (10): 2006-2014.

6. Max W, Sung HY, Stark B (2009). The economic burden of breast cancer in california. *Breast Cancer Res Treat, 116* (1): 201-207.

7. Lang HC, Wu SL (2012). Lifetime costs of the top five cancers in taiwan. *Eur J Health Econ, 13*(3): 347-353.

8. Drummmond M (1992). Cost-of-illness studies: A major headache? *Pharmaco Econ, 2*: 1-4.

9. Coughlin SS, Ekwueme DU (2009). Breast cancer as a global health concern. *Cancer Epidemiol, 33*(5): 315-318.

10. Brown ML and Yabroff KR(2006). Economic impact of cancer in the united states; *Cancer epidemiology and prevention*, Eds schottenfeld and faumeni, 1st ed. oxford university press, new york. pp 202-209.

11. Brown ML, Lipscomb J, Snyder C (2001). The burden of illness of cancer: Economic cost and quality of life. *Ann Rev Public Health, 22*(1): 91-113.

12. Harirchi I, Kolahdoozan S, Karbakhsh M, Chegini N, Mohseni SM, Montazeri A, Motlaken AJ, Kashefi A, Ebrahimi M (2011). Twenty years of breast cancer in iran: Downstaging without a formal screening program. *Ann Oncol, 22*(1): 93-97.

13. Davari M, Yazdanpanah F, Aslani A, Hosseini M, Nazari AR, Mokarian F (2013). The direct medical costs of breast cancer in iran: Analyzing the patient's level data from a cancer specific hospital in isfahan. *Int J Prev Med, 4*(7): 748-754.

14. Taplin SH, Barlow W, Urban N, Mandelson MT, Timlin DJ, Ichikawa L, Nefcy P (1995). Stage, age, comorbidity, and direct costs of colon, prostate, and breast cancer care. *J Natl Cancer Inst,87*(6): 417-426.

15. Rashidian H, Daroudi R, Ghasvand R, Harirchi I, K Zendehdel (2013): Prevalence and incidence of premenopausal and postmenopausal breast cancer in iran in 2010. *BCCR, 5*(3): 2-10.

16. National cancer reasearch network of Iran (2011). *Trastuzumab guideline in breast cancer*. 1st ed, nashre daneshgahi, Tehran.

17. Mariotto AB, Yabroff KR, Shao Y, Feuer EJ, Brown ML (2011). Projections of the cost of cancer care in the united states: 2010-2020. *J Natl Cancer Inst,103*: 117-128.

18. Warren JL, Brown ML, Fay MP, Schussler N, Potosky AL, Riley GF (2002). Costs of treatment for elderly women with early-stage breast cancer in fee-for-service settings. *JCO,20*(1): 307-316.

19. Ministry of labour and social affair(2013). labour market information system. available from: Http://www.Amarkar.Ir/asp/statreport.Aspx.

20. Ghasvand R, Maram ES, Tahmasebi S, Tabatabae SH (2011). Risk factors for breast cancer among young women in southern iran. *IJIC, 129*(6): 1443-1449.

21. Vostakolaei FA, Broeders MJ, Rostami N, van Diick JA, Feuth T, Kiemeney LA, Verbeek AL(2012). Age at diagnosis and breast cancer survival in iran. *Int J Breast Cancer, 2012*: 1-8.

22. Marzban M, Haghdoost AA, Dortaj E, Bahrampour A, Zendehdel K (2015). Completeness and Underestimation of Cancer Mortality Rate in Iran: A Report from Fars Province in Southern Iran. *Arch Iran Med, 18*(3): 33-44.
23. The world bank (2013). Data, Available from: http://data.worldbank.org/country/iran-islamic-republic
24. The central bank of Islamic Republic of Iran (2013). The total price index of consumer goods and services in urban areas(inflation rate): http://www.cbi.ir/simplelist/1589.aspx,
25. The central bank of Islamic Republic of Iran (2013). Exchange rate, Available from: Http://www.Cbi.IR/exrates/rates_fa.aspx,
26. Hoang L, Laohasiriwong W, Stewart JF, Tung ND, Coyte PC (2013). Cost of treatment for breast cancer in central vietnam. Glob Health Action,6:1-10.
27. Will BP, Berthelot JM, Le Petit C, Tomiak EM, Verma S, Evans WK (2000). Estimates of the lifetime costs of breast cancer treatment in canada. Eur J Cancer,36(6):724-735.
28. Kazemi Z. Study of the effective factor for attracting medical tourism in iran. (MSc thesis), Department of Business Administration and Social Sciences, Division of Industrial and e-commerce, Lulea University of Technology, 2007.
29. Ministry of health and medical education (2012). Diagnostic and treatment services tariffs in public and private sectors. 1st ed , Rahavard ,Tehran, Iran, (in Persian).
30. Doshmangir L, Rashidian A, Akbari Sari A (2011). Unresolved issues in medical tariffs: Challenges and respective solutions to improve tariff system in iranian health sectors. JHOSP,10(4):1-10 (in Persion).
31. Yabroff KR, Davis WW, Lamont EB, Fahey A, Topor M, Brown ML, Warren JI,(2007). Patient time costs associated with cancer care. J Natl Cancer Inst, 99(1) :14-23.
32. Yabroff KR, Warren JL, Knopf K, Davis WW, Brown ML. (2005). Estimating patient time costs associated with colorectal cancer care. Medical Care,43(7): 640-648.
33. Lauzier S, Maunsell E, Drolet M, Coyle D, Hebert-Croteau N, Brisson J, Masse B, Abdous B, Robidoux A, Robert J (2008). Wage losses in the year after breast cancer: Extent and determinants among canadian women. J Natl Cancer Inst, 100(5): 321-332.
34. Khamse A, Aghamohammadi S, Kazemi E,(2013). Assessing the main factors affecting waiting times referred to specialized clinics on one of the public hospitals of tehran. Journal of Sabzevar University of Medical Sciences 20(1): 62-70 (in Persian).
35. Ghasavand R, Adami H, Harirchi I, Akrami R, Zendehdel K (2014). Higher incidence of premenopausal breast cancer in less developed countries; myth or truth?. BMC Cancer, 14(1): 343.
36. Bradley CJ, Yabroff KR, Dahman B, Feuer EJ, Mariotto A, Brown ML. (2008). Productivity costs of cancer mortality in the united states: 2000-2020. J Natl Cancer Inst,100(24):1763-1770.
37. Rouollahi MR, Mohagheghi MA, Mohammadrezaei N, Ghasavand R, Ghanbari Motlagh A, Harirchi I, Zendehdel K (2014). Situation analysis of the national comprehensive cancer control program (2013) in Iran; assessment and recommendations based on the iaea impact mission. Arch Iran Med,17(4): 222-231.
38. The World Health Organization (2014), WHO position paper on mammography screening: http://www.who.int/cancer/publications/mammography_screening/en/