

RESEARCH ARTICLE

Editorial Process: Submission:25/02/2026 Acceptance:16/09/2026 Published:28/09/2026

Barriers and Facilitators of Cancer Screening Uptake in Meghalaya and Mizoram States under the National Programme for Prevention and Control of NCDs in India: A Mixed-methods Study

Sutapa Biswas^{1*}, Bobby Paul², Anushka Ghosh¹, Ranajit Mondal³, Maqsood Siddiqi^{1*}

Abstract

Objective: Cancer is a leading cause of both morbidity and mortality in India. In response, the government launched a national screening programme under the National Programme for Prevention and Control of Non-communicable Diseases (NPCDCS/NP-NCD). Despite comprehensive guidelines, screening rates remain very low. We conducted a field study in Meghalaya and Mizoram between 2021 and 2023 to identify barriers and facilitators to cancer screening uptake, involving a diverse group of stakeholders. **Methods:** The mixed-methods study included 420 frontline health workers (FLHWs), 38 government officials, 75 key informants from non-governmental organisations, and 244 community members. We employed purposive and snowball sampling methods to recruit a diverse group of participants for qualitative data collection. For quantitative data collection, we used a stratified random sampling technique. Data collection comprised surveys, in-depth interviews and free-listing in both physical and virtual settings. Quantitative data from FLHWs were statistically analysed, while qualitative data from other stakeholders were reviewed and thematically coded using Anthropic version 4.98.1/X, with graphical visualisation in ATLAS.ti. **Results:** Stakeholders highlighted critical barriers to cancer screening uptake. At the individual level, obstacles include fears of diagnosis. At the community level, lack of cancer awareness and social stigma persist. Healthcare facilities face challenges like infrequent cancer screenings and resource shortages. At the policy level, insufficient financial support and ineffective communication strategies were key issues. Stakeholders recommended innovative awareness campaigns, information sharing through community events and gram sabhas, and engagement of community leaders and NGOs. They also emphasised upgrading infrastructure, enhancing staff training and adding screening facilities in villages. **Conclusion:** The study offers a detailed analysis of barriers and facilitators to cancer screening uptake, as highlighted by a diverse group of stakeholders. Findings suggest that complex, multi-layered challenges require innovative communication strategies and systemic improvements to enhance participation in cancer screening within the NPCDCS/NP-NCD initiatives in Meghalaya and Mizoram.

Keywords: Cancer screening, Mixed-methods study, Multi-layered challenges, NP-NCD, NPCDCS

Asian Pac J Cancer Prev, 27 (9), 3465-3478

Introduction

Cancer is a major public health challenge in India, ranking among the leading causes of morbidity and mortality [1]. In 2022, the country recorded 1,461,427 new cases and 916,827 deaths [2, 3]. In India, one in every nine people is likely to develop cancer at some point in their lifetime, and the burden of cancer incidence is steadily increasing [3]. In response to rising concerns about cancer incidence, the Government of India has launched a national screening programme for individuals aged 30 years and above, utilising visual inspection with

acetic acid (VIA) for cervical cancer, clinical breast examination (CBE) for breast cancer, and oral visual examination (OVE) for oral cancer [4]. This initiative forms part of the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases, and Stroke (NPCDCS) under the National Health Mission (NHM) [4, 5]. Launched in 2010 as part of the 11th Five-Year Plan, the NPCDCS was implemented in 100 districts across 21 states to tackle the rising prevalence of non-communicable diseases (NCDs), including cancer. Under the 12th Five-Year Plan, the NPCDCS was gradually expanded nationwide to cover all districts. In 2023, the

¹Cancer Foundation of India, Kolkata, India. ²All India Institute of Public Health, Kolkata, India. ³Chittaranjan National Cancer Institute, Kolkata, India. *For Correspondence: siddiqi@cficancer.org, sutapabiswas1@gmail.com

NPCDCS was reorganised into the National Programme for Prevention and Control of Non-communicable Diseases (NP-NCD), incorporating health promotion through behaviour change, community awareness, and improved health infrastructure to enable more effective management [6]. As part of the NP-NCD, NCD clinics are established at various levels of the healthcare system, including District Hospitals, to screen, diagnose, and provide referral services for specialised care [4]. These clinics primarily rely on community health workers, known as Accredited Social Health Activists (ASHAs), and other frontline health workers to conduct the cancer screening component of the NP-NCD [4, 6].

Although there have been substantial advances in the programme's operational aspects and in health facilities at district and community health centres for NCD service delivery, the number of cancer screenings conducted in the country remains low. The 5th National Family Health Survey (NFHS), conducted between 2019 and 2021, reported that among women aged 30 to 49, only 1.9% utilised cervical cancer screening, and 0.9% each utilised oral and breast screening services. Additionally, only 1.2% of men aged 30 to 49 accessed oral cancer screening services [7, 8]. These figures indicate notable underperformance in cancer screening programmes.

The importance of effective population-based screening for early cancer detection, its role in reducing cancer mortality, and its potential to improve treatment outcomes cannot be overstated. However, the successful implementation of screening programmes faces numerous challenges related to individuals, sociocultural factors, and policies that hinder people from utilising these services. These include a lack of cancer awareness and knowledge of early signs and symptoms, financial constraints due to treatment costs, and the fear and stigma associated with cancer diagnoses, which significantly impede cancer screening efforts [9-14]. Furthermore, there are growing concerns about insufficient infrastructure and a shortage of trained personnel [15]. Although many cross-sectional studies have explored these issues across various contexts, there remains a need for work that captures the insights of implementers, users, and other stakeholders on specific barriers and facilitators that influence the uptake of cancer screening in the NP-NCD.

The Northeastern states of India have some of the highest cancer incidence rates in the country, yet health care facilities are inadequate. Notably, the East Khasi district in Meghalaya reports high rates of oral cancer, while the Aizawl district in Mizoram shows significant rates of lung, breast, and cervical cancer. Additionally, the Papumpare district in Arunachal Pradesh has a high incidence of cervical cancer [16].

Based on evidence from annual NPCDCS reports indicating low cancer screening uptake across states, this study focuses on the NPCDCS programmes in the Meghalaya and Mizoram provinces of Northeast India [17, 18]. The objectives of this study are twofold: first, to elucidate the role of frontline health workers (FLHWs) and identify barriers to participation in cancer screening; and second, to explore barriers to participation as perceived by a diverse group of stakeholders and to collect their insights

and recommendations for increasing participation in cancer screening programmes. The stakeholders included members of the general public, government officials, and key informants. The study conducted an in-person survey using a pre-tested structured questionnaire and interview guides. The study captures a diverse perspective from individuals across different social strata, identify barriers to cancer screening, and gather recommendations to enhance screening uptake. By adopting a comprehensive mixed-methods approach and including a diverse group of respondents, we aimed to strengthen the robustness and depth of our findings and provide actionable recommendations to address existing challenges and increase uptake of cancer screening services across NCD clinics in the states.

Materials and Methods

Study Design

The study adopted a mixed-methods approach with a convergent parallel design, in which quantitative and qualitative data were collected concurrently, analysed independently, and integrated during interpretation. The quantitative component centred on frontline health workers (FLHWs) and provided essential contextual insights into the landscape of cancer screening practices in Mizoram and Meghalaya.

In parallel, the qualitative component included participants from the general population, government officials, including those responsible for implementing the NPCDCS/NP-NCD, and key informants from non-governmental organisations. This component focused exclusively on qualitative research. Through this qualitative framework, the study seeks to obtain a deeper understanding of the local context, cultural influences, and personal experiences that shape behaviours related to cancer screening.

Study Area

The study was carried out between 2021 and 2023 in two Northeastern states of India: Mizoram and Meghalaya. Due to the unavailability of the Community-Based Assessment Checklist (CBAC), which provides high-risk screening data for non-communicable diseases (NCDs), we utilized NPCDCS annual reports from the past three years to assess district performance based on engagement with cancer screening services. Good-performing districts exhibited higher footfalls at NCD clinics, indicating greater participation in screening, while poor-performing areas reported minimal or no footfalls, suggesting lower participation. Districts in Mizoram and Meghalaya were initially stratified into good-performing and poor-performing groups according to district-wise footfalls at NCD clinics. Within each selected district, villages were further stratified using the same criteria. Participants were then selected from each stratum through a random sampling technique.

In Mizoram, data collection covered eight districts, and in Meghalaya, six districts, as shown in Figure 1. For a free-listing-based assessment, districts and villages were randomly selected from the previously selected areas,

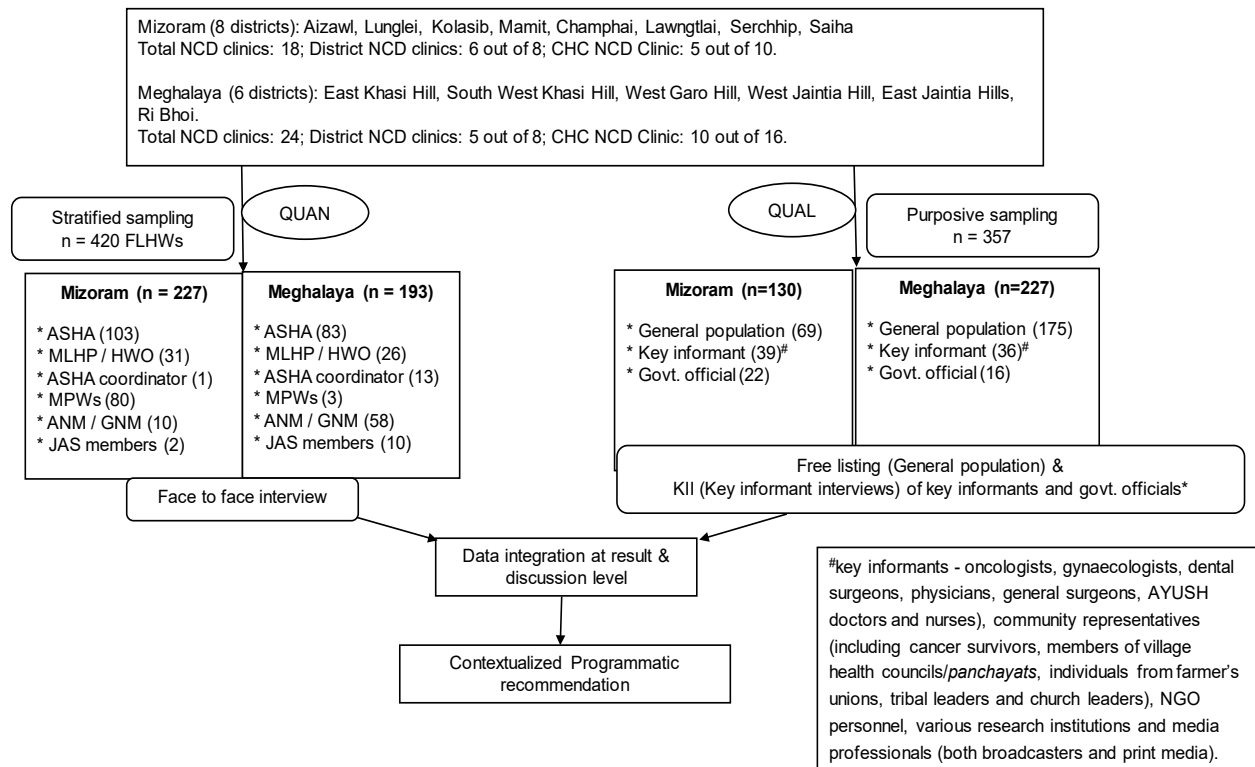


Figure 1. Procedural Diagram Depicting a Convergent Parallel Mixed-Methods Study Design

taking into account logistical and operational feasibility and ensuring representation of rural, urban, and remote/tribal areas. In Mizoram, three districts were chosen: Kolasib (5 villages), Mamit (2 villages) and Saiha (1 village). In Meghalaya, five districts were chosen: West Jaintia Hills (6 villages), East Khasi Hills (12 villages), South West Khasi Hills (3 villages), East Jaintia Hills (1 village), and Ri Bhoi (3 villages).

Study population

Frontline Health Workers (FLHWs): The study involved FLHWs, both male and female, employed in NCD clinics during the study period. This included the categories of FLHWs shown in Figure 1, namely Accredited Social Health Activists (ASHAs), Mid-Level Health Providers (MLHPs), Health and Wellness Officers (HWOs), Auxiliary Nurse Midwives (ANMs), Community Health Officers (CHOs), Multi-Purpose Workers (MPWs) and Jan Arogya Samiti (JAS) members. These individuals serve as vital conduits for delivering essential healthcare services and health education directly to communities. The diverse representation of FLHWs enhances the reliability of the findings, as these workers play a crucial role in delivering healthcare services and providing health education to communities. Adequate training for FLHWs is provided in accordance with the guidelines [5].

General population

The study population consisted of individuals (both males and females), aged 30 to 65, who could benefit from cancer screenings. Participants were recruited from urban, rural, and remote/tribal areas to capture

diverse insights into cancer screening across various age groups and locations, thereby ensuring a comprehensive understanding of the factors influencing screening uptake.

Government officials

The study included government officials from various levels of the NPCDCS/NP-NCD. In Mizoram, the respondents were District Nursing Officers, besides those associated with NPCDCS, which included positions such as Sub-Divisional Extension Officer (SDEO), Senior Program Manager (SPM), State Program Officer (SPO), State Program Coordinator (SPC), and State Level Field Coordinator (SLFC), Medical Officers from NCD clinics, District Program Coordinators (DPCs), District Program Officer (DPO) and a State Consultant from the National Tobacco Control Programme.

In Meghalaya, the respondents were Medical Officers from Community Health Centres, Medical Officers from four District Hospitals, and those associated with the NPCDCS, such as District Nursing Officer, Senior Field Level Coordinator (SFLC), Senior Program Manager (SPM), and epidemiologist.

Key informants

The key informants comprised a diverse group of professionals, community representatives, and healthcare providers (see Figure 1). In Mizoram, the key informants included health NGOs, cancer survivors, doctors, religious leaders, nurses, members of educational institutions, community leaders, and media personnel. In Meghalaya, the key informants included members of NGOs, cancer survivors, doctors, religious leaders, nurses, members of educational institutions, community leaders, and media

persons.

Sample size and sampling technique

A total of 420 FLHWs participated in the study as shown with details in Figure 1. Participants were selected using proportionate stratified random sampling, and only individuals who provided voluntary consent were included in the study. The representation underscores the diverse contributions of health workers involved in the study.

The free listing included a total of 244 individuals representing the general population, and Key informant interviews were conducted with 75 key informants and 38 government officials, as per the details provided for both states in Figure 1. The study began with purposive sampling to recruit a diverse group of respondents. This initial method was further refined through snowball sampling, which utilised the networks of the initial participants to identify additional contributors.

The inclusion criterion for identifying stakeholders was that individuals must have been involved in or contributed to cancer screening activities and possessed relevant knowledge of cancer screening practices in their respective areas. Individuals who did not provide informed consent to participate were excluded from the study. This approach ensured a representative, thorough sample of stakeholders from diverse demographic and professional backgrounds.

Data Collection

Semi-structured questionnaires were developed and translated into local languages to facilitate data collection. These questionnaires underwent rigorous forward and backward translation into Mizo, Khasi, and Garo to ensure both linguistic and conceptual equivalence. A panel of seven experts, comprising subject-matter specialists and linguistic professionals, reviewed the questionnaires to establish content validity, ensuring that all relevant domains of cancer screening were comprehensively captured. A content validity index of 0.85, representing 85% agreement among experts, was deemed acceptable for this study. The questionnaires were then pilot tested in a population similar to, but not included in, the final study sample to evaluate item clarity and contextual relevance. After minor revisions, the finalised questionnaires were administered to participants through direct interviews, with trained project staff in each state overseeing data collection.

Resource persons from both the states received training to help gather qualitative data which was conducted in two phases, utilising both Key informant interviews ((KIIs) and free-listing methods. KIIs were conducted with key informants from government officials, non-governmental organisations, in both physical and virtual formats using pre-tested semi-structured interview guides, and free-listing data was collected by administering pre-tested questionnaires during the direct interviews with general population representatives. The interviews (FGDs and KIIs) were digitally audio-recorded with participants' informed consent and supplemented with field notes. All questionnaires and interview guides in English, along

with their translations into Mizo, Khasi, and Garo, were approved by the relevant authorities of the respective state health departments prior to data collection.

Operational Definition

This study primarily focused on identifying the barriers and facilitators of cancer screening in the north-eastern states of India. Factors that impede individuals from seeking appropriate healthcare such as timely screening, diagnosis, initiation of treatment, and adherence to cancer care, were classified as barriers. These were further categorized into patient-, community-, facility-, and policy-level barriers. Conversely, factors that promote or enable timely uptake of breast cancer screening, diagnosis, treatment, and adherence were identified as facilitators.

Data Analysis

Quantitative data from the questionnaires were coded in MS Excel, and a coding sheet was prepared for analysis in SPSS version 21.0 [19]. Descriptive statistics, including frequencies and percentages, were used to assess the socio-demographic characteristics and work responsibilities of FLHWs. The qualitative interview data were translated into English by language experts. After reviewing and refining the raw data, thematic coding was used in MS Excel, with categories assigned and justifications provided. The Excel file was then converted to text for import into a statistical tool. Frequency, average rank, and Smith salience scores were calculated to interpret the findings. Data triangulation was accomplished by integrating quantitative and data from multiple stakeholder groups. Each dataset was analysed separately using appropriate methods: free-listing for data from the general population and thematic analysis for data from government officials and key informants. The findings were subsequently compared and synthesised across stakeholder groups to identify common themes related to barriers and facilitators of cancer screening. Qualitative data analysis was performed using MS Excel and Anthropic 4.98.1/X software [20]. Graphical visualizations of the qualitative data were generated with ATLAS.ti (version 22) [21].

Results

Barriers to cancer screening uptake identified by FLHWs

Work profiles of FLHWs: According to the survey of ASHA workers, 85% in Mizoram and 89.1% in Meghalaya have been in their roles for over two years. In Mizoram, the majority of workers (79.6%) work 2-4 days a week, while in Meghalaya, 65.1% work more than 4 days a week. Interestingly, 31.7% of ASHA workers in Mizoram reported not participating in cancer screening, and only 8.4% conducted screenings for fewer than two days a week. In comparison, the majority of ASHA workers in Meghalaya also screened for fewer than two days per week. Furthermore, 85.4% of ASHA workers in Mizoram received training in community-based non-communicable disease (NCD) screening, whereas this was true for only 60.3% in Meghalaya.

Challenges in Conducting Cancer Screenings

Table 1 shows that awareness of cervical cancer prevention among frontline health workers (FLHWs) was 74.9% in Mizoram and 63.7% in Meghalaya. Knowledge of breast and oral cancer prevention was higher, but self-screening rates were low, at 27.8% in Mizoram and 24.3% in Meghalaya. At the facility level, only 57.7% of FLHWs in Mizoram and 60.6% in Meghalaya reported that cancer screening was available at their health centres. As shown in Table 1, only 27.8% of health centres in Mizoram and 40.4% in Meghalaya organised outreach camps for cancer screening. Additionally, in Meghalaya, 24.9% of respondents reported that screening centres were located far from their communities, whereas in Mizoram, only 6.2% reported the same issue. Moreover, 36.5% of respondents in Mizoram and 45.1% in Meghalaya observed a lack of essential equipment and consumables necessary for cancer screening at health centres.

According to FLHWs, individuals avoid cancer screening for a range of reasons. In Mizoram, 60.8% and in Meghalaya, 38.9% identified fear of a cancer diagnosis as the primary concern. Additionally, 48.0% of respondents in Mizoram and 52.3% in Meghalaya believe screening is unnecessary in the absence of symptoms. Financial concerns were cited by 30.8% in Mizoram and 21.8% in Meghalaya, while time constraints were mentioned by 14.9% and 18.1% of respondents, respectively. Lack of awareness about cancer screening programmes remains a significant barrier, with 12.3% in Mizoram and 20.2% in Meghalaya unaware of available services. Less commonly mentioned issues include cancer-related stigma, inadequate family support, transportation difficulties, and fear of premature death from cancer.

Barriers and facilitators as identified by the general population

A free-listing analysis was conducted among the general population aged 30-65 years, of whom approximately 72.5% in Mizoram and 68.6% in Meghalaya were female; the remainder were male in both states.

Barriers identified

In Mizoram (Table 2a), financial constraints were a significant barrier to accessing cancer screening, with 97.1% of respondents (S value = 0.756) citing concerns about treatment costs. Moreover, 79.7% (S value = 0.501) reported low health awareness, while 46.4% (S value = 0.297) reported insufficient knowledge of cancer and its symptoms. Geographic barriers were also notable, with 37.7% (S value = 0.229) indicating that distance to screening centres was a challenge. Additionally, 34.8% (S value = 0.171) believed they were asymptomatic, and 26.1% (S value = 0.134) expressed fear of a potential diagnosis, both of which hindered uptake of screening services.

In Meghalaya (see Table 2b), financial constraints were the main obstacle to seeking screening, affecting 51.4% of respondents (Saliency value = 0.348). Additionally, 34.3% cited a lack of awareness regarding treatment options (S value = 0.267), and 31.4% reported fear of cancer (S value = 0.211). Other barriers included apathy

Table 1. Barriers to Cancer Screening Uptake as Identified by FLHWs

Identified barriers	Mizoram n=227 n (%)	Meghalaya n=193 n (%)
Individual-level barriers		
Knowledge about cancer screening#		
Cervical	170 (74.9)	123 (63.7)
Breast	213 (93.8)	175 (90.7)
Oral	220 (96.9)	184 (95.3)
Self-screening of cancer	63 (27.8)	47 (24.3)
Organisational and Facility-level barriers		
Cancer screening in health centres		
Yes	131 (57.7)	117 (60.6)
No	89 (39.2)	70 (36.3)
Don't know	7 (3.1)	6 (3.1)
Frequency of screening in health centre		
Less than 2 days	56 (42.7)	66 (56.4)
2-4 days	0 (0)	2 (1.7)
More than 4 days	75 (57.3)	49 (41.9)
Holding outreach camps for screening		
Yes	63 (27.8)	78 (40.4)
No	136 (59.9)	98 (50.8)
Don't know	28 (12.3)	17 (8.8)
Distance of screening centres from the community		
Distant	14 (6.2)	48 (24.9)
Nearby	199 (87.7)	136 (70.5)
Don't know	14 (6.2)	9 (4.7)
Availability of screening equipment and consumables		
Yes	130 (57.3)	87 (45.1)
No	83 (36.5)	95 (49.2)
Don't know	14 (6.2)	11 (5.7)
Community-related Barriers#		
Fear of getting detected of cancer	138 (60.8)	75 (38.9)
Asymptomatic, no need of screening	109 (48.0)	101 (52.3)
Fear of high cost of treatment	70 (30.8)	42 (21.8)
Fear of death due to cancer	35 (15.4)	29 (15.0)
Lack of time	34 (14.9)	35 (18.1)
Not aware of cancer screening	28 (12.3)	39 (20.2)
Social Stigma	28 (12.3)	20 (10.4)
Lack of transportation	21 (9.2)	22 (11.4)
Lack of family support	14 (6.2)	15 (7.8)

#multiple response based

towards health (30.9%, S value = 0.193), reluctance to learn about their health status (30.9%, S value = 0.180), limited understanding of cancer symptoms (18.3%, S value = 0.135), and fear of possible diagnoses (19.4%, S value = 0.129).

Proposed Facilitators

In Mizoram (Table 3a), the most frequently

Table 2. Barriers of Cancer Screening Uptake as Identified by General Population

a. Mizoram (free listing analysis)

Sl no.	Identified barriers	Frequency (%)	Average Rank	Salience
1	Financial constraints and/or fear of treatment cost	97.1	1.97	0.756
2	Negligence of health/cancer screening	79.7	2.69	0.501
3	Lack of knowledge about the disease and symptoms	46.4	2.63	0.297
4	Far to reach screening centres	37.7	2.81	0.229
5	Asymptomatic, no need for screening	34.8	3.38	0.171
6	Fear of getting detected of cancer	26.1	3.33	0.134

b. Meghalaya (free listing analysis)

Sl no.	Identified barriers	Frequency (%)	Average Rank	Salience
1	Financial constraints and/or fear of treatment cost	51.4	2.37	0.348
2	No knowledge for treatment and screening	34.3	1.95	0.267
3	Fear of getting detected of cancer	31.4	2.35	0.211
4	Unwillingness to know health status/cancer	30.9	2.59	0.18
5	Negligence of health/cancer screening	30.9	2.54	0.193
6	Lack of knowledge about the disease and symptoms	18.3	2.06	0.135

recommended strategy to increase screening uptake was establishing additional screening facilities, particularly in villages and nearby areas (49.3%, S value = 0.348). This was closely followed by initiatives to raise awareness of screening and encourage open discussions about cancer (43.5%, S value = 0.313). Other suggestions included conducting more awareness campaigns (34.8%, S value = 0.295), disseminating information through printed media (40.6%, S value = 0.192), and providing health and cancer education (23.2%, S value = 0.157). Additional recommendations included upgrading infrastructure and enhancing staff training (23.2%, S value = 0.142) and increasing government proactivity (26.1%, S value = 0.144) to address knowledge gaps and improve administrative support.

In Meghalaya (Table 3b), the primary recommendation was to increase cancer awareness campaigns, supported

by 69.1% of respondents (S value = 0.590). Other important suggestions included providing counselling to encourage participation (29.1%, S value = 0.188) and offering free screening and treatment (21.7%, S value = 0.125). Additionally, enhancing health communication in schools, hospitals, and at community events or gram sabhas (18.3%, S value = 0.109) and integrating health and cancer education into school and community programmes (14.9%, S value = 0.106) were recommended.

Barriers and facilitators as perceived by government officials

In-depth interviews with government officials revealed significant insights into barriers to cancer screening, illustrated by a word cloud (Figure 2). The primary challenge is the rural-urban divide. The term “rural” is particularly significant, highlighting the considerable

Table 3. Top Five Facilitators of Cancer Screening Uptake as Identified by General Population

a. Mizoram (free listing analysis)

Sl no.	Identified facilitators	Frequency (%)	Average Rank	Salience
1	Establish more screening facilities (spcl. in villages, near locality)	49.3	2.29	0.348
2	Promoting screening awareness and open up about cancers	43.5	2.3	0.313
3	Conducting more awareness campaigns	34.8	1.71	0.295
4	Dissemination of screening information through printed media	40.6	3.39	0.192
5	Teaching about health and cancer	23.2	2.5	0.157

b. Meghalaya (free listing analysis)

Sl no.	Identified facilitators	Frequency (%)	Average Rank	Salience
1	Conducting more awareness campaigns	69.1	1.51	0.59
2	Provide counselling to step forward	29.1	2.35	0.188
3	Provide free cancer screening and treatment	21.7	2.61	0.125
4	Health communication in school/hospital/gram sabha/gathering	18.3	2.44	0.109
5	Proactiveness from government	15.4	2.93	0.08

Table 4. Reported Barriers of Cancer Screening Uptake by Quantitative and Qualitative Data Triangulation

Domain	Quantitative Findings (FLHWS)	Qualitative Findings (Government Stakeholders)	Qualitative Findings (Community Influencers)	Qualitative Findings(beneficiaries)	Interpretation
Individual-level barriers	Low self-screening among HCWs (nearly 28% screened once); community reluctance due to fear of diagnosis, perceived lack of need when asymptomatic, and treatment cost concerns	Lack of knowledge about cancer screening; fear of cancer; low prioritisation of preventive health; lack of trust in modern medicine; perceived financial burden	Lack of awareness; poor health-seeking behaviour; fear of diagnosis; financial burden associated with detection	Self-neglect; fear of diagnosis; financial constraints for treatment; reluctance to engage with screening	Strong convergence across all groups indicates that fear, low awareness, and economic concerns are central determinants of screening uptake. Preventive health behaviour remains weakly internalised.
Community-level barriers	Low community participation in outreach camps (21–30% attendance); resistance despite ASHA mobilisation efforts; community fears (e.g., fear of contracting cancer during screening); low uptake despite availability	Cancer-related stigma; rural inequities; economic hardship; traditional health beliefs limiting uptake; Lack of trust in modern medicine; low preventive measures	Lack of awareness efforts; weak community engagement; socio-cultural barriers influencing health behaviour; reluctance to engage with formal health systems	Stigma; low awareness, especially among youth	Convergence highlights that community engagement is insufficient, with stigma, low awareness, and socio-cultural norms limiting participation. Outreach efforts alone are inadequate without behavioural change strategies. Complementarity shows that behavioural resistance is linked not only to awareness gaps but also to trust deficits in the health system.
Facility-level barriers	Equipment deficits (36% Mizoram, 50% Meghalaya); inadequate staffing (30%); limited outreach camps	Shortage of human resources; inadequate infrastructure and facility-level resources in NCD clinics	Resource constraints and limited service delivery capacity	Poor screening resources, especially in rural NCD clinics; access challenges to screening centres	Strong agreement indicates systemic capacity constraints in service delivery. Infrastructure and workforce gaps directly limit screening availability and outreach effectiveness.
Policy-level barriers	Need for training in cancer communication; poor implementation of outreach camps (not conducted as per NPCDCS norms); limited utilisation even when conducted	Lack of equitable healthcare delivery; absence of structured health communication strategy; inappropriate resource allocation; inequitable implementation and weak governance structures	Lack of structured awareness efforts; absence of consistent communication strategies; lack of consistent engagement mechanisms at community level	Difficulty accessing screening centres	Convergent evidence suggests that policy and governance gaps—particularly in communication strategy, training, and equitable resource allocation—drive downstream barriers at facility and community levels. A clear implementation gap is observed where programme design does not translate effectively into practice at the ground level.

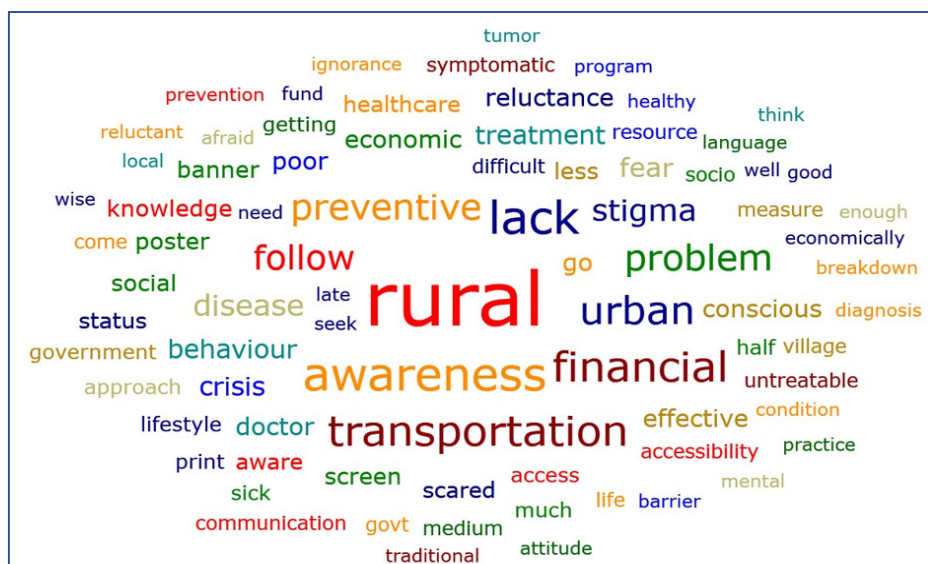


Figure 2. Word Cloud Illustrating Key Words Related to Barriers to Cancer Screening Uptake as Identified by Government Officials

difficulties individuals in these areas face when trying to access cancer screening services. This underscores the need for targeted interventions to close this gap. Financial constraints also play a crucial role, as indicated by frequent references to “financial” and “economic” challenges. Additionally, transportation issues create barriers to accessing screening centres, particularly in remote areas. The terms “awareness” and “transportation” were often mentioned. Moreover, the concepts of “stigma” and “fear” reflect social taboos.

Figure 3 presents a qualitative analysis of the relationships between category codes and thematic barriers identified through interviews with government officials.

The information is structured in a hierarchical network that visually links specific coded items to aggregated theme-level constructs.

Policy-level barriers emerged as particularly significant, greatly influencing subsequent challenges. A central issue was the lack of an equitable approach to healthcare delivery. Furthermore, ineffective health communication strategies and inadequate resource allocation obstructed the successful dissemination of critical information. At the facility level, healthcare centres exhibit considerable deficiencies. Inadequate resource allocation has led to a shortage of specialised personnel essential to non-communicable disease (NCD)

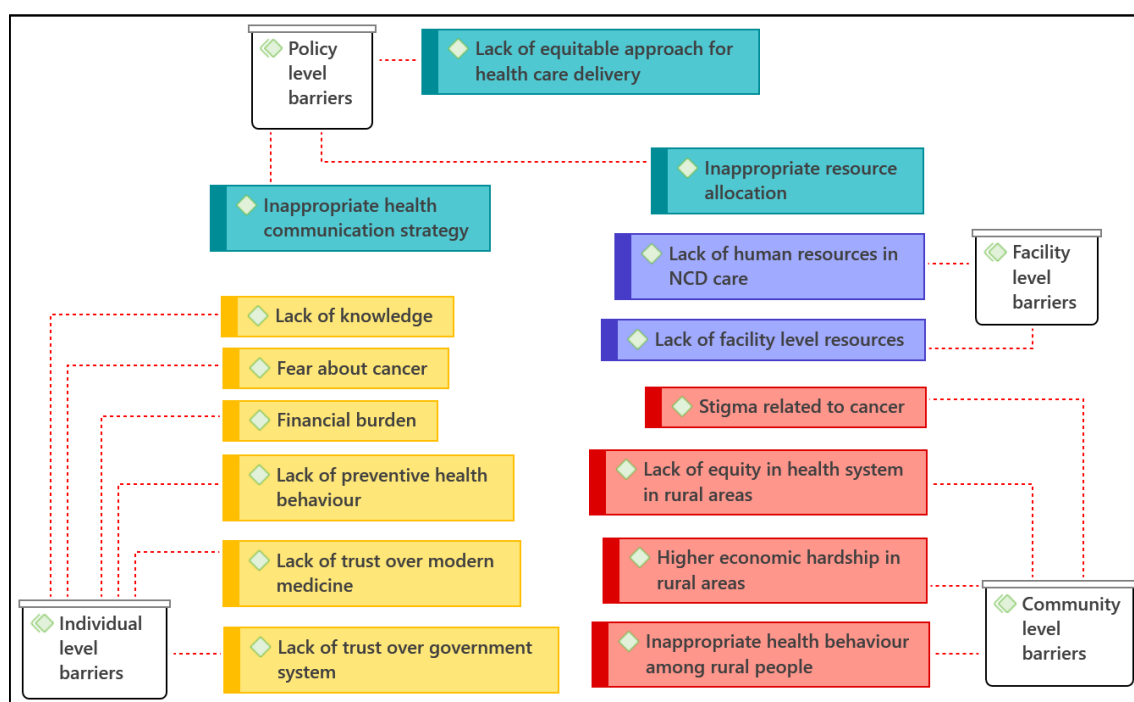


Figure 3. Relationship between Category Codes and Themes of Barriers Emerging from Interviews with Government Officials

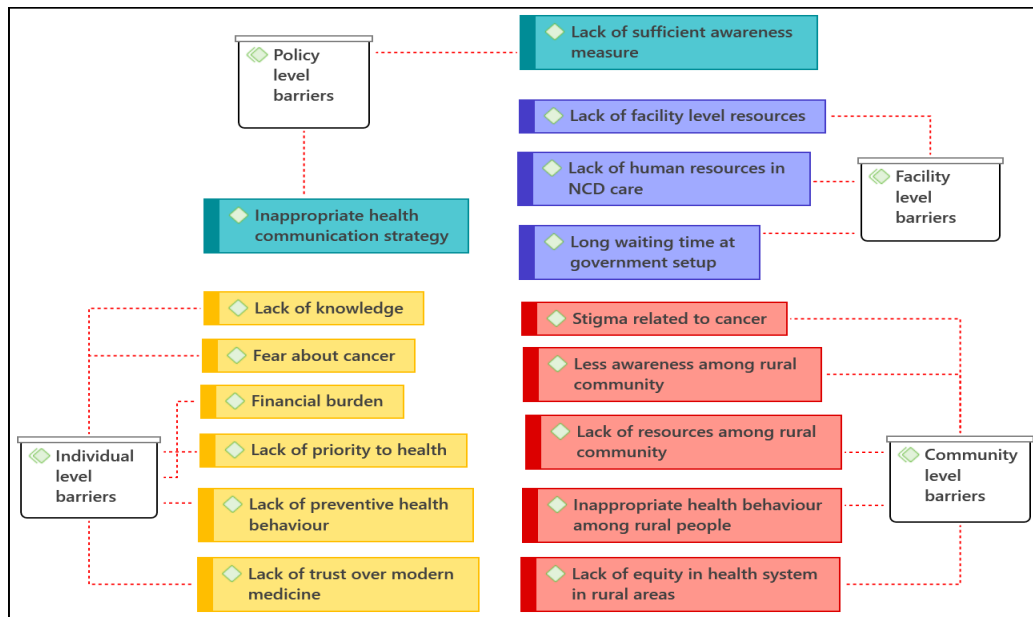


Figure 4. Relationship between Category Codes and Themes of Barriers Identified in Interviews with Key Community Influencers

Table 5. Suggested Facilitators of Cancer Screening Uptake by Data Triangulation from General Population and Key Informants

Themes	Subthemes
Better access to screening facilities	Establishing more screening facilities
	Camp based screening
	Home based screening
Improved health communication and awareness generation	Reduction of misinformation
	Outreach programme
	Health communication in local language
	Communication through social media
	Being respectful to the community
	Awareness generation during health camps
	Awareness generation among school students
Improvement of existing facilities	Specifying target population
	Adequate human resource
	Appropriate infrastructure
	Appropriate training of health care workers
	Engagement of specialist
	Proper manpower utilization and supervision
	Adequate funding
Involving different stakeholders	Involvement of private practitioners
	Involvement of political and community leaders
	Involvement of NGOs
	Involvement of celebrities
	Involvement of cancer survivors
Multisectoral integration	Involvement of religious leaders and institutions
	Improvement of transportation
	Co-operation between government-NGO and community
Political Economy and Governance	Integration of general and health administration
	Political willingness
	Health insurance coverage
	State specific cancer policy
	Provision of subsidy in cancer treatment

care. Community-level barriers primarily arise from social and economic challenges. The stigma associated with cancer frequently discourages individuals from pursuing screening and treatment options. At the individual level, various personal and psychological factors hinder participation in cancer screening. A significant lack of awareness regarding cancer and the screening process leads to markedly lower participation rates. Moreover, the fear of receiving a cancer diagnosis and its implications often prevents individuals from seeking screening. The financial burden associated with potential treatment adds another layer of difficulty. Finally, insufficient preventive health behaviours among individuals also contribute to these challenges.

Barriers perceived by key community influencers

In-depth interviews were also conducted with key non-governmental informants and community influencers. Figure 4 provides a comprehensive visual overview of barriers to cancer screening, categorised according to insights from these interviews.

At the policy level, the primary barriers identified include inadequate awareness initiatives and ineffective health communication strategies. Facility-level challenges largely stem from resource constraints, with significant shortfalls in both facility and human resources. Additionally, long waiting times at government healthcare facilities discourage individuals from seeking timely screening and treatment. Community-level issues include stigma surrounding cancer, limited awareness, and a lack of resources in rural areas. Individual-level barriers highlighted in the findings include a lack of knowledge about cancer, fear of a cancer diagnosis, financial burdens, and insufficient prioritisation of health. Furthermore, there is a prevalent lack of preventive health behaviours and trust in modern medicine within the community.

Data Triangulation

Table 4 presents a triangulated analysis that identifies barriers to cancer screening uptake at multiple levels. At the individual level, strong convergence across all stakeholder groups indicates that fear of diagnosis, low awareness, and financial issues are primary deterrents; these barriers are also echoed at the community level. Stigma, socio-cultural norms, and low trust in formal healthcare systems further limit participation in screening initiatives, even when outreach efforts are made. Qualitative insights complement these findings, revealing that resistance stems not only from a lack of awareness but also from underlying trust deficits. At the facility level, consistent evidence highlights systemic constraints, such as inadequate infrastructure, workforce shortages, and limited outreach capacity, all of which restrict service availability. At the policy level, convergent findings point to governance gaps, especially in communication strategies, training, and resource allocation. In summary, these results demonstrate a substantial implementation gap: the programme's intent is not being effectively translated into practice, resulting in persistently low screening uptake.

Table 5 outlines recommended interventions to increase cancer screening uptake, based on triangulated data. These interventions are grouped into several essential categories.

Better access to screening facilities

Suggested actions include establishing additional screening facilities by installing screening points at primary health centres (PHCs), community health centres (CHCs), and district hospitals. There are also plans to organise camp-based screening events in underserved villages and to implement home-based screening programmes, with trained ASHA workers providing home-based cervical and breast screening services to women in the community.

Improved health communication and awareness

This theme emphasises the importance of strengthening health communication and raising public awareness. Recommended strategies include tackling misinformation by disseminating accurate cancer information, organising outreach programmes, using local languages for communication, utilising social media for health messaging, and conducting awareness campaigns during health camps. Furthermore, integrating health education into school curricula and being sensitive to community values while targeting specific populations are vital to the effectiveness of these efforts.

Improvement of existing facilities

This requires a multifaceted approach to ensure that healthcare professionals are well trained, adequate infrastructure is in place, and continuous staff education is prioritised. Engaging specialists, optimising workforce use, and securing necessary funding are critical steps to boosting the capacity and quality of cancer screening services. Equally important is involving a diverse range of stakeholders in these efforts.

Involving different stakeholders

Partnering with private practitioners, political and community leaders, and NGOs for outreach, and engaging celebrities, cancer survivors, and representatives from religious institutions such as churches.

Multi-sector approach

It is essential to develop a cohesive strategy for cancer screening that improves transport access, fosters collaboration among government entities, NGOs, and local communities, and integrates general administration and health management to streamline and support screening initiatives effectively.

Finally, addressing political economy and governance factors is crucial to increasing screening uptake across states. Essential actions include securing political commitment, ensuring health insurance coverage, creating tailored state-specific cancer policies, and providing subsidies for cancer treatment, all of which are necessary to support and sustain effective screening initiatives.

Discussion

Cancer screening is a critical public health initiative that demands a comprehensive, multipronged agenda for effective implementation. Key components should include raising public awareness of cancer, educating communities about early signs, mobilising community participation, employing evidence-based screening methods, ensuring adequate diagnostic facilities, and providing referral services for treatment and ongoing patient monitoring. Establishing such an organised system is essential for maximising access to screening and improving health outcomes across communities. The cancer screening initiative, as part of the NPCDCS/ NP-NCD, has evolved significantly since its inception in 2010 [4]. The 2023 revision introduced new elements, such as health promotion through behaviour change, awareness campaigns, and enhancements to health infrastructure to support more effective management of the initiative [6]. Despite a robust organisational framework underpinning the national cancer screening programme in India, effectiveness varies widely across the country. This inconsistency is largely attributable to the operational efficiency of individual state governments, each of which implements the programme independently while adhering to central government guidelines [22].

Our study was prompted by the low and inconsistent participation rates in cancer screening observed across various states in India [8]. We focused on the Meghalaya and Mizoram provinces in Northeast India as a case study to identify diverse individual, community-level, facility-level, organisational, or policy-level barriers that prevent people from participating in cancer screening, and to seek recommendations of facilitators to enhance participation from a diverse group of stakeholders, as previously mentioned

Barriers to cancer screening uptake identified by FLHWs

We identified a notable gap in the knowledge and practice of cancer screening among frontline health

workers (FLHWs), which demands urgent attention. Evidence suggests that bridging this gap through targeted training can improve participation in cervical cancer screening [23]. Moreover, self-screening practices among FLHWs are uncommon, missing a key opportunity for them to model preventive behaviours.

Cancer screening remains infrequent and limited across both states, largely due to significant policy-level deficiencies, including insufficient resources. While outreach screening camps have been organised, their limited frequency, constrained by organisational factors, has significantly reduced the programmes' effectiveness. Additionally, the lack of essential equipment and supplies in many health centres further impedes service delivery [24].

FLHWs identified fear of a cancer diagnosis as the most significant community-level barrier to screening uptake. Other prevalent concerns include the worries about the high cost of treatment, and time constraints. A study in Assam province examining challenges faced by community health workers (CHWs) in cancer screening identified several factors contributing to declining participation, including limited community knowledge and awareness of cancer screening [14]. Similarly, a study involving rural populations in Rajasthan, Kerala, and Tamil Nadu found that CHWs encountered obstacles such as insufficient formal training, inadequate infrastructure, ineffective communication, fear of a cancer diagnosis, and financial constraints [25]. Both studies corroborate the community-level barriers reported by FLHWs in our survey conducted in Mizoram and Meghalaya.

Barriers and facilitators as identified by the general population

The free listing method applied to the general population identified financial constraints as a major barrier to participation in cancer screening programmes in both states. In addition to the other barriers highlighted in our study, psychological factors played a significant role by causing individuals to neglect their health and hesitate to seek screening. These findings underscore the urgent need for FLHWs to implement improved communication strategies that effectively engage communities and directly address the psychological barriers deterring participation in cancer screening.

Our findings reveal a lack of awareness about cancer and its symptoms, echoing results from a study among rural populations in villages across three north-eastern states of India [26]. Similarly, a separate study of urban, educated young women aged 18–25 in Meghalaya identified substantial gaps in knowledge regarding breast cancer and breast self-examination [27]. Together, these knowledge gaps highlight major shortcomings in public health education across these regions. The prominence of financial concerns and fear of diagnosis reflects a broader perception of cancer as both an economic and psychological burden, which may outweigh the perceived benefits of early detection. Additionally, the tendency to avoid screening in the absence of symptoms suggests that preventive health services are not yet fully internalised within community health-seeking behaviour.

Distance to health centres providing cancer screenings is a major barrier in Mizoram. Conversely, in Meghalaya, many individuals avoid screening due to being asymptomatic. Findings from Meghalaya further indicate that financial constraints, limited knowledge of treatment options, and fear of a cancer diagnosis are key obstacles to participation. These insights are consistent with results from a multicentre cross-sectional study on cervical cancer screening under the NPCDCS programme in Himachal Pradesh, Meghalaya, and Karnataka [13]. Moreover, a narrative review of 42 studies on breast cancer screening identified low cancer awareness, fear, and socio-cultural factors, such as stigma and concerns about modesty, as significant barriers to participation [28]. Participants from Mizoram recommended establishing more local screening facilities, while those from Meghalaya emphasised the need for enhanced awareness campaigns. Both recommendations highlight the necessity for comprehensive education of health workers to address existing knowledge gaps, as supported by Sahu et al. [29]. Additional respondent suggestions included the importance of multi-channel communication and systemic improvements. Implementing these interventions has been shown to increase screening uptake, as noted by Zhang et al. [30] and other studies [31, 32].

Barriers and facilitators as perceived by Government officers

A qualitative analysis of barriers to cancer screening, as perceived by government officials, highlighted significant disparities between rural and urban areas. A key barrier identified was the lack of transport infrastructure, which not only limits access but also discourages timely participation in screenings. This finding is consistent with similar barriers reported in a study of rural adults in the U.S.A. on lung cancer screening [33] and a scoping review of low participation in breast and cervical cancer screening in India [34]. Frontline healthcare workers in our study also cited lack of transport as a barrier.

Overall, insights from interviews with government stakeholders, analysed through the word cloud, indicate that poor healthcare infrastructure, insufficient facility-level resources, social stigma and rural living challenges, inadequate public awareness, insufficient preventive health behaviours, fear of a cancer diagnosis, and limited proactive government initiatives are significant barriers to cancer screening. Our findings align with a study examining barriers to cervical cancer screening as reported by NPCDCS implementation officers in three Indian states [13].

The visual mapping of category codes to themes underscores the diverse and interconnected challenges facing the health system. Our analysis identifies inequitable healthcare delivery, ineffective health communication strategies, and insufficient resource allocation as the most significant policy-level barriers. At the facility level, healthcare centres display a range of deficiencies, with inadequate resource allocation leading to shortages of specialised personnel for screening services. Furthermore, several NCD clinics in both states lack essential equipment and supplies for cancer screening,

further hindering service delivery. Addressing these gaps may strengthen programme managers' and policymakers' commitment to resource provision. Additionally, the stigma associated with cancer deters many individuals from seeking necessary screenings and treatments [35]. At the individual level, personal and psychological factors continue to impede participation in screening programmes.

Barriers perceived by key community influencers

Interviews with key community influencers revealed insights that closely mirrored those of government officials. Additional barriers identified were a lack of prioritisation of health at the individual level, insufficient awareness initiatives at the policy level, and long waiting times at government healthcare facilities, all of which discouraged individuals from seeking timely screening and treatment. Importantly, barriers are rarely isolated; multiple category codes often span several themes, indicating that operational challenges frequently cut across governance, logistics, and human resources. This complexity highlights the need for integrated interventions rather than fragmented solutions.

Data triangulation

To enhance the validity of our findings from both interviews and surveys, we applied a triangulation approach that integrated data from multiple stakeholder groups. This method enabled us to identify consistent patterns of barriers and facilitators, thereby enhancing both the credibility and depth of our results.

Triangulation of data sources indicated that the low rate of cancer screening is attributable to barriers at multiple levels. Major factors preventing individuals from accessing cancer screening include fear of diagnosis, lack of awareness about screening, and financial concerns. These barriers reflect poor internalisation of preventive health practices. Similar findings have been reported in studies on breast and cervical cancer screening, where fear and low perceived susceptibility to cancer have significantly reduced participation in screening programmes [34, 36]. Stigma, socio-cultural norms, and lack of trust in the formal healthcare system were also identified as community-level barriers. This finding supports existing evidence that cultural and social stigma are primary factors impeding cancer screening uptake in India [11]. Additionally, several facility-level constraints, including insufficient infrastructure, workforce shortages, and limited outreach capacity, reduced service availability and contributed to low screening uptake. These findings are consistent with previous research that highlights healthcare system limitations as significant barriers to implementing screening programmes [37]. Policy-level limitations, such as inadequate communication strategies, insufficient training resources, and inequitable resource allocation also signalled weak programme implementation. This study highlights a substantial gap in the implementation of cancer screening programmes and underscores the pressing need for coordinated, multi-level interventions.

Furthermore, triangulation study identified six key intervention themes aimed at increasing cancer screening

uptake. Implementing these strategies is expected to improve health communication by raising awareness, correcting misinformation, changing risk perceptions, increasing motivation for screening, building patient trust, and addressing logistical barriers such as transportation. Furthermore, engaging a broad range of stakeholders will leverage trusted communication channels, expand referral networks, and support sustainability, thereby enhancing service quality. The intervention themes identified in our study are consistent with those highlighted in a scoping review of facilitators for cervical cancer screening and early breast cancer diagnosis in Sub-Saharan Africa [38]. Collectively, these comprehensive interventions underscore the importance of a multifaceted strategy to increase participation in cancer screening and improve health outcomes [39, 40].

In summary, our study provides a novel perspective by systematically identifying barriers to participation in India's national cancer screening programme in Meghalaya and Mizoram, while also compiling actionable recommendations from a diverse range of stakeholders to enhance screening uptake. Despite the existence of well-established national guidelines, implementation in these states has been hindered by limited resources, inadequate training for health workers, and an apparent lack of management commitment. These challenges have contributed to a pronounced "know-do gap" in implementation science. As such, our findings hold significant relevance for other low- and middle-income countries (LMICs), as they highlight gap between policy and practice. Addressing these challenges requires urgent, targeted interventions to bridge knowledge gaps, strengthen infrastructure and resources, ensure privacy for women in NCD clinics, foster management commitment to build trust, engage the media, and prioritise rural communities.

Author Contribution Statement

SB, BP and MS conceived the study and designed the methodology. SB, BP and AG supervised the study. AG and BP conducted the statistical analysis and interpreted the data. The manuscript was written by MS, SB, and BP, and critically reviewed by BP, AG, and RM. All authors read and approved the final manuscript..

Acknowledgements

The authors would like to thank Mr Ram Kumar, I.A.S., and Dr Eric Zomawia, M.D., the Mission Directors of NHM in the states of Meghalaya and Mizoram, respectively, for their cooperation and support during this research. They also express their gratitude to the study participants for their involvement. The authors sincerely appreciate the project staff at the Kolkata, Mizoram, and Meghalaya sites for their invaluable support in data collection. They also acknowledge, with thanks, the financial assistance approved by the Indian Council of Medical Research under project sanction no. 5/13/6/SB/ICRC/2020/NCD III, dated 5th November 2020.

Ethical Consideration

Ethical approval for the study was obtained from the Institutional Ethics Committee at Chittaranjan National Cancer Institute, Kolkata (IEC Ref. CNCI-IEC-SB-2020-8), before the study commenced. To ensure clarity and respect for cultural sensitivities, informed consent forms and Participant Information Sheets (PIS) were carefully drafted and translated into Mizo, Khasi, and Garo languages. Before data collection, informed consent was obtained from each participant, confirming that they were fully aware of the study's purpose and procedures. Privacy was maintained during data collection, and the confidentiality of their participation was safeguarded.

Statement of Conflict of Interest

The authors declare no conflicts of interest concerning the publication of this article.

References

- Ahuja M. Burden of cancers in India: Stumbling blocks and vision of success. *J Midlife Health*. 2022;13(3):195-8. https://doi.org/10.4103/jmh.jmh_227_22.
- Bray F, Laversanne M, Sung H, Ferlay J, Siegel RL, Soerjomataram I, et al. Global cancer statistics 2022: Globocan estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2024;74(3):229-63. <https://doi.org/10.3322/caac.21834>.
- Sathishkumar K, Chaturvedi M, Das P, Stephen S, Mathur P. Cancer incidence estimates for 2022 & projection for 2025: Result from national cancer registry programme, India. *Indian J Med Res*. 2022;156(4&5):598-607. https://doi.org/10.4103/ijmr.ijmr_1821_22.
- Ministry of health and family welfare, government of india. Operational guidelines (revised 2013–17): National programme for prevention and control of cancer, diabetes, cardiovascular diseases and stroke (NPCDCS). New Delhi: Ministry of Health and Family Welfare, Government of India; 2013.
- Ministry of Health and Family Welfare, Government of India. Operational guidelines: Prevention, screening, and control of common non-communicable diseases: Hypertension, diabetes, and common cancers (oral, breast, and cervix). New Delhi: Ministry of Health and Family Welfare, Government of India; 2016.
- Ministry of health and family welfare, government of india. Operational guidelines: National programme for prevention and control of non-communicable diseases (2023–2030). New Delhi: Ministry of health and family welfare, government of india; 2023.
- International Institute for Population Sciences. National family health survey (NFHS-5), 2019–21: India Report. Mumbai: International institute for population sciences; 2021.
- Gopika MG, Prabhu PR, Thulaseedharan JV. Status of cancer screening in india: An alarm signal from the national family health survey (nfhs-5). *J Family Med Prim Care*. 2022;11(11):7303-7. https://doi.org/10.4103/jfmpc.jfmpc_1140_22.
- Kaur A, Kumar R, Garg S, Kumar H, Kumar D. A comparative study of cancer and blood sugar levels among adults as per NFHS-4 and nfhs- 5 surveys in India. *J Coloproctol*. 2024;44(4):e292–e295. <https://doi.org/10.1055/s-0044-1800930>.
- Tripathi N, Kadam YR, Dhobale RV, Gore AD. Barriers for early detection of cancer amongst indian rural women. *South Asian J Cancer*. 2014;3(2):122-27. <https://doi.org/10.4103/2278-330X.130449>.
- Petersen Z, Jaca A, Ginindza TG, Maseko G, Takatshana S, Ndlovu P, et al. Barriers to uptake of cervical cancer screening services in low-and-middle-income countries: A systematic review. *BMC Womens Health*. 2022;22(1):486. <https://doi.org/10.1186/s12905-022-02043-y>.
- Gupta S, Dey A, Kundu S, Sinha Gupta S. Barriers to cervical cancer screening in india: Insights from national family health survey-5 data. *Asian Pac J Cancer Prev*. 2025;26(5):1853-61. <https://doi.org/10.31557/apjcp.2025.26.5.1853>.
- Dsouza JP, Van den Broucke S, Pattanshetty S, Dhoore W. Exploring the barriers to cervical cancer screening through the lens of implementers and beneficiaries of the national screening program: A multi-contextual study. *Asian Pac J Cancer Prev*. 2020;21(8):2209-15. <https://doi.org/10.31557/apjcp.2020.21.8.2209>.
- Kedar A, John A, Goala S, Babu R, Tapkire R, Kannan R, et al. Barriers and facilitators in implementing population based common cancer screening through community health workers. *ecancermedicalsecience*. 2021;15:1277. <https://doi.org/10.3332/ecancer.2021.1277>.
- Oswal K, Gaurav K, Pradhan A, Ramachandran V, Sebastian P, Basu P. Current status of implementation of cancer screening programme in India: A review of policies and practice. *Asian Pac J Cancer Prev*. 2025;26(4):1117-28. <https://doi.org/10.31557/apjcp.2025.26.4.1117>.
- Shanker N, Mathur P, Das P, Sathishkumar K, Martina Shalini AJ, Chaturvedi M. Cancer scenario in north-east india and need for an appropriate research agenda. *Indian J Med Res*. 2021;154(1):27-35. https://doi.org/10.4103/ijmr.ijmr_347_20.
- Pohsnem F, Nongrum MS, Sarkar R, Albert S. Barriers in implementing cancer prevention programme in north-eastern India: A case study from meghalaya. *Indian J Med Res*. 2025;162(6):771-8. https://doi.org/10.25259/ijmr_742_2025.
- Ministry of Health and Family Welfare, Government of India. National programme for prevention and control of cancer, diabetes, cardiovascular diseases and stroke (NPCDCS): National health mission [Internet]. New delhi: Ministry of health and family welfare; [cited 2026 sep 12]. Available from: <https://nhm.gov.in/index1.Php?Lang=1&level=2&sublicid=1048&lid=604>.
- IBM Corp. IBM SPSS Statistics for windows, version 21.0. Armonk, NY: Ibm corp.; 2012.
- Analytic Technologies. Anthropic 4.98.1/x [computer software]. Natick, MA: Analytic technologies; 1998.
- ATLAS.ti Scientific Software Development GmbH. ATLAS.ti: Qualitative Data Analysis, version 22.0 [computer software]. Berlin: ATLAS.ti Scientific Software Development GmbH; 2021.
- Chokshi M, Patil B, Khanna R, Neogi SB, Sharma J, Paul VK, et al. Health systems in india. *J Perinatol*. 2016;36(Suppl 3):S9-S12. <https://doi.org/10.1038/jp.2016.184>.
- Ochomo EO, Ndege S, Itsura P. Focused training of community health volunteers on cervical cancer in rural kisumu. *J Cancer Educ*. 2022;37(2):466-73. <https://doi.org/10.1007/s13187-020-01839-6>.
- Pittalis C, Panteli E, Schouten E, Magongwa I, Gajewski J. Breast and cervical cancer screening services in malawi: A systematic review. *BMC Cancer*. 2020;20(1):1101. <https://doi.org/10.1186/s12885-020-07610-w>.
- Palaniraja S, Taghavi K, Kataria I, Oswal K, Vani NV, Liji AA, et al. Barriers and contributions of rural community health workers in enabling cancer early detection and subsequent care in India: A qualitative study. *BMC Public*

- Health. 2025;25(1):1527. <https://doi.org/10.1186/s12889-025-22735-y>.
26. Oswal K, Kanodia R, Pradhan A, Nadkar U, Avhad M, Venkataramanan R, et al. Assessment of knowledge and screening in oral, breast, and cervical cancer in the population of the northeast region of India. *JCO Glob Oncol*. 2020;6:601-9. <https://doi.org/10.1200/jgo.19.00257>.
27. Biswas S, Syiemlieh J, Nongrum R, Sharma S, Siddiqi M. Impact of educational level and family income on breast cancer awareness among college-going girls in shillong (meghalaya), india. *Asian Pac J Cancer Prev*. 2020;21(12):3639-46. <https://doi.org/10.31557/apjcp.2020.21.12.3639>.
28. Raibag R. Barriers to breast cancer screening in urban india: A narrative review. *Int J Res Publ Rev*. 2025;6(6):10006-10011. <https://doi.org/10.55248/gengpi.6.0625.22112>.
29. Sahu DP, Subba SH, Giri PP. Cancer awareness and attitude towards cancer screening in india: A narrative review. *J Family Med Prim Care*. 2020;9(5):2214-8. https://doi.org/10.4103/jfmpe.jfmpe_145_20.
30. Zhang M, Sit JWH, Chan DNS, Akingbade O, Chan CWH. Educational interventions to promote cervical cancer screening among rural populations: A systematic review. *Int J Environ Res Public Health*. 2022;19(11):116874. <https://doi.org/10.3390/ijerph19116874>.
31. McCutchan G, Weiss B, Quinn-Scoggins H, Dao A, Downs T, Deng Y, et al. Psychosocial influences on help-seeking behaviour for cancer in low-income and lower middle-income countries: A mixed-methods systematic review. *BMJ Glob Health*. 2021;6(2):e004213. <https://doi.org/10.1136/bmjgh-2020-004213>.
32. Conley CC, Otto AK, McDonnell GA, Tercyak KP. Multiple approaches to enhancing cancer communication in the next decade: Translating research into practice and policy. *Transl Behav Med*. 2021;11(11):2018-32. <https://doi.org/10.1093/tbm/ibab089>.
33. Schiffelbein JE, Carluzzo KL, Hasson RM, Alford-Teaster JA, Imset I, Onega T. Barriers, facilitators, and suggested interventions for lung cancer screening among a rural screening-eligible population. *J Prim Care Community Health*. 2020;11:2150132720930544. <https://doi.org/10.1177/2150132720930544>.
34. Venghateri JB, Nathani P, Goyal S, Sarang B, Rawtani H, Patil P, et al. Low participation in cancer screening in India: A scoping review of breast and cervical cancer programs. *BMC Cancer*. 2025;25(1):1724. <https://doi.org/10.1186/s12885-025-14859-6>.
35. Kataria I, Sethuraman L, Nayak P, Oswal K, Purushotham A. Measurement of cancer stigma in India: Challenges and opportunities. *Lancet Reg Health Southeast Asia*. 2024;24:100408. <https://doi.org/10.1016/j.lansea.2024.100408>.
36. Marlow LA, Waller J, Wardle J. Barriers to cervical cancer screening among ethnic minority women: A qualitative study. *J Fam Plann Reprod Health Care*. 2015;41(4):248-54. <https://doi.org/10.1136/jfprhc-2014-101082>.
37. Sankaranarayanan R, Ramadas K, Qiao YL. Managing the changing burden of cancer in Asia. *BMC Med*. 2014;12:3. <https://doi.org/10.1186/1741-7015-12-3>.
38. Pierz AJ, Randall TC, Castle PE, Adedimeji A, Ingabire C, Kubwimana G, et al. A scoping review: Facilitators and barriers of cervical cancer screening and early diagnosis of breast cancer in sub-saharan african health settings. *Gynecol Oncol Rep*. 2020;33:100605. <https://doi.org/10.1016/j.gore.2020.100605>.
39. Subramanian S, Tangka FKL, Hoover S, DeGroff A. Integrated interventions and supporting activities to increase uptake of multiple cancer screenings: Conceptual framework, determinants of implementation success, measurement challenges, and research priorities. *Implement Sci Commun*. 2022;3(1):105. <https://doi.org/10.1186/s43058-022-00353-8>.
40. Tin KN, Ngamjarus C, Rattanakanokchai S, Sothornwit J, Aue-Aungkul A, Paing AK, et al. Interventions to increase the uptake of cervical cancer screening in low- and middle-income countries: A systematic review and meta-analysis. *BMC Womens Health*. 2023;23(1):120. <https://doi.org/10.1186/s12905-023-02265-8>.



This work is licensed under a Creative Commons Attribution-Non Commercial 4.0 International License.