RESEARCH ARTICLE

Editorial Process: Submission:09/10/2021 Acceptance:03/19/2022

Study of Diagnostic Delay among Symptomatic Breast Cancer Patients in Northern India: *A Mixed-Methods Analysis from a Dedicated Breast Cancer Centre*

Ankit Rai[1]*, Prateek Sharda[2], Pradeep Aggarwal[3], Bina Ravi[2]

Abstract

Objective: We conducted this study to understand the factors that contribute to the delay in diagnosis of symptomatic breast cancer patients. **Methodology:** We did a prospective analytical study with both quantitative and qualitative components over 14 months. The total delay in diagnosis of breast cancer from first symptom onset was defined as diagnostic delay. Presentation delay was defined as the time duration between the first symptom and the first visit to a health care provider. Provider delay was defined as the time duration between the presentation to a health care provider and the final diagnosis. Three hundred female breast cancer patients with a diagnostic delay of at least 3 months were interviewed using a pre-tested semi-structured questionnaire. **Results:** We found that more than 50% of patients with delayed presentation were between 30-50 years of age. Painless breast lump was the most common initial symptom. More than 70% of patients presented with locally advanced and metastatic disease. The patient-related delay was more common than provider delay. Breast cancer awareness ($p = 0.040$) and reasons for delay ($p = 0.014$) were found to significantly influence the delay. More than 70% of patients reported their symptoms to male members of their families. **Conclusion:** Breast cancer awareness is the single most important determinant influencing diagnostic delay among symptomatic patients.

Keywords: Breast cancer- diagnosis- delay

Asian Pac J Cancer Prev, **23 (3)**, 893-904

Introduction

Breast cancer is the most common site-specific cancer and a leading cause of death from cancer in women globally (DeVita et al., 2019). It accounted for 11.7% of new cases and 6.9% deaths of all cancers taken together in the year 2020 as per GLOBOCAN estimates. Breast cancer remains the most common cancer and the most common cause of cancer-related mortality in India with 7.85% of all cases from the country (Sung et al., 2021). The projection for India during the periods between 2020 and 2040 predicts the number of cases to go as high as 3,70,000 from the current 1,80,000 with its approximate relative percentage remaining the same among all the cancers (ICMR, 2016; Sung et al., 2021).

In several developed countries, including the United States, Canada, the United Kingdom, France, and Australia, the fall in incidence during early 2000s was partly attributable to a decline in the use of postmenopausal hormonal treatment after publication of the Women's Health Initiative trial linking postmenopausal hormone use to increased breast cancer risk (WHI, 2002; Ravdin et al., 2007). Overall, in the Western population there has been a fall in deaths caused by breast cancer as a result of breast screening, early diagnosis and better treatment, although the relative contribution of these factors is yet to be evaluated (Richards et al., 2000).

However, it is still a non-existent entity for majority of Indian population. Healthcare is low on priority and even in major cities screening is an 'alien' word for most people. The numerous myths and ignorance that prevail in Indian society about breast cancer have resulted in an unrealistic fear of the disease (Aggarwal et al., 2007). According to various studies, majority of carcinoma breast cases in the West report in stages I and II of disease, whereas in India 45.7% patients report in advanced stages (Kakarala et al., 2010; Leong et al., 2010). Studies suggest that the disease peaks at 40–50 years in Indian women (Chopra et al., 2014). Breast cancer awareness programs are more concentrated in the cities and have still not reached the remote and rural parts of the country (Chopra, 2001). Women often do not present for medical care early enough due to various reasons such as illiteracy, lack of awareness, and financial constraints. Thus, majority of breast cancer

*[1]Junior Resident, General Surgery, All India Institute of Medical Sciences (AIIMS), Rishikesh, India. [2]Integrated Breast Care Centre (IBCC), All India Institute of Medical Sciences (AIIMS), Rishikesh, India. [3]Community and Family Medicine, All India Institute of Medical Sciences (AIIMS), Rishikesh, India. *For Correspondence: ankitrai75@yahoo.co.in*

patients in India are still treated at locally advanced and metastatic stages (Chopra, 2001; Aggarwal et al., 2008). Breast cancer has been replacing cancer of the cervix as the leading site of cancer in all urban cancer registries in India (ICMR, 2016).

Taken together these facts indicate that most Indian women are diagnosed at an advanced stage of breast cancer during the most productive period of their lives. It has been proven that patients with longer duration of symptoms present with more advanced disease and that a delay in diagnosis between 3-6 months after onset of symptoms reduces 5-years survival by 7% compared to patients diagnosed within 3 months of onset of symptoms (Richards et al., 1999; Montazeri et al., 2003). The time between first symptom and treatment is longer than 3 months in at least a third of all patients, and in about a quarter the time is longer than 6 months (Richards et al., 1999). As organized, mammographic screening programs are not feasible or cost effective in low resource settings, efforts must be made to promote early diagnosis of breast cancer through better awareness along with appropriate and timely treatment (WHO, 2014; Birnbaum et al., 2018; Ngan et al., 2020). A study from sub-Saharan countries reported that more than 25% deaths could be prevented by early diagnosis and timely treatment of breast cancer (McCormack et al., 2020). In a study from the United States, authors reported a significant improvement in breast cancer mortality before the introduction of mammographic screening and adjuvant therapy (Arndt et al., 2002).

Lack of screening program and delay in diagnosis is hindering attempts to improve breast cancer survival in India. Studies over the last 20 years have assessed the delays by both the patients and providers among breast cancer patients, however an in-depth, contextual understanding of the reasons for delay is more important (Arndt et al., 2002). Significant gains can be made by encouraging women to seek help more quickly, while simultaneously improve hospital practices. To reduce the increasing load of mortality due to breast cancer, we need to lay emphasis on early diagnosis and increased use of systemic therapy. Any strategy aimed to shorten the delay in presentation of breast cancer patients requires a comprehensive understanding of the factors that influence the delays.

Quantitative research methods dominate the study of delayed help-seeking among breast cancer patients; focusing mainly on mapping incidences and stages of cancer at diagnosis, establishing the relationship between survival outcomes and duration of delays, and knowledge of breast cancer and demographic attributes (Lin et al., 2015). Seven systematic reviews have been performed between 1999 and 2020, to examine the factors influencing presentation, diagnosis and breast cancer care and of the 144 included studies, only 13 were qualitative and 3 were mixed methods study (Ramirez et al., 1999; Alhurishi et al., 2011; Sharma et al., 2012; Jones et al., 2014; Khan et al., 2015; Espina et al., 2017; Kailemia et al., 2020).

Unlike quantitative research, qualitative research provides in-depth explanations and contextual information crucial to understanding attitudes, decision-making processes, behaviours, concerns, motivations, culture or lifestyles, as well as in generating ideas for new strategies, interventions or theories (Austin and Sutton, 2014). In a study from the UK, authors concluded that delay in presentation of breast cancer patients was not related to socioeconomic status and other demographic variables and instead associated with the beliefs about the breast symptoms and their attribution (Nosarti et al., 2000). Similar findings were reported in a qualitative study among the Iranian women (Khakbazan et al., 2014). These results provide a basis for comprehensive qualitative evaluation of delayed presentation among symptomatic patients. Few qualitative studies evaluating the screening programme (Bener et al., 2002; Lamiyan et al., 2007), social support (Bener et al., 2002), religious and spiritual role (Harandy et al., 2010), living experience with breast cancer (Doumit et al., 2010) have been found but none exploring the factors which influence late presentation or delayed help seeking behaviour among breast cancer patients.

We aimed to evaluate both quantitatively and qualitatively, reasons for diagnostic delay in symptomatic breast cancer patients presenting at Integrated Breast Care Centre (IBCC), All India Institute of Medical Sciences, Rishikesh (India) while also assess the quality and strength of the current evidence related to the factors that may predict delays both by the patients, as well as the primary care physicians.

Materials and Methods

Methodology

We conducted a prospective analytical study at the Integrated Breast Care Centre, All India Institute of Medical Sciences, Rishikesh (India) after obtaining ethical clearance from the Institute's Ethics Committee. Total of 300 patients who visited the Integrated Breast Care Centre during the study period were included based on the pre-specified selection criteria.

Inclusion criteria

1. Females of any age group willing to participate in the study
2. Patients able to respond in person to the study questionnaire

Exclusion criteria

1. Recurrent breast cancer
2. Second primaries

Data was collected with the help of a pre-tested semi structured questionnaire via personal interviews. Information regarding demographic profile, educational status, marital status, occupation, personal history of breast disease, family history of breast cancer, time lag between noticing symptoms and final diagnosis, awareness regarding breast cancer and its source, prevalence and frequency of self-breast examination (SBE), reasons for delaying presentation after noticing symptom, time taken by doctors to give a final diagnosis and tumor characteristics were collected.

The total delay in diagnosis of breast cancer from first symptom onset was defined as diagnostic delay. Presentation delay was defined as the time duration between first symptom and first visit to a health care provider. Provider delay was defined as the time duration between presentation to a health care provider till the final diagnosis was made (Weller et al., 2012).

Data were coded and recorded in Microsoft Excel Spreadsheet program (2007). SPSS v23 (IBM Corp., USA) statistical package was used for data analysis. Descriptive analysis were elaborated in the form of means/standard deviations and medians/IQRs for continuous variables, and frequencies and percentages for categorical variables. Chi-squared test was used for group comparisons for categorical data. In case the expected frequency was in the contigency tables was found to be <5% for more than 25% of the cells, Fisher's exact test was used instead. One-Way ANOVA and Kruskal Wallis test were used to compare three or more groups in case of normally or non-normally distributed continuous variables respectively. Linear correlation between two continuous variables was explored using Pearson's correlation (if data was not normally distributed) and Spearman's correlation (if data was normally distributed). Statistical significance was kept at $p<0.05$.

Results

Sociodemographic characteristics

We collected data about the sociodemographic profile (age, marital status, residence, religion, education, occupation, etc.) of our patients. The economic stratification of patients was done using the modified Kuppuswamy scale (Saleem and Jan, 2021). Our findings are summarized in Table 1.

Clinical characteristics

Painless breast lump was the most common presenting complaint followed by breast pain. However, the nature of breast complaint did not influence diagnostic delay ($\chi^2 = 18.070$, $p = 0.213$). (Table 2)

Tumor characteristics

More than 70% patients presented with locally advanced and advanced breast cancer. 98.6% patients had an invasive breast cancer at the time of presentation. A large number of patients presented at cT4b disease (36.0%). Thirty-four patients (11.3%) had metastatic disease at the time of presentation. T4b stage is associated with skin changes of breast cancer (ulceration, satellite nodules and Peau d'orange appearance) (Kalli et al., 2018). However, we did not find any association between the cT ($\chi^2 = 27.190$, $p = 0.296$) or anatomical tumor stage ($\chi^2 = 17.875$, $p = 0.657$) and delayed presentation.

Delay in diagnosis of breast cancer

Diagnostic delay was more common in women without any formal education (41.7%) compared to those who received some form of education. However, at least 15% patients who were graduate and above also delayed help seeking. Statistical analysis failed to show any association between literacy level and diagnostic delay ($\chi^2 = 9.546$, $p = 0.388$) (Table 3).

Table 1. Sociodemographic Characteristics of the Participants

characteristics	
Age (Mean ± SD) in years	47.82 ± 11.70
Age (Frequency) in %	
20-29 Years	11 (3.7%)
30-39 Years	68 (22.7%)
40-49 Years	94 (31.3%)
50-59 Years	70 (23.3%)
60-69 Years	46 (15.3%)
70-79 Years	10 (3.3%)
80-89 Years	1 (0.3%)
State (Frequency) in %	
Uttar Pradesh	166 (55.3%)
Uttarakhand	130 (43.3%)
Haryana	2 (0.7%)
Delhi	1 (0.3%)
Jharkhand	1 (0.3%)
Locality (Frequency) in %	
Rural	172 (57.3%)
Urban	128 (42.7%)
Religion (Frequency) in %	
Hindu	246 (82.0%)
Muslim	48 (16.0%)
Sikh	6 (2.0%)
Marital Status (Frequency) in %	
Unmarried	5 (1.7%)
Married	266 (88.7%)
Widowed	29 (9.7%)
Education (Frequency) in %	
None	125 (41.7%)
Primary	73 (24.3%)
Secondary	46 (15.3%)
Graduate and above	56 (18.7%)
Occupation (Frequency) in %	
Homemaker	266 (88.7%)
Employed	29 (9.7%)
Retired	5 (1.7%)
Socio-Economic Status (Frequency) in %	
Upper	10 (3.3%)
Upper Middle	74 (24.7%)
Lower Middle	98 (32.7%)
Upper Lower	13 (4.3%)
Lower	105 (35.0%)

Reasons for delay

More than 50% patients sought help late due to an 'apparently' asymptomatic breast lump not associated with any other complaint. At least 20% patients took other form of treatments (Ayurvedic/Homeopathic) before reaching

Table 2. Summary of Symptom at Onset

First Symptom (Frequency) in %	
Painless breast lump	233 (77.7%)
Pain	51 (17.0%)
Nipple Discharge	9 (3.0%)
Breast Asymmetry	5 (1.7%)
Axillary Ulcer	1 (0.3%)
Pruritus/Skin changes	1 (0.3%)

Table 3. Summary of Delay in Diagnosis of Breast Cancer

Delay	Mean ± SD	Median (IQR)
Diagnostic Delay (Months)	9.63 ± 8.62	6.33 (4.96-12.33)
Presentation Delay (Months)	7.98 ± 8.68	5.00 (4.00-8.00)
Provider Delay (Months)	1.64 ± 3.25	0.50 (0.33-1.00)

our centre. Covid-19 imposed lockdown was responsible for the delay in 4.8% patients (Table 4).

Knowledge and practices

Only 39.0% patients had some awareness about signs or symptoms of breast cancer. Family and friends were the most common source of their awareness. Health workers/professionals contributed just 4.3% to breast cancer awareness. Self-breast examination was practiced by only 7% patients. More than 80% patients were not aware of the cause of breast cancer. Others attributed it to a range of causes (Table 5).

Nearly 60% patients reported their complaint to their husbands, followed by daughter, son, daughter-in-law, mother, sister, sister-in-law, mother-in-law, brother, cousin and friend (Table 5).

Table 4. Summary of the Reasons for Delay in Diagnosis of Breast Cancer

Reasons for Delay	
Reasons for Presentation Delay (Frequency) in %	
Asymptomatic breast lump	149 (55.0%)
Took Ayurvedic medicines	37 (13.7%)
Took Homeopathic medicines	30 (11.1%)
COVID-19 lockdown	13 (4.8%)
Lack of family support	11 (4.1%)
Misinformed by unqualified practitioners (‘quacks’)	10 (3.7%)
Fear of diagnosis of cancer	6 (2.2%)
Poor access to health services	6 (2.2%)
Financial issues	4 (1.5%)
Lack of knowledge	3 (1.1%)
Engaged in family activities	1 (0.4%)
Pregnancy	1 (0.4%)
Reasons for Provider Delay (Frequency) in %	
Misdiagnosed by primary physician	47 (65.3%)
Delay in investigations	13 (18.1%)
Delayed referral to higher centre	12 (16.7%)

Association between diagnostic delay and other variables

We did a subgroup analysis of all the variables to identify those which influenced the presentation of breast cancer patients (Table 6). We found that awareness of breast cancer and reasons for presentation delay were significantly associated with diagnostic delay ($p < 0.05$).

There was a significant difference between the

Table 5. Summary of Knowledge and Practices among the Patients

characteristics	
Awareness about breast cancer (Frequency) in %	
Yes	117 (39.0%)
No	183 (61.0%)
Source of Awareness (Frequency) in %	
Family/Friends	78 (66.6%)
TV/Newspaper	26 (22.2%)
Health-Workers/Professionals	13 (11.2%)
Self-Breast Examination (Frequency) in %	
Yes	21 (7.0%)
No	279 (93.0%)
Perceived Causes (Frequency) in %	
Not Aware	250 (83.3%)
Lack of Breastfeeding	9 (3.0%)
Trauma to Breast	8 (2.7%)
Hormonal Factors	6 (2.0%)
Genetic Factors	4 (1.3%)
Lifestyle Changes	4 (1.3%)
Old Age	3 (1.0%)
Tobacco Smoking	3 (1.0%)
Environmental Pollution	2 (0.7%)
Fated	2 (0.7%)
Dietary Factors	1 (0.3%)
Family History	1 (0.3%)
Food Habits	1 (0.3%)
Infection	1 (0.3%)
Medications	1 (0.3%)
Menopause Induced	1 (0.3%)
Oral Contraceptive Pills	1 (0.3%)
Oral Tobacco Use	1 (0.3%)
Post-Hysterectomy	1 (0.3%)
First Reported To (Frequency) in %	
Husband	179 (59.7%)
Daughter	42 (14.0%)
Son	30 (10.0%)
Daughter-in-law	21 (7.0%)
Mother	8 (2.7%)
Sister	8 (2.7%)
Sister-in-law	5 (1.7%)
Mother-in-law	4 (1.3%)
Brother	1 (0.3%)
Cousin	1 (0.3%)
Friend	1 (0.3%)

Table 6. Association between Diagnostic Delay and Other Variables

Parameters	Diagnostic Delay				p- Value
	3-6 Months (n = 133)	6-12 Months (n = 86)	12-24 Months (n = 58)	>24 Months (n = 23)	
I. Sociodemographic characteristics					
Age (Mean ± SD) in years	48.46 ± 11.26	47.19 ± 11.39	46.05 ± 11.40	50.91 ± 15.52	0.312[1]
Age (Frequency) in %					0.198[2]
20-29 Years	3 (27.3%)	3 (27.3%)	3 (27.3%)	2 (18.2%)	
30-39 Years	28 (41.2%)	22 (32.4%)	15 (22.1%)	3 (4.4%)	
40-49 Years	43 (45.7%)	27 (28.7%)	17 (18.1%)	7 (7.4%)	
50-59 Years	33 (47.1%)	19 (27.1%)	15 (21.4%)	3 (4.3%)	
60-69 Years	21 (45.7%)	14 (30.4%)	6 (13.0%)	5 (10.9%)	
70-79 Years	5 (50.0%)	1 (10.0%)	2 (20.0%)	2 (20.0%)	
80-89 Years	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (100.0%)	
State (Frequency) in %					0.828[3]
Uttar Pradesh	74 (44.6%)	49 (29.5%)	32 (19.3%)	11 (6.6%)	
Uttarakhand	56 (43.1%)	37 (28.5%)	26 (20.0%)	11 (8.5%)	
Haryana	1 (50.0%)	0 (0.0%)	0 (0.0%)	1 (50.0%)	
Delhi	1 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Jharkhand	1 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Locality (Frequency) in %					0.685[2]
Rural	73 (42.4%)	54 (31.4%)	32 (18.6%)	13 (7.6%)	
Urban	60 (46.9%)	32 (25.0%)	26 (20.3%)	10 (7.8%)	
Religion (Frequency) in %					0.351[3]
Hindu	109 (44.3%)	66 (26.8%)	49 (19.9%)	22 (8.9%)	
Muslim	21 (43.8%)	19 (39.6%)	7 (14.6%)	1 (2.1%)	
Sikh	3 (50.0%)	1 (16.7%)	2 (33.3%)	0 (0.0%)	
Marital Status (Frequency) in %					0.124[3]
Unmarried	1 (20.0%)	0 (0.0%)	2 (40.0%)	2 (40.0%)	
Married	118 (44.4%)	78 (29.3%)	52 (19.5%)	18 (6.8%)	
Widowed	14 (48.3%)	8 (27.6%)	4 (13.8%)	3 (10.3%)	
Education (Frequency) in %					0.388[2]
None	45 (36.0%)	43 (34.4%)	27 (21.6%)	10 (8.0%)	
Primary	36 (49.3%)	21 (28.8%)	10 (13.7%)	6 (8.2%)	
Secondary	21 (45.7%)	11 (23.9%)	11 (23.9%)	3 (6.5%)	
Graduate and above	31 (55.4%)	11 (19.6%)	10 (17.9%)	4 (7.1%)	
Occupation (Frequency) in %					0.166[3]
Homemaker	117 (44.0%)	77 (28.9%)	54 (20.3%)	18 (6.8%)	
Employed	14 (48.3%)	9 (31.0%)	3 (10.3%)	3 (10.3%)	
Retired	2 (40.0%)	0 (0.0%)	1 (20.0%)	2 (40.0%)	
Socio-Economic Status (Frequency) in %					0.362[2]
Upper	4 (40.0%)	2 (20.0%)	3 (30.0%)	1 (10.0%)	
Upper Middle	36 (48.6%)	17 (23.0%)	16 (21.6%)	5 (6.8%)	
Lower Middle	52 (53.1%)	25 (25.5%)	12 (12.2%)	9 (9.2%)	
Upper Lower	5 (38.5%)	5 (38.5%)	2 (15.4%)	1 (7.7%)	
Lower	36 (34.3%)	37 (35.2%)	25 (23.8%)	7 (6.7%)	
II. Clinical characteristics					
First Symptom (Frequency) in %					0.213[3]
Painless breast lump	97 (41.6%)	72 (30.9%)	44 (18.9%)	20 (8.6%)	
Pain	25 (49.0%)	12 (23.5%)	12 (23.5%)	2 (3.9%)	
Nipple discharge	7 (77.8%)	0 (0.0%)	1 (11.1%)	1 (11.1%)	

Table 6. Continued

Parameters	Diagnostic Delay				p- Value
	3-6 Months (n = 133)	6-12 Months (n = 86)	12-24 Months (n = 58)	>24 Months (n = 23)	
II. Clinical characteristics					
First Symptom (Frequency) in %					0.213[3]
Breast asymmetry	4 (80.0%)	1 (20.0%)	0 (0.0%)	0 (0.0%)	
Axillary ulcer	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	
Pruritus/Skin changes	0 (0.0%)	1 (100.0%)	0 (0.0%)	0 (0.0%)	
III. Tumor characteristics					
Type of Breast Cancer (Frequency) in %					0.360[3]
Ductal carcinoma in-situ (DCIS)	1 (50.0%)	1 (50.0%)	0 (0.0%)	0 (0.0%)	
DCIS with Paget's Disease	0 (0.0%)	1 (50.0%)	0 (0.0%)	1 (50.0%)	
Invasive Carcinoma, NOS	125 (45.1%)	79 (28.5%)	53 (19.1%)	20 (7.2%)	
Invasive Lobular Carcinoma	4 (44.4%)	2 (22.2%)	2 (22.2%)	1 (11.1%)	
Invasive Metaplastic Carcinoma	2 (66.7%)	1 (33.3%)	0 (0.0%)	0 (0.0%)	
Invasive Medullary Carcinoma, NOS	0 (0.0%)	1 (50.0%)	1 (50.0%)	0 (0.0%)	
Invasive Mucinous Carcinoma	1 (50.0%)	1 (50.0%)	0 (0.0%)	0 (0.0%)	
Invasive Adenosquamous Carcinoma	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	
Invasive Apocrine Carcinoma	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	
Invasive Colloid Carcinoma	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (100.0%)	
T Stage (Frequency) in %					0.296[2]
Tis	1 (33.3%)	2 (66.7%)	0 (0.0%)	0 (0.0%)	
T1	5 (83.3%)	0 (0.0%)	1 (16.7%)	0 (0.0%)	
T2	34 (47.9%)	19 (26.8%)	15 (21.1%)	3 (4.2%)	
T3	43 (49.4%)	29 (33.3%)	11 (12.6%)	4 (4.6%)	
T4a	7 (46.7%)	5 (33.3%)	1 (6.7%)	2 (13.3%)	
T4b	40 (37.0%)	28 (25.9%)	27 (25.0%)	13 (12.0%)	
T4c	2 (25.0%)	3 (37.5%)	2 (25.0%)	1 (12.5%)	
T4d	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	
N Stage (Frequency) in %					0.558[2]
N0	42 (50.0%)	22 (26.2%)	13 (15.5%)	7 (8.3%)	
N1	51 (46.8%)	31 (28.4%)	21 (19.3%)	6 (5.5%)	
N2a	22 (37.3%)	20 (33.9%)	11 (18.6%)	6 (10.2%)	
N2b	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	
N3a	8 (34.8%)	5 (21.7%)	8 (34.8%)	2 (8.7%)	
N3b	0 (0.0%)	2 (50.0%)	1 (25.0%)	1 (25.0%)	
N3c	10 (50.0%)	6 (30.0%)	3 (15.0%)	1 (5.0%)	
M Stage (Frequency) in %					0.793[2]
M0	120 (45.1%)	74 (27.8%)	52 (19.5%)	20 (7.5%)	
M1	13 (38.2%)	12 (35.3%)	6 (17.6%)	3 (8.8%)	
Anatomical Stage (Frequency) in %					0.657[2]
Stage 0	1 (33.3%)	2 (66.7%)	0 (0.0%)	0 (0.0%)	
Stage 1	4 (80.0%)	0 (0.0%)	1 (20.0%)	0 (0.0%)	
Stage 2a	16 (48.5%)	7 (21.2%)	8 (24.2%)	2 (6.1%)	
Stage 2b	24 (50.0%)	15 (31.2%)	8 (16.7%)	1 (2.1%)	
Stage 3a	27 (46.6%)	18 (31.0%)	9 (15.5%)	4 (6.9%)	
Stage 3b	36 (40.0%)	25 (27.8%)	17 (18.9%)	12 (13.3%)	
Stage 3c	16 (38.1%)	11 (26.2%)	12 (28.6%)	3 (7.1%)	
Stage 4	9 (42.9%)	8 (38.1%)	3 (14.3%)	1 (4.8%)	

Table 6. Continued

Parameters	Diagnostic Delay				p- Value
	3-6 Months (n = 133)	6-12 Months (n = 86)	12-24 Months (n = 58)	>24 Months (n = 23)	
Stage (Frequency) in %					0.476[2]
Early	44 (50.0%)	24 (27.3%)	17 (19.3%)	3 (3.4%)	
Locally advanced	80 (41.9%)	54 (28.3%)	38 (19.9%)	19 (9.9%)	
Advanced	9 (42.9%)	8 (38.1%)	3 (14.3%)	1 (4.8%)	
IV. Reasons for delay					
Reasons for Presentation Delay*** (Frequency) in %					0.014[2]
Asymptomatic breast lump	80 (53.7%)	41 (27.5%)	19 (12.8%)	9 (6.0%)	
Took Ayurvedic medicines	9 (24.3%)	9 (24.3%)	12 (32.4%)	7 (18.9%)	
Took Homeopathic medicines	6 (20.0%)	11 (36.7%)	9 (30.0%)	4 (13.3%)	
COVID-19 lockdown	7 (53.8%)	5 (38.5%)	1 (7.7%)	0 (0.0%)	
Lack of family support	7 (63.6%)	3 (27.3%)	0 (0.0%)	1 (9.1%)	
Misinformed by unqualified practitioners (‘quacks’)	3 (30.0%)	2 (20.0%)	5 (50.0%)	0 (0.0%)	
Fear of diagnosis of cancer	2 (33.3%)	1 (16.7%)	2 (33.3%)	1 (16.7%)	
Poor access to health services	4 (66.7%)	2 (33.3%)	0 (0.0%)	0 (0.0%)	
Financial issues	0 (0.0%)	2 (50.0%)	2 (50.0%)	0 (0.0%)	
Lack of knowledge	1 (33.3%)	1 (33.3%)	0 (0.0%)	1 (33.3%)	
Engaged in family activities	1 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Pregnancy	1 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Reasons for Provider Delay (Frequency) in %					0.415[3]
Misdiagnosed by primary physician	11 (23.9%)	16 (34.8%)	18 (39.1%)	2 (2.2%)	
Delay in investigations	4 (30.8%)	7 (53.8%)	2 (15.4%)	0 (0.0%)	
Delayed referral to higher centre	3 (25.0%)	7 (58.3%)	2 (16.7%)	0 (0.0%)	
V. Knowledge and practices					
Awareness (Yes)***	59 (50.4%)	26 (22.2%)	19 (16.2%)	13 (11.1%)	0.040[2]
Source of Awareness (Frequency) in %					0.230[2]
Family/Friends	40 (50.6%)	21 (26.6%)	11 (13.9%)	7 (8.9%)	
TV/Newspaper	14 (53.8%)	3 (11.5%)	5 (19.2%)	4 (15.4%)	
Health-Workers/Professionals	5 (38.5%)	3 (23.1%)	3 (23.1%)	2 (15.4%)	
SBE (Present)	14 (66.7%)	3 (14.3%)	3 (14.3%)	1 (4.8%)	0.229[3]
Perceived Causes (Frequency) in %					
Not aware	113 (45.2%)	75 (30.0%)	47 (18.8%)	15 (6.0%)	
Lack of breastfeeding	4 (44.4%)	1 (11.1%)	3 (33.3%)	1 (11.1%)	
Trauma to breast	3 (37.5%)	1 (12.5%)	3 (37.5%)	1 (12.5%)	
Hormonal factors	1 (16.7%)	2 (33.3%)	1 (16.7%)	2 (33.3%)	
Genetic factors	3 (75.0%)	0 (0.0%)	0 (0.0%)	1 (25.0%)	
Lifestyle changes	1 (25.0%)	1 (25.0%)	1 (25.0%)	1 (25.0%)	
Old age	0 (0.0%)	1 (33.3%)	1 (33.3%)	1 (33.3%)	
Tobacco smoking	2 (66.7%)	0 (0.0%)	0 (0.0%)	1 (33.3%)	
Environmental pollution	1 (50.0%)	1 (50.0%)	0 (0.0%)	0 (0.0%)	
Fated	0 (0.0%)	2 (100.0%)	0 (0.0%)	0 (0.0%)	
Dietary factors	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	
Family history	0 (0.0%)	1 (100.0%)	0 (0.0%)	0 (0.0%)	
Food habits	1 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Infection	0 (0.0%)	1 (100.0%)	0 (0.0%)	0 (0.0%)	
Medications	1 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Menopause induced	1 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	

Table 6. Continued

Parameters	Diagnostic Delay				p- Value
	3-6 Months (n = 133)	6-12 Months (n = 86)	12-24 Months (n = 58)	>24 Months (n = 23)	
Perceived Causes (Frequency) in %					
Oral Contraceptive Pills	1 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Oral tobacco use	1 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Post-Hysterectomy	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	
First Reported To (Frequency) in %					0.171[2]
Husband	78 (43.6%)	57 (31.8%)	34 (19.0%)	10 (5.6%)	
Daughter	19 (45.2%)	10 (23.8%)	11 (26.2%)	2 (4.8%)	
Son	16 (53.3%)	9 (30.0%)	2 (6.7%)	3 (10.0%)	
Daughter-in-law	7 (33.3%)	6 (28.6%)	4 (19.0%)	4 (19.0%)	
Mother	2 (25.0%)	1 (12.5%)	3 (37.5%)	2 (25.0%)	
Sister	4 (50.0%)	1 (12.5%)	3 (37.5%)	0 (0.0%)	
Sister-in-law	1 (20.0%)	1 (20.0%)	1 (20.0%)	2 (40.0%)	
Mother-in-law	4 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Brother	1 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Cousin	0 (0.0%)	1 (100.0%)	0 (0.0%)	0 (0.0%)	
Friend	1 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	

***Significant at p<0.05, [1], One-Way ANOVA; [2], Chi-Squared Test; [3], Fisher's Exact Test; [4], Kruskal Wallis Test

various groups in terms of distribution of diagnostic delay (χ^2 = 8.303, p = 0.040). The source of awareness was not significantly associated with the diagnostic delay (χ^2 = 11.709, p = 0.230). The reasons for delay in presentation was also significantly associated with diagnostic delay (χ^2 = 53.320, p = 0.014).

Discussion

Majority of patients in our study who delayed presentation were between 30 – 50 years of age. Three studies done previously concluded that younger women were more likely to have delayed presentation than older women (Facione and Facione, 2006; Li et al., 2012; Friedman et al., 2006). However, we did not find any significant difference between any age group and diagnostic delay (χ^2 = 22.802, p = 0.198).

We witnessed a huge influx of patients from western Uttar Pradesh and Uttarakhand. A detailed analysis of the public health care infrastructure of the draining districts of Uttar Pradesh reveals adequate public health facilities in these regions (NRHM, 2013; Sarwal et al., 2021). Therefore, the delay in diagnosis of breast cancer in patients coming from these regions cannot be attributed to lack of healthcare access. Affordability is also not an issue as majority of the facilities are public funded with highly subsidized services (Banerjee, 2020). Patients from Uttarakhand on the other hand face unique challenges due to geographical barriers imposed by hilly terrain. However, these concerns were not matched by our analysis as geographical location was not found to influence delayed presentation of the patients (χ^2 = 8.625, p = 0.828) (Table 1).

We did not find formal education to influence diagnostic delay of symptomatic patients (χ^2 = 9.546, p = 0.388). In a study from the United States, authors found that at least 66% women with delay were college educated (Facione and Facione, 2006). In another study comparing cancer prevention knowledge and behavior among Blacks and Whites in the United States, authors found education to be a significant predictor of the outcome (Jepson et al., 1991). Similar findings were reported by others in studies done exclusively among the breast cancer patients (Coates et al., 1992; Hunter et al., 1993; Lam et al., 2009; Khakbazan et al, 2014). However, few other studies did not find any association between the education level and delayed diagnosis (Vernon et al., 1985; Mor et al., 1990).

In a study from North America, authors found that religious beliefs could delay the presentation of symptomatic breast cancer patients in women who believe that 'cure is in the hand of God' (Mitchell et al., 2002). A meta-analysis evaluating the effect of religion, spirituality and physical health in cancer patients found that religion and spirituality were associated with better patient reported physical health (Jim et al., 2015). In a study among African American women, authors found an association between delay in diagnosis of breast cancer and disclosing the breast symptoms to God (Gullatte et al., 2010). In another study from North America, authors found that religious beliefs positively influenced presentation time among whites but delayed presentation among African American women (Moorman et al., 2019). We did not find any association between the religion of patients and delay in diagnosis of breast cancer (χ^2 = 6.780, p = 0.351). However, we believe that general religious beliefs and spiritual inclinations more strongly influence patient presentation rather than religion itself.

We did not find any association between socioeconomic

status of the patients and delayed diagnosis of breast cancer (χ^2 = 13.096, p = 0.362). In a study evaluating the effect of ethnicity, socioeconomic status and diagnostic delay on the survival of breast cancer patients, authors concluded that socioeconomic status affects the survival of patients when considered separately but not when all the variables were included (Vernon et al., 1985). However, some other studies found an association between lower family incomes with delayed help-seeking behavior (Jepson et al., 1991; Friedman et al., 2006; Li et al., 2012; Khakbazan et al., 2014).

The nature of breast complaint did not influence the delay in diagnosis of symptomatic patients (χ^2 = 18.070, p = 0.213). However, others reported lump-symptoms as more prompting to seek help rather than non-lump symptoms (O'Mahony et al., 2013; Khakbazan et al., 2014). Patients with painful breast lumps also seek help earlier, as painless symptoms are generally attributed to physiological processes such as pregnancy (Lam et al., 2009; Khakbazan et al., 2014).

Breast lump was the most common symptom in our patients followed by breast pain. Lack of awareness and knowledge about the breast symptoms, and interpretation of the symptoms as harmless and temporary and insufficient to seek care were primarily responsible for the delay in diagnosis among our patients. Our findings are consistent with studies conducted elsewhere (Nosarti et al., 2000; O'Mahony and Hegarty, 2009; Li et al., 2012). In many instances the breast symptoms were reassured by the family members who were first informed by the patient. This is vital concept that needs to be addressed in the awareness campaign and can cause significant improvement in early presentation of breast cancer patients.

Significant delay was caused among our patients due to preference of indigenous medicines for breast cancer treatment (p = 0.014). The sale and availability of any non-evidence-based treatment that claims to 'cure' malignancies should therefore be tightly regulated. The Covid-19 pandemic was also responsible for significant delay of symptomatic patients. Even though most centers continued to offer services to cancer patients, the imposition of curfews, lack of public transport possible could have led to the delay. Nearly 4% patients first visited unqualified practitioners ('quacks'). Most of them revealed that easy access, low consulting costs were the among the main reasons for seeking their advice. Guaranteed treatment and cure offered by these practitioners is another factor that brings patients to them.

A significant proportion of patients were informed that their symptoms were benign and were reassured. Many of these patients were made to undergo a series of investigations before finally referred to a higher dedicated centre. This delay ranged from 2 days to 3 months and was particularly higher in high volume public institutions. This delay calls for better training of primary care physicians to better identify breast related signs and symptoms.

Nearly 40% of our patients had some awareness about breast cancer. The source of awareness, however did not influence the delay in diagnosis (χ^2 = 11.709, p = 0.230). In a study from Malaysia, authors found that public awareness program reduced the proportion of women presenting with stage III and stage IV disease from 77 to 37% (χ^2= 17.0, p < 0.0001) between 1993 and 1998 respectively (Devi et al., 2007). A cross-sectional survey from Ghana evaluated the impact of breast cancer awareness program and concluded that those who attended the program were more likely to perform self-breast examination and have higher knowledge scores. Whether, it improves early breast cancer detection however is not clear (Mena et al., 2014). A randomized control trial involving an educational intervention to improve attitudes, behavioural intentions and early-stage diagnosis concluded that 'fear appeals' led to improvements in attitude (p = 0.01) and intentions (p = 0.001) but no effect was seen in early-stage diagnosis (p = 0.78) (Zonouzy et al., 2018).

Clinical and self-breast examination are well known to facilitate early diagnosis of breast cancer especially when mammographic screening is not available or feasible (Holleb, 1981; Wu and Lee, 2018). Based on these findings, breast self-examination was included in international cancer control programs particularly in the low and middle-income countries (Sullivan et al., 2015). However, self-breast examination was not found to influence the delay in diagnosis of breast cancer among our patients (χ^2 = 4.716, p = 0.229). In a study from Kashmir, India, authors found breast cancer awareness and breast self-examination in 7.35% women. They also concluded that breast cancer awareness was linked to the general education of the women (Malik et al., 2020). As majority of our patients did not have any formal education/ training or exposure about how to practice breast self-examination, the practice itself might have been rendered ineffective. More than 80% of our patients were not aware of the cause of breast cancer. Others attributed it to lack of breastfeeding, breast trauma, hormonal factors and genetic factors. However, patients' perception was not found to influence the delay in presentation breast cancer (χ^2 = 52.206, p = 0.544).

There was no association between the person breast symptoms were reported to by the patient and diagnostic delay χ^2 = 37.214, p = 0.171). Nearly 70% of our patients reported their breast complaints to male members their family (husband/son). This allows us to effectively engage adult males in female breast cancer awareness programs. Easy access and outreach to men in the society can prove especially effective in early presentation of breast cancer patients.

In conclusion, breast cancer is a fast-increasing public health problem with significant burden on health care expenditure. We did a mixed methods study, with a large sample size available for qualitative analysis. We assessed a number of factors ranging from sociodemographic to clinical variables, tumour characteristics and knowledge and practices pertaining to breast cancer. Breast cancer awareness was found to be the most effective method of ensuring early-stage presentation of symptomatic breast cancer patients. We conclude that breast awareness is not synonymous with educational status. More effort must be made to improve awareness of women towards breast

symptoms and early reporting. As more than 70% patients report their complaints to male members of their families, we suggest a gender-neutral approach to breast cancer awareness programs.

Author Contribution Statement

Dr. Ankit Rai and Dr. Bina Ravi conceptualized the study; Dr. Ankit Rai, Dr. Bina Ravi, Dr. Pradeep Aggarwal prepared the study protocol; Dr. Ankit Rai, Dr. Bina Ravi, Dr. Prateek Sharda did the data collection; Dr. Ankit Rai, Dr. Pradeep Aggarwal did the data interpretation and analysis; Dr. Ankit Rai, Dr. Bina Ravi, Dr. Pradeep Aggarwal, Dr. Prateek Sharda prepared the final manuscript.

Acknowledgements

The authors express their sincere thanks to the entire team at the Integrated Breast Care Centre (IBCC) at All India Institute of Medical Sciences, Rishikesh, India for the continuous support throughout the study. We acknowledge the valuable inputs and help of Dr. Satish Chaitanya and Dr. Ananya Deori (MCh Residents, Breast and Endocrine Surgery) at All India Institute of Medical Sciences, Rishikesh, India.

This study was approved by the Research Review Board at All India Institute of Medical Sciences, Rishikesh, India.

Ethical approval

Study was approved by the Institute Ethics Committee (IEC) of All India Institute of Medical Sciences, Rishikesh on 31.12.2019 (AIIMS/IEC/19/1261).

Availability of data

The original data can be provided on request.

Conflict of interest

The authors declare they do not have any conflict of interest.

References

Agarwal G, Pradeep PV, Aggarwal V, Yip C-H, Cheung PSY (2007). Spectrum of breast cancer in Asian women. *World J Surg*, **31**, 1031–40.

Aggarwal V, Agarwal G, Lal P, Krishnani N, Mishra A, et al (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, 2562–9.

Alhurishi S, Lim JNW, Potrata B, West R (2011). Factors influencing late presentation for breast cancer in the middle East: a systematic review. *Asian Pac J Cancer Prev*, **12**, 1597–600.

Arndt V, Stürmer T, Stegmaier C, et al (2002). Patient delay and stage of diagnosis among breast cancer patients in Germany -- a population based study. *Br J Cancer*, **86**, 1034–40.

Austin Z, Sutton J (2014). Qualitative research: Getting Started. *Can J Hosp Pharm*, **67**, 436–40.

Banerjee A (2020). Equity and quality of health-care access: Where Do We Stand and the Way Forward?. *Indian J Community Med*, **45**, 4-7.

Bener A, Honein G, Carter AO, et al (2002). The determinants of breast cancer screening behavior: a focus group study of women in the United Arab Emirates. *Oncol Nurs Forum*, **29**, 91-8.

Birnbaum JK, Duggan C, Anderson BO, Etzioni R (2018). Early detection and treatment strategies for breast cancer in low-income and upper middle-income countries: a modelling study. *Lancet Glob Health*, **6**, 885–93.

Chopra B, Kaur V, Singh K, et al (2014). Age shift: Breast cancer is occurring in younger age groups - Is it true?. *Clin Cancer Investig J*, **3**, 526-9.

Chopra R (2001). The Indian scene. J *Clin Oncol*, **19**, 106-11.

Coates RJ, Bransfield DD, Wesley M, et al (1992). Differences between black and white women with breast cancer in time from symptom recognition to medical consultation. *J Natl Cancer Inst*, **84**, 938–50.

Devi BCR, Tang TS, Corbex M (2007). Reducing by half the percentage of late-stage presentation for breast and cervix cancer over 4 years: a pilot study of clinical downstaging in Sarawak, Malaysia. *Ann Oncol*, **18**, 1172–6.

DeVita VT, Lawrence TS, Rosenberg SA (2019). Cancer: Principles and Practice of Oncology. In 'Malignant Tumors of the Breast', 11th Eds. Wolters Kluwer, Philadelphia pp 2261-4.

Doumit MAA, Huijer HA-S, Kelley JH, El Saghir N, Nassar N (2010). Coping with breast cancer: a phenomenological study. *Cancer Nurs*, **33**, 33-9.

Espina C, McKenzie F, dos-Santos-Silva I (2017). Delayed presentation and diagnosis of breast cancer in African women: a systematic review. *Ann Epidemiol*, **27**, 659-71.

Facione NC, Facione PA (2006). The cognitive structuring of patient delay in breast cancer. *Soc Sci Med*, **63**, 3137–49.

Friedman LC, Kalidas M, Elledge R, et al (2006). Medical and psychosocial predictors of delay in seeking medical consultation for breast symptoms in women in a public sector Setting. *J Behav Med*, **29**, 327–34.

Gullatte MM, Brawley O, Kinney A, Powe B, Mooney K (2010). Religiosity, spirituality, and cancer fatalism beliefs on delay in breast cancer diagnosis in African American women. *J Relig Health*, **49**, 62–72.

Harandy TF, Ghofranipour F, Montazeri A, et al (2010). Muslim breast cancer survivor spirituality: coping strategy or health seeking behavior hindrance?. *Health Care Women Int*, **31**, 88–98.

Holleb AI (1981). Purposes and goals of breast self-examination. *Isr J Med Sci*, **17**, 839–42.

Hunter CP, Redmond CK, Chen VW, et al (1993). Breast cancer: factors associated with stage at diagnosis in black and white women. Black/White Cancer Survival Study Group. *J Natl Cancer Inst*, **85**, 1129–37.

Indian Council of Medical Research (ICMR). Report of Hospital and Population-Based Cancer Registries, National Cancer Registry Program 2012-2016. [Internet]. Bangalore, India; 2016. [cited 2021 Mar 21]. Available from: https://www.ncdirindia.org/CRAB/C_2016/CRAB_2016.pdf.

Jepson C, Kessler LG, Portnoy B, Gibbs T (1991). Black-white differences in cancer prevention knowledge and behavior. *Am J Public Health*, **81**, 501–4.

Jim HSL, Pustejovsky J, Park CL, et al (2015). Religion, spirituality, and physical health in cancer patients: A Meta-Analysis. *Cancer*, **121**, 3760–8.

Jones CE, Maben J, Jack RH, et al (2014). A systematic review of barriers to early presentation and diagnosis with breast cancer among black women. *BMJ Open*, **4**, 004076.

Kailemia PN, Lee EC, Taylor C, Renfrew MJ (2020). Exploring

determinants of, and interventions for, delayed presentation of women with breast symptoms: A systematic review. *Eur J Oncol Nurs*, **44**, 101677.

Kakarala M, Rozek L, Cote M, Liyanage S, Brenner DE (2010). Breast cancer histology and receptor status characterization in Asian Indian and Pakistani women in the U.S. - a SEER analysis. *BMC Cancer*, **10**, 191.

Kalli S, Semine A, Cohen S, et al (2018). American Joint Committee on Cancer's Staging System for Breast Cancer, Eighth Edition: What the Radiologist Needs to Know. *Radiographics*, **7**, 1921-31.

Khakbazan Z, Taghipour A, Roudsari RL, Mohammadi E, Omranipour R (2014). Delayed presentation of self-discovered breast cancer symptoms in Iranian women: a qualitative study. *Asian Pac J Cancer Prev*, **15**, 9427–32.

Khan TM, Leong JPY, Ming LC, Khan AH (2015). Association of knowledge and cultural perceptions of Malaysian women with delay in diagnosis and treatment of breast cancer: a Systematic Review. *Asian Pac J Cancer Prev*, **16**, 5349–57.

Lam WWT, Fielding R, Chan M, Or A (2009). Factors influencing delayed presentation with symptomatic breast cancer in Hong Kong Chinese women. *Hong Kong Med J*, **15**, 4–7.

Lamyian M, Hydarnia A, Ahmadi F, et al (2007). Barriers to and factors facilitating breast cancer screening among Iranian women: a qualitative study. *East Mediterr Health J*, **13**, 1160–9.

Leong SPL, Shen Z-Z, Liu T-J, et al (2010). Is breast cancer the same disease in Asian and Western countries?. *World J Surg*, **34**, 2308–24.

Li WWY, Lam WWT, Wong JHF, et al (2012). Waiting to see the doctor: understanding appraisal and utilization components of consultation delay for new breast symptoms in Chinese women. *Psychooncology*, **21**, 1316–23.

Lim JN, Potrata B, Simonella L, et al (2015). Barriers to early presentation of self-discovered breast cancer in Singapore and Malaysia: a qualitative multicentre study. *BMJ Open*, **5**, 009863.

Malik R, Vera N, Dayal C, et al (2020). Factors associated with breast cancer awareness and breast self-examination in Fiji and Kashmir India – a cross-sectional study. *BMC Cancer*, **20**, 1078.

McCormack V, McKenzie F, Foerster M, et al (2020). Breast cancer survival and survival gap apportionment in sub-Saharan Africa (ABC-DO): a prospective cohort study. *Lancet Glob Health*, **8**, 1203–12.

Mena M, Wiafe-Addai B, Sauvaget C, et al (2014). Evaluation of the impact of a breast cancer awareness program in rural Ghana: A cross-sectional survey. *Int J Cancer*, **134**, 913–24.

Mitchell J, Lannin DR, Mathews HF, Swanson MS (2002). Religious beliefs and breast cancer screening. *J Womens Health (Larchmt)*, **11**, 907–15.

Montazeri A, Ebrahimi M, Mehrdad N, Ansari M, Sajadian A (2003). Delayed presentation in breast cancer: a study in Iranian women. *BMC Womens Health*, **3**, 4.

Moorman PG, Barrett NJ, Wang F, et al (2019). Effect of cultural, folk, and religious beliefs and practices on delays in diagnosis of ovarian cancer in African American women. *J Womens Health (Larchmt)*, **28**, 444-451.

Mor V, Masterson-Allen S, Goldberg R, Guadagnoli E, Wool MS (1990). Pre-diagnostic symptom recognition and help seeking among cancer patients. *J Community Health*, **15**, 253–66.

National Rural Health Mission (NRHM) (2013). Uttar Pradesh Annual Health Report (2012-13). [Internet]. Available from: http://upnrhm.gov.in/assets/site-files/Annual_Health_Report_2012-13_New.pdf.

Ngan TT, Nguyen NTQ, Van Minh H, et al (2020). Effectiveness of clinical breast examination as a 'stand-alone' screening modality: an overview of systematic reviews. *BMC Cancer*, **20**, 1070.

Nosarti C, Crayford T, Roberts JV, et al (2000). Delay in presentation of symptomatic referrals to a breast clinic: patient and system factors. *Br J Cancer*, **82**, 742–8.

O'Mahony M, Hegarty J (2009). Factors influencing women in seeking help from a health care professional on self-discovery of a breast symptom, in an Irish context. *J Clin Nurs*. **18**, 2020–9.

O'Mahony M, McCarthy G, Corcoran P, Hegarty J (2013). Shedding light on women's help-seeking behavior for self-discovered breast symptoms. *Eur J Oncol Nurs*, **17**, 632–9.

Ramirez AJ, Westcombe AM, Burgess CC, et al (1999). Factors predicting delayed presentation of symptomatic breast cancer: a systematic review. *Lancet*, **353**, 1127–31.

Ravdin PM, Cronin KA, Howlader N, et al (2007). The decrease in breast-cancer incidence in 2003 in the United States. *N Engl J Med*, **356**, 1670–4.

Richards MA, Westcombe AM, Love SB, Littlejohns P, Ramirez AJ (1999). Influence of delay on survival in patients with breast cancer: a systematic review. *Lancet*, **353**, 1119–26.

Richards MA, Stockton D, Babb P, Coleman MP (2000). How many deaths have been avoided through improvements in cancer survival?. *BMJ*, **320**, 895–8.

Saleem SM, Jan SS (2021). Modified Kuppuswamy socioeconomic scale updated for the year 2021. *Indian J Forensic Community Med*, **8**, 1-3.

Sarwal R, Kalal S, Iyer V (2021). Best Practices in the Performance of District Hospitals. NITI Aayog. [Internet]. Available from: https://www.niti.gov.in/verticals/health-and-familywelfare.

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.

Sullivan T, Sullivan R, Ginsburg OM, et al (2015). Screening for Cancer: Considerations for Low- and Middle-Income Countries. In 'Cancer: Disease Control Priorities', 3rd Eds. The International Bank for Reconstruction and Development / The World Bank, Washington (DC), pp 211-22.

Sung H, Ferlay J, Siegel RL, et al (2021). Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*, **7**, 209-49.

Vernon SW, Tilley BC, Neale AV, Steinfeldt L (1985). Ethnicity, survival, and delay in seeking treatment for symptoms of breast cancer. *Cancer*, **55**, 1563–71.

Weller D, Vedsted P, Rubin G, et al (2012). The Aarhus statement: improving design and reporting of studies on early cancer diagnosis. *Br J Cancer*, **106**, 1262–7.

World Health Organization (WHO) (2014). WHO position paper on mammography screening? [Internet]. Geneva, Switzerland. [cited 2021 Apr 11]. Available from:http://apps.who.int/iris/bitstream/10665/137339/1/9789241507936_eng.pdf?ua=1.

Writing Group for the Women's Health Initiative Investigators (2002). Risks and Benefits of Estrogen Plus Progestin in Healthy Postmenopausal Women: Principal Results from the Women's Health Initiative Randomized Controlled Trial. *JAMA*, **288**, 321–33.

Wu T-Y, Lee J (2018). Promoting breast cancer awareness and screening practices for early detection in low-resource settings. *Eur J Breast Health*, **15**, 18–25.

Zonouzy VT, Niknami S, Ghofranipour F, Montazeri A (2018). An educational intervention based on the extended parallel

process model to improve attitude, behavioral intention, and early breast cancer diagnosis: a randomized trial. *Int J Womens Health*, **11**, 1–10.