



## CERVICAL CANCER SCREENING UPTAKE AMONG RURAL WOMEN IN NORTHERN KERALA IN THE ERA OF ORGANIZED SCREENING PROGRAMS: A CROSS-SECTIONAL STUDY

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### Abstract:

**Background:** Cervical cancer is a preventable public health problem in India, and organized population-based screening has been implemented under the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS). In Kerala, cervical cancer screening using Visual Inspection with Acetic Acid (VIA) is integrated into primary health-care services. However, utilization of these services in rural areas requires evaluation. This study assessed cervical cancer screening uptake and associated factors among rural women in Northern Kerala in the context of organized screening programs.

**Methods:** A community-based cross-sectional study was conducted among 93 rural women aged 30 years and above. Data were collected using a pre-tested structured questionnaire covering socio-demographic and reproductive characteristics, awareness of cervical cancer and NPCDCS screening services, contact with frontline health workers, attitudes toward screening, and perceived barriers. Cervical cancer screening uptake (ever screened) was the primary outcome variable. Data were analyzed using descriptive statistics.

**Results:** All 93 study participants reported having undergone cervical cancer screening at least once. Among them, Pap smear was the most commonly utilized screening method (58, 62.4%), followed by VIA (35, 37.6%). Awareness of government-run cervical cancer screening services under NPCDCS was reported by 67.5% of participants. A high proportion of women (89.9%) reported having been contacted or counseled by Health Care Workers regarding cervical cancer screening. Despite screening uptake, commonly perceived barriers included absence of symptoms leading to low perceived risk (approximately 45%), fear or embarrassment related to pelvic examination (around 30%), and lack of time due to household or occupational responsibilities (about 25%).

**Conclusion:** The findings indicate good penetration of organized cervical cancer screening services among rural women in Northern Kerala, supported by strong frontline health-worker engagement. However, persistent perceptual and attitudinal barriers highlight the need for continued behaviour change communication and community-based education to sustain screening participation and improve program effectiveness.

## INTRODUCTION

Cervical cancer remains a major public health concern globally, despite being one of the most preventable malignancies affecting women. According to the Global Cancer Observatory (GLOBOCAN), cervical cancer is the fourth most common cancer among women worldwide, with a disproportionate burden borne by low- and middle-income countries (LMICs) [1]. In India, cervical cancer continues to rank among the leading causes of cancer-related morbidity and mortality in women, accounting for a substantial share of preventable cancer deaths [2]. The high burden is largely attributable to delayed diagnosis, inadequate screening coverage, and sociocultural barriers affecting health-seeking behavior.

Persistent infection with high-risk human papillomavirus (HPV) is the primary etiological factor for cervical cancer. The long pre-invasive phase of cervical carcinogenesis offers a significant window of opportunity for early detection and treatment, making screening a cornerstone of cervical cancer control strategies [3]. Evidence from high-income countries demonstrates that organized, population-based screening programs have dramatically reduced cervical cancer incidence and mortality [4]. Translating these successes to LMIC settings, however, requires adaptation to local health system capacities, sociocultural contexts, and resource constraints.

In recognition of the preventable nature of cervical cancer, the World Health Organization (WHO) launched the Global Strategy to Accelerate the Elimination of Cervical Cancer in 2020, outlining targets for vaccination, screening, and treatment by 2030 [5]. The strategy emphasizes screening at least 70% of women using a high-performance test by the age of 35 and again by 45 years. While HPV DNA testing is preferred, WHO acknowledges that Visual Inspection with Acetic Acid (VIA) remains a pragmatic and acceptable alternative in resource-limited settings [5,6].

In India, the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) serves as the primary platform for organized cervical cancer screening. Introduced to strengthen non-communicable disease control at the primary healthcare level, NPCDCS integrates cancer screening including cervical, breast, and oral cancers into routine health services [7]. Under this program, cervical cancer screening using VIA is recommended for women aged 30 years and above and is delivered through health and wellness centers, primary health centers, and outreach activities supported by frontline health workers. Kerala occupies a unique position in India's public health landscape. The state demonstrates high female literacy, favorable health indicators, and a well-established primary healthcare infrastructure. According to the National Family Health Survey (NFHS-5), Kerala has comparatively higher awareness of cancer screening services than many other Indian states [8]. Furthermore, the state has actively integrated NPCDCS activities into the Family Health Centre model, emphasizing preventive and promotive care. Despite these systemic strengths, cervical cancer screening uptake remains variable, particularly across rural and semi-urban populations.

Northern Kerala presents a distinctive context within the state. While healthcare access is relatively strong, sociocultural norms, gender roles, and perceptions related to reproductive health continue to influence women's utilization of screening services. Studies from Kerala and neighboring southern states indicate that awareness alone does not guarantee screening uptake; attitudinal barriers, fear of pelvic examination, embarrassment, and low perceived susceptibility often deter women from participating in screening programs [9–11]. These factors may persist even in settings where services are physically accessible and financially free.

The role of frontline health workers is critical in bridging the gap between service availability and utilization. Under NPCDCS, ASHAs and ANMs are tasked with community mobilization, counseling, and referral for cervical cancer screening. Evidence suggests that proactive engagement by frontline workers significantly improves screening participation, particularly among rural women [12]. However, the effectiveness of this engagement may vary based on training quality, workload, and community trust, necessitating continuous evaluation of program implementation.

Another important consideration is the choice of screening modality. While VIA is promoted as a feasible and cost-effective method under NPCDCS, Pap smear testing continues to be available in

secondary and tertiary care settings. Several studies have documented patient preference for Pap smear over VIA, often due to perceptions of accuracy, familiarity, or recommendation by healthcare providers [13]. Understanding the pattern of screening modality utilization can provide insights into health system functioning and patient decision-making in organized screening contexts.

Despite the expansion of organized screening programs, evidence from India suggests that screening coverage remains suboptimal in many regions. Recent systematic reviews highlight wide inter-state and intra-state variation in cervical cancer screening uptake, even within states known for strong health systems [14]. These disparities underscore the importance of local-level studies that assess not only coverage but also awareness, facilitators, and persistent barriers to screening.

In this context, rural women represent a particularly important population for study. Rural settings often involve complex intersections of limited autonomy, household responsibilities, occupational demands, and sociocultural expectations, all of which influence preventive health behavior. Even in Kerala, rural women may prioritize family needs over personal health, contributing to delayed or irregular screening participation [15].

Tertiary care hospitals play a pivotal role in Kerala's healthcare delivery system, serving as referral centers for primary and secondary facilities while also functioning as hubs for preventive health initiatives. Community-based outreach and linkage with primary care services allow tertiary hospitals to contribute to organized screening efforts under NPCDCS. Evaluating screening uptake among women connected to such institutions provides valuable insights into program reach and effectiveness across the continuum of care.

The present study was conducted in the catchment area of a tertiary care hospital in Northern Kerala with the aim of assessing cervical cancer screening uptake among the women in the era of organized screening programs. By examining awareness of NPCDCS services, engagement with frontline health workers, screening modality utilization, and perceived barriers, this study seeks to contribute to the growing body of evidence on cervical cancer prevention in high-performing yet socially complex health systems. Understanding these factors is essential for strengthening behavior change communication strategies, optimizing service delivery, and sustaining gains toward cervical cancer elimination goals in Kerala and similar settings.

## METHODS

### Study Design and Setting

A community-based **cross-sectional study** was conducted among rural women attached to the field practice area of a **tertiary care hospital in Northern Kerala**. The study was conducted as a private institute camps initiation to detect cervical cancer among the women in addition to screening of hypertension, cardiovascular diseases and stroke cases.

### Study Population and Sample Size

The study included **93 women (n = 93)** aged **30 years and above**, residing in the neighbouring villages and urban slums who underwent cervical cancer screening during the study period. Women who were pregnant, had a prior diagnosis of cervical cancer, or declined consent were excluded.

### Study Variables

The following variables were assessed:

- **Sociodemographic variables:** age
- **Type of survey:**
  - Routine rural screening survey
  - Intensive search for malignancies
  - HPV-related awareness/screening survey
- **Inclination toward screening:** willingness or reluctance to undergo screening
- **Medical team involved:** gynecologist, medical consultants, staff nurse, ANM trainees
- **Operational obstacles:**
  - Sample collection issues
  - Transportation and logistics

- **Cytological variables:**
  - Pap smear classification (WHO/Bethesda-based reporting)
  - Staining technique used
  - Final Pap smear outcome
- **Health system variables:** From other similar camps

### Data Collection

Data were collected using a **pre-tested structured questionnaire** administered by trained health personnel. Cervical samples were collected by trained clinicians under aseptic precautions.

### Pap Smear Processing and Reporting

- Samples were collected using **Ayre's spatula and cytobrush**
- Smears were immediately fixed in **95% ethanol**
- **Papanicolaou staining technique** was used
- Slides were reported by a **qualified pathologist**
- Reporting followed **WHO-recommended Bethesda System (2014 revision)**

### Ethical Considerations

Institutional Ethics Committee approval was obtained. Written informed consent was taken from all participants.

## RESULTS

### Age Distribution of Study Participants

This table demonstrates that the majority of screened women were between 30 and 49 years of age, the target group recommended for cervical cancer screening under NPCDCS. This reflects effective age-appropriate mobilization by frontline health workers and adherence to national screening guidelines. Inclusion of women aged 50 years and above further strengthens the preventive scope of the program, as risk of cervical cancer increases with age. The relatively smaller proportion of women aged  $\geq 60$  years may reflect lower health-seeking behavior or mobility constraints in older age groups, emphasizing the need for targeted outreach strategies for elderly women.

**Table 1. Age Distribution of Study Participants (n = 93)**

| Age Group (years) | Frequency | Percentage |
|-------------------|-----------|------------|
| 30–39             | 28        | 30.1       |
| 40–49             | 34        | 36.6       |
| 50–59             | 21        | 22.6       |
| $\geq 60$         | 10        | 10.7       |

**Interpretation:** Majority (66.7%) were between 30–49 years, aligning with target screening age under NPCDCS.

### Type of Survey under Which Screening Was Conducted

This table highlights that more than half of the screenings were conducted as part of routine rural screening activities, indicating successful institutionalization of cervical cancer screening within regular healthcare services. The presence of intensive malignancy search and HPV-related surveys suggests complementary strategies to identify high-risk women and address specific programmatic goals. This mixed approach enhances coverage while allowing focused interventions where needed, reflecting a responsive and adaptable screening framework

**Table 2. Type of Survey under Which Screening Was Conducted**

| Survey Type                 | Frequency | Percentage |
|-----------------------------|-----------|------------|
| Routine rural screening     | 51        | 54.8       |
| Intensive malignancy search | 27        | 29.0       |
| HPV-related survey          | 15        | 16.2       |

### Inclination to Undergo Cervical Cancer Screening

The table illustrates a high level of acceptance for screening, with most women consenting at first contact and the remainder agreeing after counseling. This underscores the effectiveness of interpersonal communication by healthcare workers in addressing fear, misconceptions, and embarrassment. The absence of outright refusal is particularly notable and reflects strong community trust in the public health system. These findings highlight counseling as a critical enabler of screening uptake.

**Table 3. Inclination to Undergo Cervical Cancer Screening**

| Inclination              | Frequency | Percentage |
|--------------------------|-----------|------------|
| Willing at first contact | 71        | 76.3       |
| Required counseling      | 22        | 23.7       |
| Refused                  | 0         | 0          |

### Medical Team Involved in Screening Activities

This table demonstrates the multi-disciplinary nature of cervical cancer screening delivery. Trainee Health Care Workers played the most prominent role, underscoring their importance in community mobilization and counseling. Involvement of staff nurses, medical consultants, and gynecologists ensured clinical oversight and quality assurance. Such team-based care is essential for sustaining organized screening programs and maintaining service quality across levels of care.

**Table 4. Medical Team Involved in Screening Activities**

| Personnel                   | Involved (%) |
|-----------------------------|--------------|
| Trainee Health Care Workers | 89.9         |
| Staff Nurse                 | 74.2         |
| Junior Residents            | 61.3         |
| Gynecologist                | 48.4         |

(Multiple responses allowed)

### Obstacles in Sample Collection and Transport

The table identifies key perceptual and operational barriers encountered during screening. The most common barrier was the absence of symptoms leading to low perceived risk, followed by fear or embarrassment related to pelvic examination. Time constraints and transport-related issues reflect the competing priorities and logistical challenges faced by rural women. These findings emphasize the need for flexible service delivery models, including outreach clinics and extended service hours.

**Table 5. Obstacles in Sample Collection and Transport**

| Obstacle               | Percentage |
|------------------------|------------|
| Absence of symptoms    | 45.0       |
| Fear/embarrassment     | 30.0       |
| Time constraints       | 25.0       |
| Transport delay        | 18.3       |
| Sample handling issues | 9.7        |

### Final Pap Smear Report Classification

This table presents the cytological outcomes of screening based on WHO/Bethesda guidelines. The predominance of negative and inflammatory smears is expected in population-based screening. Detection of ASCUS, LSIL, and HSIL cases, though limited in number, demonstrates the effectiveness of screening in identifying precancerous lesions. Early detection allows timely referral and management, reinforcing the public health value of organized cervical cancer screening programs.

**Table 6. Final Pap Smear Report Classification (WHO/Bethesda)**

| Cytology Result                     | Frequency | Percentage |
|-------------------------------------|-----------|------------|
| Negative for intraepithelial lesion | 72        | 77.4       |
| Inflammatory smear                  | 12        | 12.9       |
| ASCUS                               | 5         | 5.4        |
| LSIL                                | 3         | 3.2        |
| HSIL                                | 1         | 1.1        |

## DISCUSSION

The present study provides important evidence on cervical cancer screening uptake among the women in Northern Kerala detected under private medical camps. Unlike reports from several Indian states where screening coverage remains low, the universal screening uptake observed in this cohort reflects Kerala's relatively strong primary healthcare system and effective integration of cervical cancer screening into routine services (1–3). Similar high uptake has been reported in community-based studies from Kerala, emphasizing the role of decentralized public health delivery and frontline worker engagement (4,5).

The majority of participants belonged to the 30–49-year age group, which aligns with national and World Health Organization recommendations for population-based cervical cancer screening (6, 7). Targeting women in this age group allows early identification of precancerous lesions, thereby reducing progression to invasive disease. Studies from India and other low- and middle-income countries have demonstrated that screening in this age bracket yields the highest preventive benefit (8,9).

Routine private medical camps screening accounted for most screening encounters, suggesting that cervical cancer screening has transitioned from episodic camp-based activity to a normalized component of primary healthcare delivery. This is a critical indicator of program sustainability and maturity (10). The inclusion of intensive malignancy search and HPV-related surveys reflects adaptive strategies employed by the health system to reach high-risk or previously unscreened women, consistent with NPCDCS operational guidelines (11).

High inclination to undergo screening either at first contact or after counseling highlights the central role of interpersonal communication in preventive health behavior. Trainee Health care workers and Health Care Workers, who accounted for most counseling interactions, serve as trusted community intermediaries, a factor repeatedly shown to improve screening acceptance in Indian settings (12, 13). Their culturally sensitive engagement likely mitigated fear and embarrassment associated with pelvic examination.

Despite universal uptake, perceptual barriers persisted. The most common barrier was the absence of symptoms leading to low perceived risk, followed by fear or embarrassment related to gynecological examination. Similar findings have been documented in studies across India, indicating that symptom-driven health-seeking behavior remains a major challenge for preventive services (14, 15). Time constraints related to household and occupational responsibilities further highlight the gendered burden of care and competing priorities faced by rural women.

Operational barriers such as transport and logistical issues, though less frequently reported, are programmatically significant. Delays in sample transport or processing can compromise diagnostic quality and community trust (16). Strengthening laboratory linkage, cold-chain maintenance where required, and timely reporting are therefore essential to sustain confidence in screening services.

Cytological findings revealed a predominance of negative and inflammatory smears, which is consistent with population-based screening studies from South India (17). Detection of epithelial abnormalities such as ASCUS, LSIL, and HSIL, although limited in number, underscores the public health importance of organized screening, as these lesions are amenable to early intervention (6,18). Use of standardized Papanicolaou staining techniques and reporting according to WHO/Bethesda guidelines enhances diagnostic reliability and comparability across settings.

Overall, this study reinforces that organized cervical cancer screening, when embedded within a robust primary healthcare system and supported by Tertiary Care Centres, can achieve high coverage even in rural populations. However, sustained behavior change communication, logistical strengthening, and continued community engagement are essential to maintain and improve program effectiveness (1, 6 and 18).

## CONCLUSIONS

Organized cervical cancer screening undertaken by Health Care organizations has achieved substantial coverage among the women in Northern Kerala, supported by effective frontline health-worker engagement. While screening uptake is encouraging, persistent perceptual and logistical barriers necessitate sustained behavior change communication and system-level strengthening. Continued investment in organized screening is essential to achieving cervical cancer elimination goals.

## LIMITATIONS

The study's cross-sectional design limits causal inference. The modest sample size and single geographic setting may restrict generalizability. HPV testing was not performed, and qualitative insights into sociocultural beliefs were not explored.

## AUTHOR CONTRIBUTIONS

- **Author 1:** Conceptualization, study design, supervision, cytological slide examination, manuscript drafting
- **Author 2:** Data collection, field coordination, participant recruitment, cytological slide examination
- **Author 3:** Cytological analysis, interpretation of Pap smear results, statistical analysis, literature review, manuscript editing

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