

Does increase in women's empowerment and socio-economic conditions affect uptake of breast cancer screening? Findings from NFHS (5), India

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Research Article

Keywords: Breast cancer screening, clinical breast examination, socio-economic status, women empowerment, National Family Health Survey

Posted Date: May 16th, 2022

DOI: <https://doi.org/10.21203/rs.3.rs-1640562/v1>

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Additional Declarations: No competing interests reported.

Version of Record: A version of this preprint was published at BMC Women's Health on January 7th, 2023. See the published version at <https://doi.org/10.1186/s12905-022-02147-5>.

Abstract

Background: Breast cancer screening results in early recovery, good prognosis and improving the overall survival due to disease. However, proportion of women undergoing breast cancer screening are minimal and their participation get influenced due to low socio-economic and women empowerment status (SES and WES). This study explores the relationship of SES and WES with the breast cancer screening uptakes in the states and union territories of India using demographic health survey.

Methods: We used secondary data based on the National Family Health Survey (NFHS) state level factsheet for this study. SES and WES were considered as independent variables and breast cancer screening uptakes as dependent variable. Dimension indices based composite scores were calculated for this purpose. Spearman's rank correlation coefficient was used to find the association between the SES and WES with breast cancer screening uptake. The determinants of breast cancer screening were obtained using a simple linear regression model using the DI values of each indicator.

Results: We found breast cancer screening gets influenced by the SES and WES. State level indicators shows that spearman's rank correlation coefficient of breast cancer screening is moderately positive with socio-economic (0.336) and women empowerment (0.378) status. The highest screening uptake seen in Tamilnadu and lowest in Chandigarh. Women literacy rate and women having self-operated bank account found the significantly associated with the BC screening.

Conclusion: This study underlines that improving SES and WES may influence the breast cancer screening uptake. However, not all the components of SES and WES considered in the study are equally influential. More research is needed for the states with relatively higher WES and SES, but do not screen adequately.

Background:

The National Cancer Registry Program (NCRP) of India, in 2020 has estimated that one in twenty-nine Indian women will develop cancer in their lifetime. Breast cancer (BC) is the most common cancer in women in India. However, only one-third of breast cancer patients present at an early stage.(1) The World Health Organization (WHO) has recommended cancer screening, early detection and availability of standard referral pathways and treatment for improving survival from Breast cancer. (2)

There is lack of population-based screening programs in India and previous population-based statistics has shown that less than 10% of the Indian women ever undergo breast examination. This leads to several women presenting with advanced stages of breast cancer. (3) The Ministry of Health and Family Welfare (MoHFW) in India launched the 'National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke' in 2010, which included screening for breast cancer. This initiative prioritized health promotion and outreach screening at community level for early diagnosis of breast cervix and oral cavity cancers. Acknowledging the under-implementation of this program, the MoHFW issued operational guidelines for states in 2016, to integrate screening at the community level

within the existing primary healthcare and utilize the services of frontline healthcare workers.(4) Despite these efforts to prioritize breast cancer screening by the MoHFW, the screening uptake among women in India continues to be poor (3).

The socio-cultural and economic factors that work as barriers for uptake of screening in India and other low-middle-income countries (LMICs) are well documented. (5, 6) The literature has documented that low socio-economic status (SES) and women empowerment status (WES) correlates with poor participation in screening activities. (6–9)

India has been described as ‘many countries within a country’ due to its wide variations in SES and disease burden between the various states and union territories (UTs).(10) Health being a state subject in India, each state has its own healthcare scheme and some of the states have their cancer screening Programs with varying degrees of coverage of screening in the population. Analysis of screening coverage across states can allow mapping of areas where additional efforts to improve breast cancer screening need to be concentrated. This study explores the relationship of SES and WES with the uptake of breast cancer screening in various states and UTs of India by using demographic health survey in India called National Family Health Survey.

Methods:

Setting and data source: We considered the prospectively collected secondary data from the NFHS-5 (2019–2020), a periodic survey conducted by the International Institute of Population Sciences (IIPS) and field-based organizations in the Indian states and UTs.(11) It is a multi-staged representative national survey comprising of representative households from the 28 states and 8 UTs in India to provide disaggregated data up to the district levels. It involves use of survey-based questionnaires to collect data from selected sample households from each district in India. This largest survey is conducted by the MoHFW to study various individual and household level data related to health and demographics across the country.

Current fifth round of the survey of approximately 610,000 households were considered and data from women aged 15–49 and men aged 15–54 was included. It is conducted to measure the various indicators related to population, health and nutrition with the objective of providing reliable and comparable datasets on health, family welfare and related issues. The NFHS fact sheet is modelled on the Demographic Health Survey and collects data on indicators including household and population characteristics, socioeconomic conditions, maternal and child health and nutrition parameters, infant and child mortality, adult health with disease screening etc.

Study design & Variables: The NFHS includes a module on cancer screening for cancers of the oral-cavity, breast and cervix. This study considers breast cancer screening as the dependent variable. Clinical breast examination has been the recommended approach for screening and early detection for breast cancer in India by the operational guidelines from The Government of India. Hence, this paper has used ‘percentage of women ever undergoing breast examination’ as a broad marker for screening uptake. State and UT

wise breast cancer screening percentages were taken for women aged 30 to 49 years. We considered the SES and WES, derived from the population, household profile and women empowerment indicators mentioned in the state fact sheets of NFHS 5. Table 1 elaborates the individual indicators used for calculating the SES and WES.

Table 1
Indicators used to calculate the SES and WES

Components of Socio-Economic Status	Components of Women Empowerment Status
Population in the households living with electricity	Women participated in at least 3 household decisions
Population living in households with an improved drinking-water source	Women employed in last 12 months and paid in cash
Population living in households that use an improved sanitation facility	Women owning a house/land alone or with husband
Households using clean fuel for cooking	Women who have a bank/savings account
Women who are literate	Women having self-operated mobile phone
	Women who used hygienic menstrual methods

Table 1: **Indicators used to calculate the SES and WES**

Statistical Methods: We used dimension indices developed by Iyengar and Sudarshan for this study. (12)

Dimension index (DI): DI is a statistical measure used to estimate the development level of a district. We calculated dimension indices for all states and union territories for each indicator by using the percentage for each indicator given in NFHS fact sheets. The value of DI lies between 0 and 1, and greater value indicates good performance whereas value towards 0 indicates poor performance.

DI was calculated as follows:

Dimension Index (DI)

$$= \frac{\text{Actual Value of the indicator for a state} - \text{Minimum value of the indicator across all states/UTs}}{\text{Maximum} - \text{Minimum value of the indicator across all states/UTs}}$$

For e. g. DI for Maharashtra for BC screening is calculated as:

DI_Maharashtra

$$= \frac{\text{BC Screening \% for Maharashtra} - \text{Minimum BC Screening \% across all states and UTs}}{\text{Maximum} - \text{Minimum value of the BC screening across all states and UTs}}$$

BC = Breast Cancer

Composite scores: A composite score for SES and WES is calculated by adding DI values of their respective indicators. Table 1 shows various components of Socioeconomic status and women empowerment status indicators from NFHS 5 fact sheets.

We categorized the weighted composite score

values of SES and WES and DI values of BC screening as low, middle and high level. The categorization was performed using the 33rd and 66th percentile marks in the range of index values. The categories of SES and WES were cross tabulated with breast cancer screening uptake. To estimate the association of BC screening uptake with SES and WES, we correlated Composites scores of SES and WES for each state with DI values of the BC screening. We followed the standard convention published by Dancey C. P and Reidy Pearson for interpretation of Spearman coefficient values and categorized the association as weak moderate and strong (13).

The determinants of breast cancer screening were obtained using a simple linear regression model using the DI values of each component indicators.

The statistical analysis was carried out using SPSS Version 25 (SPSS Inc, Chicago, IL, USA) for Windows, R Studio and Microsoft Excel 2020. P value below five percent was considered as statistically significant.

Data quality and ethics review: The privacy of the data and the confidentiality of the respondents were maintained while conducting the survey. The informed consent was obtained from all the individual respondents before starting the survey. This study is based on the secondary data, the summary indicators of the NFHS-5 survey. It does not come under the purview of an institutional ethical clearance, as no human participants are directly involved by any of the authors. All the analysis and results are presented with an unbiased intent.

Results:

In this study, we found a significant moderate positive correlation of composite SES (correlation coefficient: 0.336, p-value = 0.045) and WES (correlation coefficient:0.378, p-value = 0.023) with breast cancer screening uptake (Table 2).

Table 2
Spearman's Rank Correlation Coefficient with Breast Cancer Screening Uptake

Indicators (Composite scores)	Breast Cancer Screening DI	
	Correlation Coefficient	p-value
Socio-Economic Score	0.336	0.045
Women Empowerment Score	0.378	0.023

Table 2: Spearman's Rank Correlation Coefficient with Breast Cancer Screening Uptake

The current study showed that the states of Tamilnadu, Pondicherry, Kerala, Mizoram and Andaman & Nicobar Islands were the top five ranking states in SES and WES along with high screening uptake. States of Manipur, Meghalaya and Madhya Pradesh demonstrate high breast cancer screening uptake although their SES are low as compared to the other states

Assam, Jharkhand, Odisha, Rajasthan, West Bengal had low SES, WES and low screening uptake. Dadra and Nagar Haveli Diu-Daman, Sikkim and Chandigarh have demonstrated low BC screening uptake despite good SES and WES. Supplementary table 1 provides details of SES, WES scores and screening uptake of all the states and UTs. Supplementary table 2 provides categorization of SES, WES and Screening uptake in low, middle and high categories.

Figure 1 represents the state-wise screening uptake status according to SES and WES in India. The size of the bubble represents the DI values of BC screening uptake in the respective states.

Figure 1: State wise breast cancer screening uptake status in India

Table 3 shows the results of linear regression analysis. None of the SES and WES indicators demonstrated any significant relationship with BC screening uptake, except literacy rate in women and women having self-operated bank accounts. For a 1-unit increase in the index for literacy rate in women, a 0.608 units increase was observed in BC screening uptake. Similarly, for a 1-unit increase in the index of women having a self-operated bank account, a 0.304 increase was seen in BC screening uptake.

Table 3
Determinants of Breast Cancer Screening Uptake by using simple linear regression model

Indicators	Coefficient	95% CI	p-value
Socio-Economics Status Indicators			
Electricity available	-0.148	(-0.478–0.183)	0.369
Improved drinking water source	0.242	(-0.134–0.618)	0.198
Improved sanitation facility	-0.344	(-0.843–0.155)	0.170
Clean fuel for cooking	0.148	(-0.143–0.439)	0.308
Women literacy rate	0.608	(0.11–1.106)	0.018
Women Empowerment Status Indicators			
Participate in at least 3 household decisions	0.289	(-0.044–0.622)	0.087
Employed in last 12 months and paid in cash	0.238	(-0.012–0.489)	0.062
Owning a house/land alone or with husband	-0.063	(-0.313–0.186)	0.608
Having self-operated bank account	0.304	(0.017–0.591)	0.039
Having mobile	0.111	(-0.153–0.375)	0.397
Used hygienic sanitization	0.021	(-0.253–0.296)	0.875

Table 3: Determinants of Breast Cancer Screening Uptake by using simple linear regression model

Discussion:

This paper analyzes and discusses the association of the socioeconomic and women empowerment indices with breast cancer screening uptake in India using NFHS 5 dataset. It finds that though composite SES and WES have mild to moderate correlation with BC screening, individual indicators did not have significant correlation except percentage of literate women in the state and percentage of women having self-operated bank accounts.

Association of SES with Breast cancer screening:

States and UTs like Kerala, Tamilnadu, Puducherry, Goa, Andaman and Nicobar Islands showed high SES with high BC screening uptake. Our findings were supported by other studies within India and other continents documenting higher education and socioeconomic status correlated with higher screening uptake.(3, 9, 14–17) A multinational study from Sub Saharan Africa based on demographic and health survey (DHS), which is similar to the NFHS in India, showed that financial security from health insurance, wealth index of the family and higher education predicted higher breast cancer screening in women. (15). This study elaborated that poor woman prioritized feeding the family, not missing the daily wages and

not spending on preventive health services, leading to poor screening practices. Similarly, they documented that better educated woman may be better informed about healthier lifestyles, cancer risk factors and present themselves for screening. This highlights the need of improving the outreach of education, health related awareness initiatives and financial independence in women. Similarly, losing daily wages for screening and prohibiting costs of treatment if diagnosed with cancer were barriers to screening as shown by a qualitative study from Tamilnadu which underlines the economic condition as a determinant of screening uptake.(16). An epidemiological study with district level analysis in India also demonstrated that literate and employed women with higher income are more likely to undergo BC screening. The authors, Mishra et al also point to prohibitive costs involved in diagnosis and treatment when no insurance cover or universal health coverage is available, as reasons for this association. (3)

Association of WES with Breast cancer screening:

Our study documented that women empowerment status correlated positively with screening uptake in the states and UTs like Kerala Tamilnadu, Mizoram, Puducherry Andaman and Nikobar islands. Women having self-operated bank accounts and higher literacy rates had better participation in breast cancer screening. Higher education and literacy may make the women more aware and also allow them to prioritize their health which in turn can lead to improved health seeking behavior. Having a self-operated bank account points to the financial stability, decision-making ability and overall empowerment in women. Negi et al in their study of inequities in cancer screening point out that women having financial independence were able to make choices regarding their health. (9) A qualitative study from Tamilnadu emphasized that 50% of the women mentioned “ *husbands did not allow them to go for screening*” (16), implying lack of women empowerment leading to poor participation and health seeking in women. A multicenter study from Qatar, a high GDP country, highlighted better screening practices among women whose husbands were wealthier and more educated and aware.(17) This emphasizes that women may not be able to make decisions prioritizing their health on their own/without the support of their husbands. This necessitates that improvement in women empowerment and their participation in decision making is necessary for increasing participation in screening activities.

Low screening uptake in spite of high SES and WES:

The outlier states in our study were Chandigarh, Sikkim, Delhi, Punjab and Telangana, where high SES and WES do not correlate with higher screening coverage. This highlights that improved screening uptake will need more focused efforts than simply women literacy, empowerment and socio-economic development. A systematic review including Indian studies on breast cancer screening showed that women had low cancer awareness irrespective of the SES and education. Breast cancer is asymptomatic in initial stages and there is a lack of perceived need for examination in women. Also reproductive risk factors like late menopause, late first pregnancy, may not be necessarily known to an otherwise educated woman. (14, 16) The study did not deep dive into explanations for this lack of awareness but pointed to a need for addressing socio cultural factors as a gap between education and cancer awareness and health seeking. (14) Embarrassment of revealing body parts to male examiners, Cancer stigma, Fear of

disfigurement, perceived inevitability of death once diagnosed with cancer have been documented as some of the important barriers to screening uptake by Indian studies. (14, 16, 18, 19) The reduced BC screening uptake in the north-eastern state of Sikkim, in spite of high SES may be additionally explained by the poor accessibility to healthcare services due to the difficult hilly terrain and very few centers catering to specialized cancer care in the north-east India.(5) Some of the above-mentioned factors may explain the barriers to screening in spite of high SES and WES.

The state rankings for breast cancer screening uptake:

The states and UTs like Tamilnadu, Kerala, Goa, Maharashtra, Andhra-Pradesh, Mizoram, Meghalaya and UTs Pondicherry, Lakshadweep and Andaman & Nicobar Islands ranked high in BC screening uptake in the NFHS 5. The overall increased screening in these states may be attributable to the initiatives and programs implemented by the respective state health departments. Tamilnadu has a breast and cervical cancer screening Programme funded by the state government since 2011. (20) Kerala has been the first Indian state to formulate a cancer control Programme since 1988. Kerala government has implemented district and village level screening and cancer awareness program with the help of regional cancer centers and non-governmental organizations.(21) Similar state wide initiatives are implemented in Goa Maharashtra and Andhrapradesh may have led to increased screening uptake.(22, 23) This emphasizes local state initiatives and role of public private partnership in establishing cancer control programs for better screening uptake. Mizoram has recorded highest rise in cancer incidence in its Aizawl cancer registry and since then NGOs and state as well as central government has increased focus and efforts for cancer early detection in these areas, which may have led to increased participation of women and increased screening uptake (1)

This study has important limitation. The association of the study variables has been estimated on the basis of the summary data available in the state and UT factsheets and granular individual data on SES and WES are needed to make stronger inferences regarding correlations between SES, WES and BC screening uptake.

Conclusion:

This study underlines that improving SES and WES may influence the breast cancer screening uptake. However, not all the components of SES and WES considered in the study are equally influential. States which are lagging behind can learn from the initiatives of performing states. More research is needed for the states with relatively higher WES and SES, but do not screen adequately. The efforts to investigate the barriers of breast cancer screening and potential reasons towards the underutilization needs to be focused. Further close consideration of social-cultural factors is necessary to develop culturally sensitive and acceptable screening programs with local government bodies.

Abbreviations:

BC
Breast Cancer
SES
Socio-Economic Status
WES
Women Empowerment Status
DI
Dimension Index

Declarations:

Ethics approval: Study uses NFHS-5 data, this survey followed global standards for policy of data, confidentially and anonymous data collection. The informed consent was obtained from all the individual respondents before starting the survey. This study is based on the secondary data, the summary indicators of the NFHS-5 survey. It does not come under the purview of an institutional ethical clearance, as no human participants are directly involved by any of the authors. The study presents the unbiased findings about Breast cancer screening in India.

Consent for publication: Not applicable

Availability of data and materials: The analysis is based on the factsheets of the secondary data of NFHS-5. It is available on

<http://www.rchiips.org/nfhs/index.shtml>https://aqli.epic.uchicago.edu/wp-content/uploads/2021/08/IndiaFactSheet_update.pdf

Competing interests: None

Funding: None

Authors' contributions: All authors have discussed and designed the study. PP and PB did data analysis. PP, AG and BS prepared first draft. All the authors have contributed in manuscript writing and approved the final version of article.

Acknowledgements: Authors are thankful to Dr. Kranti Vora, Dnyaneshwar Kale, Minal Shukla and Bornalli Dutta for their support.

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Figures

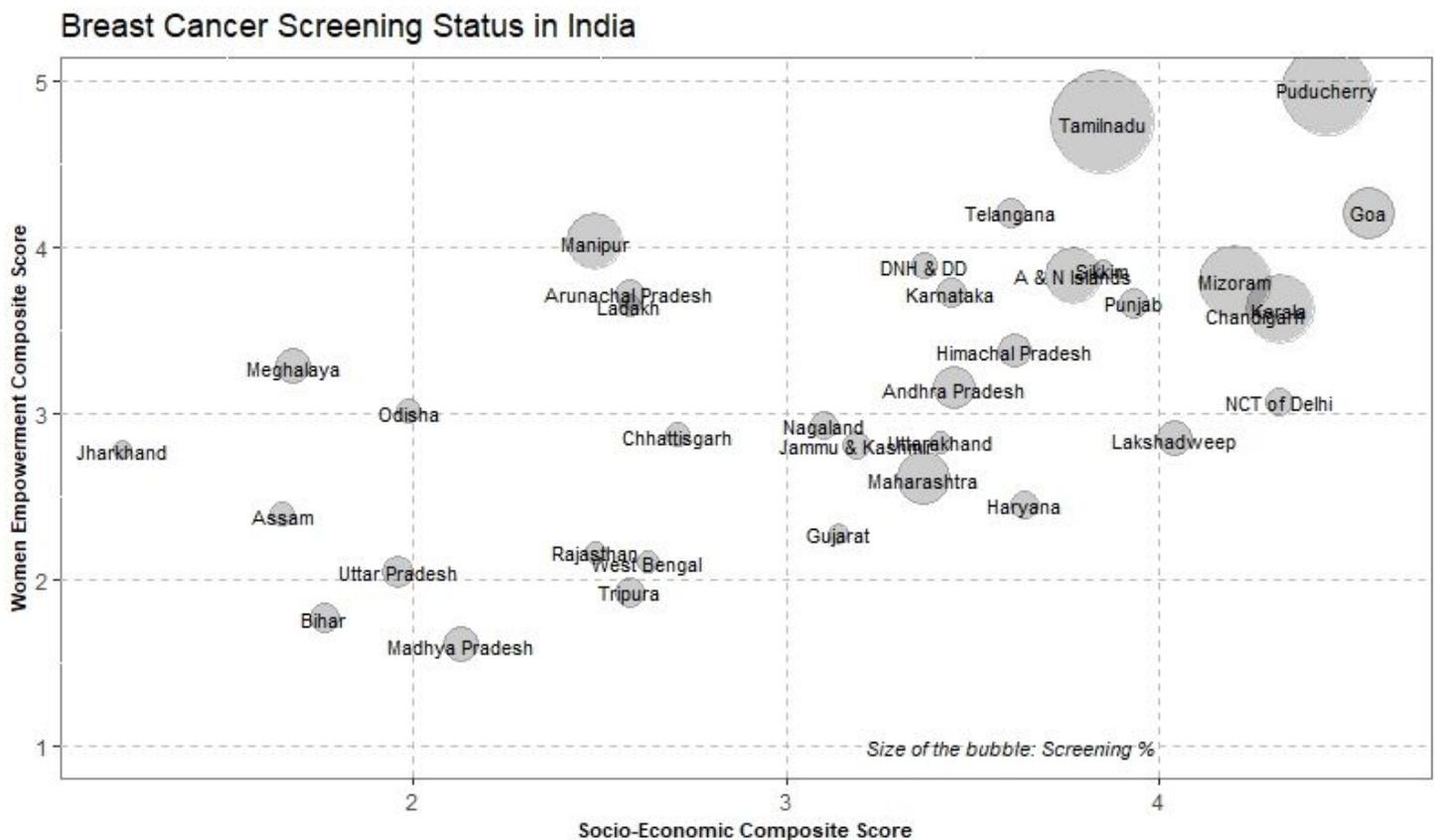


Figure 1

State wise breast cancer screening uptake status in India

Supplementary Files

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