Indian Journal of Surgical Oncology (September 2018) 9(3):374–380
https://doi.org/10.1007/s13193-018-0748-4

ORIGINAL ARTICLE

Patterns of Care of Breast Cancer Patients in a Rural Cancer Center in Western India

Bhagwan M. Nene[1] · Farida Selmouni[2] · Manoj Lokhande[1] · Sanjay J. Hingmire[1] · Richard Muwonge[2] · Kasturi Jayant[1] · Rengaswamy Sankaranarayanan[2]

Received: 22 November 2017 / Accepted: 3 April 2018 / Published online: 11 April 2018

Abstract

Breast cancer is an emerging public health problem in low- and middle-income countries. The main objective is to describe the clinical characteristics and patterns of care of breast cancer patients diagnosed and treated in a rural cancer hospital in Barshi, Western India. The results from a cross-sectional study of 99 consecutive breast cancer patients diagnosed and treated between February 2012 and November 2014 in Nargis Dutt Memorial Cancer Hospital is reported. The case records of the patients were scrutinized and reviewed to abstract data on their clinical characteristics, diagnostic, and treatment details. The mean age at diagnosis of the patients was 52.8 ± 11.6 years; 83.5% of women were married, and 60.6% were illiterate. Sixty percent of patients had tumors measuring 5 cm or less. Almost half of the patients (46.4%) had stage I or II A disease and a third (36.0%) had axillary lymph node metastasis. Estrogen, progesterone, and human epidermal growth factor receptor2 receptor status were investigated in 41 (41.4%) of patients only. The median interval between diagnosis and initiation of treatment was 11 days. Modified radical mastectomy was done in 91% of patients, and nearly a third of patients who were prescribed chemotherapy did not complete treatment. The rural-based tertiary cancer care center has made treatment more accessible to breast cancer patients and has reduced the interval between diagnosis and treatment initiation. However, there are still many challenges like non-compliance to and incomplete treatments and poor follow-up that need to be addressed.

Keywords Breast cancer · Patterns of care · India · Rural

Introduction

Breast cancer is the second most common cancer worldwide and, by far, the most frequently occurring cancer among women, with an estimated 1.67 million new cancer cases diagnosed in 2012, comprising 25% of all cancers in women [1]. Breast cancer ranks as the fifth leading cause of death from cancer overall (522,000 deaths per year) and is the most frequent cause of cancer death in women in less developed regions (324,000 deaths per year, 14.3% of all cancer deaths) [1].

The incidence of breast cancer has been increasing globally over the past several decades, especially in developing regions [2–4], with the highest increase in Asian countries [5]. Similar trends were observed in India, with higher incidence reported predominantly from the urban cancer registries [4]. More than 100,000 new cases of breast cancer occur in Indian women annually [6–8], with a relatively younger age distribution. Premenopausal women constitute 50% of all patients [6]. As per data from the Indian Council of Medical Research Population Based Cancer Registries, breast cancer is the most common cancer among women in the urban registries of Delhi, Mumbai, Ahmedabad, Calcutta, and Trivandrum, where it constitutes more than 30% of all cancers in women [8–10]. The age-standardized incidence rates vary by region and ethnicity, ranging from 6.2 to 39.5 per 100,000 person-years [8–10].

Breast cancer is eminently curable if detected early and treated appropriately. Management of breast cancer requires multidisciplinary treatment due to the heterogeneous characteristics recognized on histopathology and immunohistochemistry [11, 12]. Early diagnosis and socioeconomic features can affect both survival and quality of life [13, 14].

✉ Farida Selmouni
selmounif@fellows.iarc.fr

[1] Nargis Dutt Memorial Cancer Hospital, Barshi, India

[2] International Agency for Research on Cancer, 150 cours Albert Thomas, 69008 Lyon, France

Women from low socioeconomic strata have higher mortality rates, due to diagnosis at late stages [15, 16], when little or no benefit can be derived from any form of treatment [15]. Breast cancer survival is also related to the clinicians' workload, experience and the availability of multidisciplinary care and a full range of treatment options [17]; breast cancer patients treated in adequately equipped tertiary care centers have significantly better survival and cosmetic outcomes [18]. Access to high-quality treatment for breast cancer is still limited in the rural areas of India.

To our knowledge, little is known about the patterns of care of breast cancer patients in rural India, because there are very few centers providing tertiary care in such settings. In this manuscript, we describe the clinical profile and patterns of care from a series of 99 consecutive breast cancer patients seen in one service (Dr ML) at the Nargis Dutt Memorial Cancer Hospital (NDMCH), a rural cancer center situated in Barshi, Western India. This center has comprehensive cancer diagnostic and treatment facilities developed with technical support from Tata Memorial Hospital, in Mumbai, the leading cancer research and treatment center in India.

Materials and Methods

Only women with histologically confirmed invasive breast cancer that attended the service of one of the surgeons (ML) at NDMCH in Barshi were included. These were partly women that presented with breast symptoms or those that were already diagnosed elsewhere and seeking treatment at the hospital. Those with breast symptoms such as lump in the breast were investigated with clinical history, clinical examination, and diagnostic tests and staging investigations such as imaging, biochemical investigations, fine needle aspiration cytology, and histopathology. Patients with proven breast cancer were staged as per the Tumeur Ganglions lymphatiques Metastases (TNM) classification of malignant tumor guidelines [19]. Flourescence in situ hybridisation and immunohistochemistry were used to determine human epidermal growth factor receptor2 (HER2), estrogen receptor(ER), and progesterone receptor (PR) status in breast cancer.

The study was conducted between February 2012 and October 2014. Each included woman was registered and assigned a serial number. The patients were interviewed for social and demographic data. The clinical data, such as gynecological and family history were abstracted from patients' medical records.

A descriptive analysis was presented as observed counts and percentages; categorical variables were given as frequencies and proportions, and continuous variables were summarized as means or medians together with standard deviations (SD) or interquartile ranges (IQR) (25th–75th percentiles). All statistical analysis was performed using STAT14 software.

Results

The patient data on 99 breast cancer patients are summarized in Table 1. The mean age at diagnosis of the patients was 52.8 ± 11.6 years; 83.5% were married, and 60.6% did not have any formal education. Family history of breast cancer was reported in only 4.4% of the women. The mean age at first childbirth was 17.3 ± 2.8 years and 92.4% of the women reported having breastfed their babies for at least 6 months after the last childbirth. Nearly one third (32.0%) of the breast cancer patients were premenopausal, and 2.3% of them reported ever using hormone replacement therapy.

Table 2 shows the tumor characteristics of breast cancer patients. Almost all the patients (99.0%) presented with a lump in the breast; 46 (46.4%) patients had stage I or II A disease. Sixty (60.6%) patients had primary tumors 5 cm or less in maximum dimension and 55 (55.6%) had no axillary lymph node metastasis. Distant metastasis was present in 1.0% of the patients. The ER, PR, and HER2/neu status were documented only for 41 (41.4%) patients; among them, 12 were ER positive, 11 were PR positive, and 32 were HER2/neu positive. Based on the status of receptors, luminal A type of breast cancer (ER/PR-positive or-negative and HER2/neu-negative) was detected in only 3 (7.3%) patients, luminal B type (ER/PR-positive or ER/PR-negative and HER2/neu-positive) in 12 (29.3%) patients; 6 (14.7%) had triple-negative breast cancer and 20 (48.8%) had HER2-enriched type (ER- and PR-negative and HER2/neu-positive).

Information related to treatment is given in Table 3. The median interval between the diagnosis and the initiation of treatment was 11 days. A total of 95 patients were treated with curative intent. Modified radical mastectomy was the most frequently performed surgery, done on 90/91 (99.0%) patients who underwent surgery. Post-operative radiation therapy was prescribed for 32 women, of whom 5 could not complete radiation therapy and 9 did not undergo any radiation therapy. None of the patients had breast-conserving surgery, and as a result irradiation of the breast was not prescribed for any of them. Of the 87 patients for whom chemotherapy was prescribed, 24 (27.6%) could not complete the prescribed regime and 8 (9.2%) did not receive it at all. Chemotherapy was advised in the neoadjuvant setting in only 9 of the 87 patients for whom chemotherapy was prescribed. From the records, it was not possible to ascertain the number of patients who had discontinued treatment due to radiation- and/or chemotherapy-induced side effects and complications. No information was recorded in the patients' case notes about whether ER modulators such as tamoxifen were prescribed. None of the patients received targeted therapy with trastuzumab.

It was not possible to obtain any information on response to treatment or on the vital status of the patients at follow-up as most of the patients did not attend NDMCH for follow up.

Table 1 Patient data of the women with breast cancer

Characteristics ($N = 99$) *	Number (%)
Demographic data	
Age (mean ± SD)	52.8 ± 11.6
< 50	38 (38.4)
≥ 50	61 (61.6)
Marital status	
Unmarried	1 (1.0)
Married	81 (83.5)
Widowed	14 (14.4)
Divorced	1 (1.0)
Education	
Illiterate	57 (60.6)
Primary	30 (31.9)
Secondary	5(5.3)
College	2 (2.1)
Gravida (mean)	
< 5	75 (77.3)
≥ 5	22 (22.7)
Parity (mean)	
0	17 (17.5)
1–4	65 (67.0)
≥ 5	15 (15.5)
Age at first child birth (mean ± SD)	17.3 ± 2.8
Menstruation in the last 12 months	
Yes	30 (32.0)
No	64 (68.0)
Breastfeeding for at least 6 months for the last child	
Yes	73 (92.4)
No	6 (7.6)
Hormonal intake	
Yes	2 (2.3)
No	86 (97.7)
Family history of breast cancer	
Positive	4 (4.4)
Negative	87 (95.6)

* N varies between items because of missing data

SD standard deviation

Discussion

Our data provide an idea of the current state of breast cancer care in a rural tertiary cancer hospital in India, despite all its limitations associated with referral biases involved in a hospital/service based study. The patients were relatively young, and almost half of them had stage I or II A disease. The low average age of breast cancer onset is a common feature in low- and middle-income countries [20], reflecting the age distribution of these populations [20, 21].

Relatively more advanced disease at diagnosis for breast cancer patients has been described previously in Asian and Indian women [6, 9, 22, 23], especially among those from low socioeconomic strata [24–30] and the less educated [25, 27–29]. The most important cause of late detection of breast cancer in rural Indian women is lack of awareness about the early symptoms of the disease [31, 32]. Lack of physical and economic access to healthcare could be additional factors contributing to the late presentation [33, 34]. Fear of a breast cancer diagnosis, cancer treatments, and partner abandonment were reportedly associated with delayed and late presentation [33]. Psychosocial and cultural variables have been linked to the stigma associated with breast cancer, which may directly influence health-seeking behaviors in women [26, 27, 32, 35]. The presentation of patients in stage II or more advanced stages could be attributed to the fact that breast screening programs and public awareness strategies are virtually nonexistent in rural India. Clinical breast examination and mammography are performed very sporadically in selected institutions situated in the urban regions of India [9, 15, 23]. Rural women do not have any access to such facilities.

The median interval between the date of diagnosis and the date of treatment initiation was shorter compared with other studies [33, 36]. The shorter waiting time could be explained by the availability of the rest-house (Dharamshala) free of charge and close to NDMCH; most of the remote patients used to be accommodated there during the diagnosis and treatment period.

Among those with known receptor status, the ER/PR positivity frequencies were low compared with the rates reported in studies conducted in developed countries [37–40], The rates found here are also consistent with the previous studies conducted in India [41–44], although this might be a biased observation given the large proportion of patients in whom the receptor status could not be assessed. This higher burden of ER/PR-negative disease has been attributed to several factors, including technical failures in detecting receptor positivity, the younger age of the patients, and the advanced stage at presentation. A high frequency of HER2/neu positivity was observed in the current study, although it could be biased due to a large proportion of cases with no information. The available information suggests lower rates of HER2/neu positivity of breast cancer patients from Western countries [23]. The HER2/neu positivity reported in the earlier Indian studies ranged from 29 to 51.6% [38, 45, 46]. The observed rates of luminal B and HER2-enriched type also seem to be high and could be explained by the high rate of HER2/neu-positive breast cancer reported in our study.

The vast majority of the patients in this series could be treated with curative intent; this finding is obviously biased by the selective hospital referral patterns. It is not uncommon that patients with locally advanced disease are not taken to hospitals for care assuming futility and economic hardships

Table 2 Tumor characteristics of breast cancer patients

	Range	Number (%)
Tumor stage		
	0	1 (1.0)
	I	10 (10.1)
	IIA	35 (35.3)
	IIB	13 (13.1)
	IIIA	7 (7.1)
	IIIB	10 (10.1)
	IV	8 (8.1)
	Unknown	15 (15.1)
Tumor size (cm)		
	T0	1 (1.0)
	T1	11 (11.1)
	T2	48 (48.5)
	T3	17 (17.2)
	T4	5 (5.0)
	Unknown	17 (17.2)
Axillary lymph node		
	N0	55 (55.6)
	N1	20 (20.2)
	N2	5 (5.0)
	N3	6 (6.0)
	Unknown	13 (13.1)
Metastasis		
	M0	85 (85.8)
	M1	1 (1.0)
	Unknown	13 (13.1)
Laterality		
	Right	41 (41.4)
	Left	57 (57.6)
	Bilateral	1 (1.0)
Symptoms at presentation		
	Lump	98 (99.0)
	Skin changes	1 (1.0)
	Ulceration	1 (1.0)
	Nipple discharge	2 (2.0)
	Axillary nodes	17 (17.2)
	Symptoms of distant metastasis	4 (4.0)
Estrogen receptor		
	Positive	12 (12.1)
	Negative	29 (29.3)
	Not performed	34 (34.3)
	Unknown	24 (24.2)
Progesterone receptor		
	Positive	11 (11.1)
	Negative	30 (30.3)
	Not performed	34 (34.3)
	Unknown	24 (24.2)
HER2		
	Positive by immunohistochemistry	31 (31.3)
	Positive by FISH	1 (1.0)
	Negative	9 (9.1)
	Not performed	34 (34.3)
	Unknown	24 (24.2)
Luminal A		3 (7.3)
Luminal B		12 (29.3)
Triple negative		6 (14.7)
HER2 type		20 (48.8)

HER2 Human epidermal growth factor receptor 2

associated with such care. We believe that our series is heavily biased by referral of localized and loco-regional disease amenable to surgery. Surgery in the form of mastectomy was the main modality to treat patients with breast cancer. Breast-conserving surgery was not performed on any of the women, possibly due to the more advanced disease at diagnosis, which made the women unsuitable for conservative surgery. However, there may be other reasons for not practicing

Table 3 Treatment characteristics of breast cancer patients

Treatment details ($N = 99^{*}$)	Number (%)
Median interval between date of diagnosis and treatment (IQR25th–75th)	11 (4,19)
Treatment intent	
Curative	95 (96.0)
Palliative	1 (1.0)
Missing data	3 (3.0)
Surgical treatment	
No prescribed	2 (20.0)
Modified radical mastectomy	90 (91.0)
Toilet mastectomy	1 (1.0)
Missing data	6 (6.0)
Radiation therapy	
No prescribed	48 (48.5)
Prescribed	32 (32.3)
Prescribed but not received	9 (28.1)
Incomplete treatment	5 (15.6)
Treatment completed	18 (56.2)
Missing data	19 (19.2)
Radiation therapy type	
Following modified radical mastectomy	29 (90.6)
Palliative radiotherapy	1 (3.1)
Missing data	2 (6.3)
Chemotherapy	
No prescribed	6 (6.1)
Prescribed	87 (87,8)
Prescribed but no received	8 (9.2)
Incomplete treatment	24 (27.6)
Treatment completed	55 (63.2)
Missing data	6 (6.1)
Chemotherapy type	
Neoadjuvant	9 (10.3)
Adjuvant	77 (88.5)
Missing data	1 (1.1)

[*] *N* varies between items because of missing data

IQR interquartile range

breast-conserving surgery in the rural tertiary care hospital, e.g., low acceptance among patients and the challenges in ensuring compliance and high quality radiotherapy and adjuvant treatments and regular follow-up, especially in a rural setting [47, 48].

The poor compliance with systemic treatment observed in our study population is a matter of concern. A significant proportion of breast cancer patients may need adjuvant therapy with hormone or chemotherapy and/or radiation therapy. Nearly one tenth of the patients treated at NDMCH did not receive any adjuvant therapy after surgery in spite of being advised to do so by the multidisciplinary tumor board. One fourth of the patients did not complete the prescribed course of chemotherapy. The reasons for non-compliance could be medical (side effects of treatment), economic, or social. Understanding the reasons for non-compliance was not within the scope of the present study. There is a pressing need to investigate the factors that prevented the patients from completing the prescribed treatment.

More than one third of the patients did not undergo the hormone receptor tests. This could be related to financial constraints, because the patients had to pay for the hormone receptor tests. Testing for at least ER status is critical to plan optimal treatment for breast cancer. In patients with ER-positive breast cancer, use of adjuvant tamoxifen for 5 years reduces the annual breast cancer death rate by 31% [49, 50]. A major deficiency was non-documentation of details of hormone therapy, if any, was given: no information was recorded

in the patients' case notes about whether ER modulators were prescribed. However, it is possible that tamoxifen was prescribed but the prescription was not recorded in the case notes. Tamoxifen is widely available in India and is generally affordable to patients. Testing for HER2/neu receptor status has limited value because trastuzumab is far too expensive and is clearly out of reach of poor rural patients in India. However, the patients with triple-negative disease need more aggressive chemotherapy.

Our study clearly highlights the importance of having a feasible and effective data management system at tertiary care centers. India has made huge progress in computer software technology and telecommunications in recent times. The technological advancements have made such services accessible even in rural heartland areas, and they are being successfully used in many health programs. The tertiary oncology care centers may consider using appropriate data management software to maintain the patient records, update them regularly, and if possible, track the patients that are non-compliant with treatment and follow-up.

Undertaking the present study was warranted due to the limited publications on patterns of care in low- and middle-income countries. Huge efforts were made to collect clinical data during almost 3 years, and this is the first study on breast cancer patient care was given by NDMCH. However, we have identified certain limitations, like lapses in data recording and poor patient follow up. These limit the complete overview of the care provided to breast cancer patients.

In conclusion, the rural-based tertiary cancer care center has made treatment more accessible to breast cancer patients and has reduced the interval between diagnosis and treatment initiation. However, there are still many gaps, like affordability, non-compliance, and poor follow-up that need to be addressed.

Acknowledgements Authors acknowledge patients who contributed to this study, Katkar SV, for interviewing and abstracting data from records and Badave AG and Lakashetti SS for entering data.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

References

1. Ferlay J, Soerjomataram I, Ervik M, Dikshit R, Eser S, Mathers C et al (2013) GLOBOCAN 2012 v1.0, Cancer incidence and mortality worldwide: IARC CancerBase No. 11 [Internet}. International Agency for Research on Cancer, Lyon
2. Hortobagyi GN, de la Garza SJ, Pritchard K, Amadori D, Haidinger R, Hudis CA et al (2005) The global breast cancer burden: variations in epidemiology and survival. Clin Breast Cancer 6:391–401
3. Anderson BO, Jakesz R (2008) Breast cancer issues in developing countries: an overview of the Breast Health Global Initiative. World J Surg 32:2578–2585
4. Porter P (2008) "Westernizing" women's risks? Breast cancer in lower-income countries. N Engl J Med 358:213–216
5. 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
6. Agarwal G, Pradeep PV, Aggarwal V, Yip CH, Cheung PS (2007) Spectrum of breast cancer in Asian women. World J Surg 31:1031–1040
7. Nandakumar A, Anantha N, Venugopal TC, Sankaranarayanan R, Thimmasetty K, Dhar M (1995) Survival in breast cancer: a population-based study in Bangalore, India. Int J Cancer 60:593–596
8. Indian Council of Medical Research (2001) National Cancer Registry Programme. Consolidated report of the population based cancer registries 1990-96. Incidence and Distribution of Cancer. Indian Council of Medical Research, New Delhi
9. Agarwal G, Ramakant P (2008) Breast cancer care in India: the current scenario and the challenges for the future. Breast Care (Basel) 3:21–27
10. Khokhar A (2012) Breast cancer in India: where do we stand and where do we go? Asian Pac J Cancer Prev 13:4861–4866
11. Sandhu DS, Sandhu S, Karwasra RK, Marwah S (2010) Profile of breast cancer patients at a tertiary care hospital in North India. Indian J Cancer 47:16–22
12. Chandra AB (1979) Problems and prospects of cancer of the breast in India. J Indian Med Assoc 72:43–45
13. Berry DA, Cronin KA, Plevritis SK, Fryback DG, Clarke L, Zelen M, Mandelblatt JS, Yakovlev AY, Habbema JD, Feuer EJ, Cancer Intervention and Surveillance Modeling Network (CISNET) Collaborators (2005) Effect of screening and adjuvant therapy on mortality from breast cancer. N Engl J Med 353:1784–1792
14. Kingsmore D, Hole D, Gillis C (2004) Why does specialist treatment of breast cancer improve survival? The role of surgical management. Br J Cancer 90:1920–1925
15. Gangane N, Ng N, Sebastian MS (2015) Women's knowledge, attitudes, and practices about breast cancer in a rural district of Central India. Asian Pac J Cancer Prev 16:6863–6870
16. Hebert JR, Ghumare SS, Gupta PC (2006) Stage at diagnosis and relative differences in breast and prostate cancer incidence in India: comparison with the United States. Asian Pac J Cancer Prev 7:547–555
17. Sainsbury R, Haward B, Rider L, Johnston C, Round C (1995) Influence of clinician workload and patterns of treatment on survival from breast cancer. Lancet 345:1265–1270
18. Hebert-Croteau N, Brisson J, Lemaire J, Latreille J, Pineault R (2005) Investigating the correlation between hospital of primary treatment and the survival of women with breast cancer. Cancer 104:1343–1348
19. Sobin LH, Gospodarowicz MK (2009) TNM Classification of malignant tumours. International Union Against Cancer, Geneva
20. Harford JB (2011) Breast-cancer early detection in low-income and middle-income countries: do what you can versus one size fits all. Lancet Oncol 12:306–312
21. Mittra I, Badwe RA, Desai PB, Yeole BB, Jussawalla DJ (1989) Early detection of breast cancer in developing countries. Lancet 1:719–720
22. Saxena S, Rekhi B, Bansal A, Bagga A, Chintamani, Murthy NS (2005) Clinico-morphological patterns of breast cancer including family history in a New Delhi hospital, India—a cross-sectional study. World J Surg Oncol 3:67
23. Leong SP, Shen ZZ, Liu TJ, Agarwal G, Tajima T, Paik NS et al (2010) Is breast cancer the same disease in Asian and Western countries? World J Surg 34:2308–2324

24. Das D, Pathak M (2012) The growing rural-urban disparity in India: some issues. Int J Adv Res Technol 1:145–151
25. Sharma K, Costas A, Shulman LN, Meara JG (2012) A systematic review of barriers to breast cancer care in developing countries resulting in delayed patient presentation. J Oncol 2012:121873
26. Aziz Z, Iqbal J, Akram M (2008) Effect of social class disparities on disease stage, quality of treatment and survival outcomes in breast cancer patients from developing countries. Breast J 14:372–375
27. Cross CK, Harris J, Recht A (2002) Race, socioeconomic status, and breast carcinoma in the U.S: what have we learned from clinical studies. Cancer 95:1988–1999
28. Burgess CC, Potts HW, Hamed H, Bish AM, Hunter MS, Richards MA et al (2006) Why do older women delay presentation with breast cancer symptoms? Psychooncology 15:962–968
29. Pineros M, Sanchez R, Cendales R, Perry F, Ocampo R (2009) Patient delay among Colombian women with breast cancer. Salud Publica Mex 51:372–380
30. Mandelblatt J, Andrews H, Kerner J, Zauber A, Burnett W (1991) Determinants of late stage diagnosis of breast and cervical cancer: the impact of age, race, social class, and hospital type. Am J Public Health 81:646–649
31. Agarwal G, Ramakant P, Forgach ER, Rendon JC, Chaparro JM, Basurto CS et al (2009) Breast cancer care in developing countries. World J Surg 33:2069–2076
32. Jones CE, Maben J, Jack RH, Davies EA, Forbes LJ, Lucas G et al (2014) A systematic review of barriers to early presentation and diagnosis with breast cancer among black women. BMJ Open 4: e004076
33. Robertson R, Campbell NC, Smith S, Donnan PT, Sullivan F, Duffy R, Ritchie LD, Millar D, Cassidy J, Munro A (2004) Factors influencing time from presentation to treatment of colorectal and breast cancer in urban and rural areas. Br J Cancer 90:1479–1485
34. Donkor A, Lathlean J, Wiafe S, Vanderpuye V, Fenlon D, Yarney J et al (2015) Factors contributing to late presentation of breast cancer in Africa: a systematic literature review. Arch Med 8:1–10
35. Varughese J, Richman S (2010) Cancer care inequity for women in resource-poor countries. Rev Obstet Gynecol 3:122–132
36. Montella M, Crispo A, Botti G, De MM, de BG, Fabbrocini G et al (2001) An assessment of delays in obtaining definitive breast cancer treatment in Southern Italy. Breast Cancer Res Treat 66:209–215
37. Sofi GN, Sofi JN, Nadeem R, Shiekh RY, Khan FA, Sofi AA, Bhat HA, Bhat RA (2012) Estrogen receptor and progesterone receptor status in breast cancer in relation to age, histological grade, size of lesion and lymph node involvement. Asian Pac J Cancer Prev 13: 5047–5052
38. Zubeda S, Kaipa PR, Shaik NA, Mohiuddin MK, Vaidya S, Pavani B, Srinivasulu M, Latha MM, Hasan Q (2013) Her-2/neu status: a neglected marker of prognostication and management of breast cancer patients in India. Asian Pac J Cancer Prev 14:2231–2235
39. Francis GD, Dimech M, Giles L, Hopkins A (2007) Frequency and reliability of oestrogen receptor, progesterone receptor and HER2 in breast carcinoma determined by immunohistochemistry in Australasia: results of the RCPA Quality Assurance Program. J Clin Pathol 60:1277–1283
40. Rhodes A, Jasani B, Balaton AJ, Barnes DM, Miller KD (2000) Frequency of oestrogen and progesterone receptor positivity by immunohistochemical analysis in 7016 breast carcinomas: correlation with patient age, assay sensitivity, threshold value, and mammographic screening. J Clin Pathol 53:688–696
41. Kuraparthy S, Reddy KM, Yadagiri LA, Yutla M, Venkata PB, Kadainti SV et al (2007) Epidemiology and patterns of care for invasive breast carcinoma at a community hospital in southern India. World J Surg Oncol 5:56
42. Shet T, Agrawal A, Nadkarni M, Palkar M, Havaldar R, Parmar V, Badwe R, Chinoy RF (2009) Hormone receptors over the last 8 years in a cancer referral center in India: what was and what is? Indian J Pathol Microbiol 52:171–174
43. Dey S, Boffetta P, Mathews A, Brennan P, Soliman A, Mathew A (2009) Risk factors according to estrogen receptor status of breast cancer patients in Trivandrum, South India. Int J Cancer 125:1663–1670
44. Manjunath S, Prabhu JS, Kaluve R, Correa M, Sridhar TS (2011) Estrogen receptor negative breast cancer in India: do we really have higher burden of this subtype? Indian J Surg Oncol 2:122–125
45. Kumar V, Tewari M, Singh U, Shukla HS (2007) Significance of Her-2/neu protein over expression in Indian breast cancer patients. Indian J Surg 69:122–128
46. Munjal K, Ambaye A, Evans MF, Mitchell J, Nandedkar S, Cooper K (2009) Immunohistochemical analysis of ER, PR, Her2 and CK5/6 in infiltrative breast carcinomas in Indian patients. Asian Pac J Cancer Prev 10:773–778
47. Raina V, Bhutani M, Bedi R, Sharma A, Deo SV, Shukla NK et al (2005) Clinical features and prognostic factors of early breast cancer at a major cancer center in North India. Indian J Cancer 42:40–45
48. Aggarwal V, Agarwal G, Lal P, Krishnani N, Mishra A, Verma AK, Mishra SK (2008) Feasibility study of safe breast conservation in large and locally advanced cancers with use of radiopaque markers to mark pre-neoadjuvant chemotherapy tumor margins. World J Surg 32:2562–2569
49. Davies C, Godwin J, Gray R, Clarke M, Cutter D, Darby S et al (2011) Relevance of breast cancer hormone receptors and other factors to the efficacy of adjuvant tamoxifen: patient-level meta-analysis of randomised trials. Lancet 378:771–784
50. Early Breast Cancer Trialists' Collaborative (EBCTCG) (2005) Effects of chemotherapy and hormonal therapy for early breast cancer on recurrence and 15-year survival: an overview of the randomised trials. Lancet 365:1687–1717