Health Technology Assessment of Strategies for Breast Cancer Screening in India

Health Technology Assessment in India (HTA In)

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POLICY BRIEF

Policy Recommendations

1. Clinical breast examination should be considered for screening breast cancer in India.
2. Screening of women more than 30 years of age using clinical breast examination at an interval of 5 years is the most cost-effective approach.

Summary

- In India, breast cancer is the most common cancer among females in India in terms of incidence and mortality and is often diagnosed at an advanced stage. This health technology assessment study aims to assess the cost-effectiveness of commonly used breast cancer screening strategies.

- A Markov Model approach was undertaken to derive the lifetime costs and health outcomes of various screening strategies namely breast-self-examination (BSE), clinical breast examination (CBE), iBreast Exam (IBE), mammography (MMG), ultrasonography (USG), and at different intervals from a societal perspective using a discount rate of 3%, compared to no-screening in women above 30 years of age in India.

- Screening using IBE at 3 years interval yielded least number of incident cases and averted maximum deaths. However, screening using CBE at 5 years interval yielded least ICER (Incremental Cost - Effectiveness Ratio) among various strategies studied.

- The most cost-effective approach for breast cancer screening in India is clinical breast examination at an interval of 5 years among women more than 30 years of age.

Breast exam

Background

- GLOBOCAN 2022 estimates showed there were an estimated 1,92,020 new cases of breast cancer and estimated 97,146 breast cancer deaths in India (1).
- Most patients with breast cancer present at an advanced stage, requiring expensive and aggressive combined modality treatment .
- This study was designed to evaluate the cost-effectiveness of commonly used breast cancer screening techniques namely, breast self-examination (BSE), clinical breast examination (CBE), iBreast exam (IBE), mammography (MMG) and ultrasonography (USG).

Objectives

1. To assess the cost-effectiveness of commonly used screening modalities for breast cancer. i.e., BSE, CBE, IBE, MMG, and USG.
2. To determine the most cost-effective interval (out of 3, 5, and 10 years) between periodic screening check-ups.

Methods and Approach

Cost-effectiveness analysis (CEA)

- Markov Model following natural history of progression was developed.

- The CEA was conducted using the Markov model technique for estimating the lifetime costs and health outcomes in a hypothetical cohort of 1 lakh men and women above 30 years of age.

- The outcomes were measured in terms of breast cancer incident cases, breast cancer deaths averted, quality-adjusted life-years (QALYs) gained, and incremental cost-effectiveness ratio (ICER).

- Perspective - Societal.

- Discount rate - 3%.

- Probabilistic Sensitivity analysis (PSA) was done to address any parameter uncertainty.

- Threshold analysis was conducted to address any uncertainty related to screening coverage used for the CEA.

- Budget impact analysis (BIA) was conducted to assess the amount (in %) of the budget required for nation-wide implementation of the screening programme.
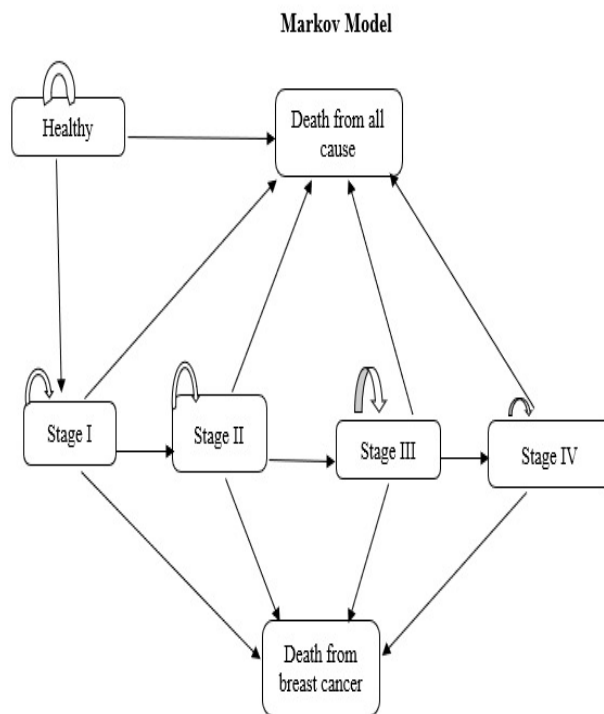
- Software – Microsoft Excel.

Figure 1 Model

Markov Model

Fig 1: Markov model

Results

Cost-effectiveness analysis

- When compared across five screening strategies versus no-screening at three different interval of screening, it was seen that screening with iBE at three years interval yielded the least number of incident cases (893.24 cases) (Table 1)

- When compared across five screening strategies versus no-screening at three different interval of screening, it was seen that iBE at an interval of 3 years (59.57 deaths averted) averted the maximum number of deaths, followed by CBE at 3 years interval (52.84 deaths averted). (Table 1)

- Amongst all screening techniques, CBE at 5 years interval had least ICER (90,889.13INR/QALY), making it the most cost-effective approach. (Table 1)

- PSA showed CBE at 5-year was more than 80% cost-effective at the willingness to pay threshold of India (Figure 2).

- Threshold analysis showed CBE was most cost-effective strategy when the coverage of screening varied from 10% to 80%.

- Budget impact analysis showed that for the first-year implementation of nation-wide clinical breast examination for screening of breast cancer will cost 0.09% of the annual health care budget (2023-2024).

Table 1: Outcome indicator in cost and consequences in a cohort of 100,000 population among various screening scenarios versus no screening

S.No	Screening strategy	Breast cancer incident cases	Breast cancer deaths averted	ICER (INR per QALYs gained
1	No screening	1,225.75	N/A	N/A
2	BSE 3 years	1,040.61	35.32	1,64,114.36
	BSE 5 years	1,109.60	22.35	1,62,035.66
	BSE 10 years	1,162.83	12.31	1,63,345.14
3	CBE 3 years	931.57	52.84	1,03,692.80
	CBE 5 years	1,039.54	33.93	90,889.13
	CBE 10 years	1,124.37	18.92	1,03,813.10
4	IBE 3 years	893.24	59.57	1,66,802.92
	IBE 5 years	1,014.71	44.03	1,66,076.41
	IBE 10 years	1,110.64	21.47	1,63,858.83
5	MMG 3 years	939.29	51.47	1,32,189.85
	MMG 5 years	1,044.53	33.03	1,31,686.25
	MMG 10 years	1,127.12	18.4	1,32,400.65
6	USG 3 years	931.57	52.84	1,43,704.25
	USG 5 years	1,039.54	33.93	1,43,146.39
	USG 10 years	1,124.37	18.92	1,43,929.14

Figure 2 Base-case cost-effectiveness plane
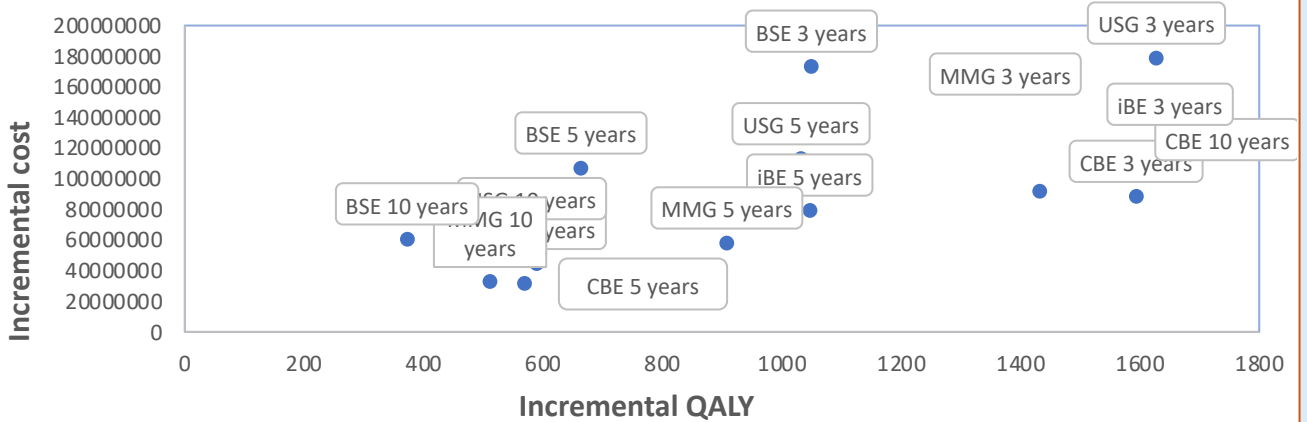
Figure 3: Cost-effectiveness Plane (CE Plane)
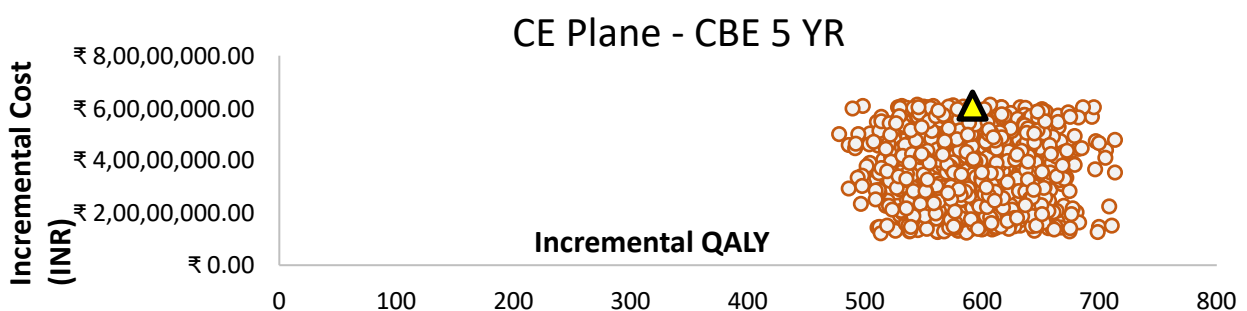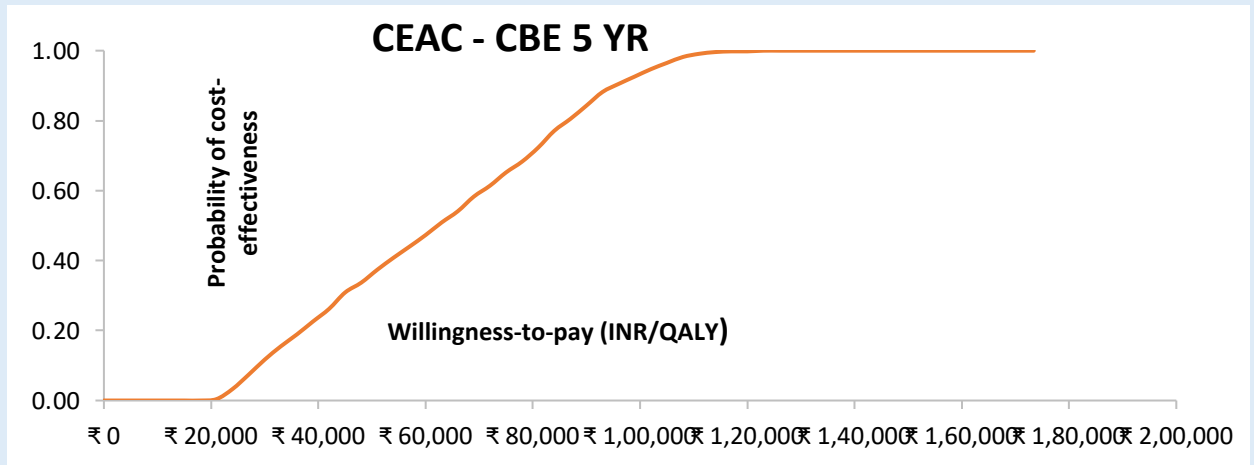
CE Plane - CBE 5 YR

Figure 3 Cost-effectiveness acceptability curve (CEAC)

Conclusion

- Screening at an interval of five years was most cost-effective as compared to three- and ten-year interval across all screening strategies.
- The most cost-effective strategy for breast cancer screening in India among females aged more than 30 years is clinical breast examination at an interval 5 years interval

Reference

1. GLOBOCAN, Cancer Today 2022, International Agency for Research on Cancer. World Health Organization.
https://gco.iarc.fr/today/onlineanalysistable?v=2020&mode=population&mode_population=regions&population=900&populations=900&key=asr&sex=2&cancer=1&type=0&statistic=1&prevalence=0&population_group=0&ages_group%5B%5D=0&ages_group%5B%5D=17&group_cancer=1&include_nmsc=0&include_nmsc_other=1.