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Original Research Article

Knowledge, Health Beliefs, and Determinants of Cervical Cancer Screening Uptake among Women Aged 30–49 Years in Central India: A Community-Based Cross-Sectional Study

Vandana Jada[1]*, Dr. Surendra Goswami[2]

[1]Research Scholar, Department of Nursing, Index Nursing College, Malwanchal University
[2]Research Supervisor, Department of Nursing, Index Nursing College, Malwanchal University

***Corresponding Author:** Vandana Jada
Research Scholar, Department of Nursing, Index Nursing College, Malwanchal University

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Abstract: ***Background:*** India accounts for approximately a quarter of global cervical cancer deaths, yet screening coverage remains among the lowest worldwide. Understanding the knowledge deficits and health beliefs that underlie non-participation is essential for designing effective demand-generation strategies. This study assessed knowledge of cervical cancer and Visual Inspection with Acetic Acid (VIA) screening, Health Belief Model (HBM) profiles, and determinants of screening uptake among women aged 30–49 years. ***Methods:*** A community-based cross-sectional study was conducted among 300 women aged 30–49 years residing in the rural and urban health training centre catchment areas of a medical college hospital in Indore, Madhya Pradesh. Women who had not been screened in the preceding three years and who had no history of cervical cancer or hysterectomy were enrolled. Data were collected through face-to-face interviews using a structured socio-demographic and reproductive history schedule, a 25-item knowledge questionnaire, and a Hindi-validated adaptation of Champion's Health Belief Model Scale (30 items across six constructs, 5-point Likert). Determinants of subsequent VIA screening uptake, verified through screening registers, were examined using logistic regression. ***Results:*** The mean age of participants was 39.7 ± 5.4 years; 60.3% were homemakers, 31.3% had no formal or only primary education, and 35.0% reported a monthly family income below ₹10,000. Knowledge of cervical cancer and VIA screening was low, with a mean score of 8.7 ± 3.2 out of 25. The HBM profile was characterized by high perceived barriers (3.45 ± 0.65), moderate perceived severity (3.35 ± 0.75), and low self-efficacy (2.85 ± 0.65) and cues to action (2.65 ± 0.75). On multivariate analysis, higher baseline knowledge (adjusted OR 1.11 per point, 95% CI 1.02–1.21, p = 0.02) and higher self-efficacy (adjusted OR 1.48 per unit, 95% CI 1.02–2.15, p = 0.04) independently predicted screening uptake, while age, income, and parity did not; education at secondary level or above showed a borderline association (adjusted OR 1.74, 95% CI 0.97–3.12, p = 0.06). ***Conclusion:*** Women in this population begin from a position of substantial knowledge deficit, high perceived barriers, and low self-efficacy. Because knowledge and self-efficacy independently predicted screening uptake, interventions that combine education with explicit barrier reduction and confidence building are likely to be more effective than awareness campaigns alone.

Keywords: Cervical Cancer, Visual Inspection with Acetic Acid, Screening, Knowledge, Health Belief Model, Self-Efficacy, India.

INTRODUCTION

Cervical cancer is the fourth most common cancer among women worldwide, with an estimated 604,000 new cases and 342,000 deaths reported in 2020 [1]. The disease is caused by persistent infection with high-risk human papillomavirus and progresses slowly over 10–15 years from precancerous lesions to invasive cancer, offering a wide window for detection and treatment. Expert estimates suggest that up to 90% of cases are preventable through appropriate screening and timely treatment.

India bears a disproportionate share of this burden, contributing approximately 25% of global cervical cancer deaths, with an estimated 123,907 new cases and 77,348 deaths in 2020 [2]. Under the National Health Mission, population-based screening targets women aged 30–65 years, and Visual Inspection with Acetic Acid (VIA) is the primary modality at sub-health centres and primary health centres. VIA is inexpensive, requires no laboratory infrastructure, provides point-of-care results enabling single-visit screen-and-treat approaches, and can be performed by trained nurses. A meta-analysis of 21 studies reported pooled sensitivity of 0.80 (95% CI 0.71–0.87) and specificity of 0.81 (95% CI 0.70–0.88) [3]. Cluster-randomized trials in Tamil Nadu and Mumbai have demonstrated that VIA screening delivered by trained nurses and primary health workers significantly reduces cervical cancer incidence and mortality [4, 5].

Despite this evidence and the existence of a national programme, uptake remains the binding constraint. As of July 2025, national data indicated that 10.18 crore of 25.42 crore eligible women aged 30 years and above had been screened, and survey estimates suggest that only a small minority of women aged 30–49 years report ever having been screened. A health systems assessment from Tamil Nadu found that service utilization was largely confined to symptomatic women attending facilities, with most asymptomatic women perceiving no need for screening or fearing the implications of a positive result [6]. A scoping review of Indian screening programmes identified lower education, lower socioeconomic status, lack of transportation, and suboptimal services as barriers to participation [7].

These findings point to psychosocial determinants knowledge, beliefs, fear, and confidence rather than service availability alone as the primary obstacles. The Health Belief Model (HBM) provides an established framework for characterizing these determinants through perceived susceptibility, severity, benefits, barriers, cues to action, and self-efficacy, and HBM-based interventions emphasizing risk awareness and barrier reduction have increased screening uptake in several settings [8, 9]. However, population-specific data profiling these determinants among Indian women in the target age band, and quantifying which of them actually predict screening behaviour, remain limited. The present study therefore assessed knowledge of cervical cancer and VIA screening, characterized the HBM profile, and identified independent determinants of verified VIA screening uptake among women aged 30–49 years in central India.

MATERIALS AND METHODS

Study Design and Setting

This community-based cross-sectional study was conducted in the catchment areas of the Rural Health Training Centre, Khudel, and the Urban Health Training Centre, Sanghi Colony, attached to a medical college hospital in Indore, Madhya Pradesh, India. The inclusion of both rural and urban field practice areas was intended to reflect the socio-demographic diversity of the target population. Data reported here derive from the baseline assessment and verified screening records of a community trial of screening promotion; the present analysis is restricted to descriptive profiling and determinants of uptake.

Participants

Women aged 30–49 years who had resided in the study area for at least six months, were able to communicate in Hindi or English, had not been screened for cervical cancer in the preceding three years, and provided written informed consent were eligible. Women with a known diagnosis of cervical cancer, prior hysterectomy, current pregnancy, acute gynaecological conditions requiring immediate attention, severe mental illness or cognitive impairment, or participation in a similar screening programme in the past year were excluded. Eligible women were identified through community-based surveys and health camp registers, with mobilization support from Accredited Social Health Activists (ASHAs) and community health workers.

Sample Size

The sample size of 300 was determined for the parent trial to detect a difference in screening uptake between 15% and 35% with 80% power at a two-sided α of 0.05, allowing for 20% attrition. All 300 women who completed baseline assessment are included in this analysis.

Instruments

Three instruments were administered through face-to-face interview. A structured schedule collected socio-demographic characteristics (age, residence, education, occupation, income, marital status, religion, family type) and reproductive history (age at menarche, age at marriage, parity, contraceptive use). A 25-item knowledge questionnaire assessed understanding of cervical cancer causes, risk factors, signs and symptoms, and prevention, and of the VIA procedure, its benefits, and follow-up; items were scored as correct or incorrect, giving a total score of 0–25. Health beliefs were assessed using a 30-item scale adapted from Champion's Health Belief Model Scale, comprising perceived susceptibility (5 items), perceived severity (5), perceived benefits (5), perceived barriers (6), cues to action (4), and self-efficacy (5), each rated on a 5-point Likert scale from strongly disagree to strongly agree. Instruments were translated into Hindi and back-translated to English; content validity was established by experts in gynaecology, public health, and nursing, and face validity and comprehensibility were assessed by pilot testing with 30 women from the target population.

Outcome Ascertainment

VIA screening uptake was ascertained over six months of follow-up and verified against facility screening registers and medical records rather than relying on self-report alone.

Data Quality and Ethics

Data collectors were trained on the protocol and standardized procedures; 10% of responses were verified through repeat interviews. Data were double-entered into a secure electronic database and checked for completeness, consistency, and outliers. The study was approved by the Institutional Ethics Committee of the nursing college prior to commencement. Written informed consent was obtained from all participants in Hindi or English as preferred, participation was voluntary with the right to withdraw at any time, and confidentiality was maintained using unique study identifiers. Women with abnormal findings on screening were referred for appropriate follow-up and treatment.

Statistical Analysis

Continuous variables are summarized as mean ± standard deviation and categorical variables as frequencies and percentages. Determinants of VIA screening uptake were examined by logistic regression; variables of a priori interest (age, education, income, parity, knowledge score, and self-efficacy) were entered into a multivariable model, and crude and adjusted odds ratios with 95% confidence intervals are reported. Analyses were performed using SPSS version 26.0, with $p < 0.05$ considered statistically significant.

RESULTS

Socio-demographic and Reproductive Profile

Three hundred women completed the baseline assessment. The mean age was 39.7 ± 5.4 years, distributed fairly evenly across the four five-year age bands. Slightly more than half resided in urban areas (53.7%). Educational attainment was low: 15.7% had no formal education and 21.7% had completed only primary schooling, while 12.7% were graduates or above. The majority were homemakers (60.3%), and 35.0% reported a monthly family income below ₹10,000. Most were currently married (87.7%) and Hindu (73.0%), and 56.3% belonged to nuclear families (Table 1). Reproductive characteristics reflected early marriage and high parity typical of the region: mean age at menarche was 13.3 ± 1.2 years, mean age at marriage 20.0 ± 2.9 years, 45.0% of women had three or more children, and 64.0% had ever used contraception (Table 2).

Table 1: Socio-demographic characteristics of participants (N = 300)

Characteristic	Category	n (%)
Age group (years)	30–34	73 (24.3)
	35–39	82 (27.3)
	40–44	76 (25.3)
	45–49	69 (23.0)
Age (years), mean ± SD		39.7 ± 5.4
Residence	Urban	161 (53.7)
	Rural	139 (46.3)
Education	No formal education	47 (15.7)
	Primary	65 (21.7)
	Secondary	92 (30.7)
	Higher secondary	58 (19.3)
	Graduate & above	38 (12.7)
Occupation	Homemaker	181 (60.3)
	Unskilled / manual	55 (18.3)
	Skilled / semi-skilled	40 (13.3)
	Professional / clerical	24 (8.0)
Monthly family income (₹)	< 10,000	105 (35.0)
	10,000–20,000	123 (41.0)
	> 20,000	72 (24.0)
Marital status	Married	263 (87.7)
	Widowed / divorced / separated	37 (12.3)
Religion	Hindu	219 (73.0)
	Muslim	57 (19.0)
	Christian	17 (5.7)
	Other	7 (2.3)
Family type	Nuclear	169 (56.3)
	Joint	131 (43.7)

SD: *standard deviation.*

Table 2: Reproductive characteristics of participants (N = 300)

Variable	Category	Value
Age at menarche (years), mean ± SD		13.3 ± 1.2
Age at marriage (years), mean ± SD		20.0 ± 2.9
Parity, n (%)	0–1	45 (15.0)
	2	120 (40.0)
	3	90 (30.0)
	≥ 4	45 (15.0)
Ever used contraception, n (%)	Yes	192 (64.0)
	No	108 (36.0)

Knowledge of Cervical Cancer and VIA Screening

Knowledge was uniformly low. The mean knowledge score was 8.7 ± 3.2 out of a possible 25, corresponding to approximately one-third of items answered correctly. Deficits spanned all domains assessed the viral aetiology and risk factors for cervical cancer, its early symptoms, the existence and nature of the VIA procedure, and what a positive result entails. No participant achieved a score in the highest quartile of the scale, indicating a floor effect that reflects the near-absence of prior exposure to cervical cancer information in this population rather than variability in retention.

Health Belief Model profile

The health belief profile at baseline was characteristic of a population unlikely to seek screening (Table 3). Perceived barriers were the highest-scoring construct (3.45 ± 0.65 on a 1–5 scale), while self-efficacy (2.85 ± 0.65) and cues to action (2.65 ± 0.75) were the lowest. Perceived susceptibility was modest (2.95 ± 0.65), indicating that most women did not consider themselves personally at risk. Perceived severity (3.35 ± 0.75) and perceived benefits (3.15 ± 0.65) occupied intermediate positions, suggesting that women recognized cervical cancer as a serious disease and screening as broadly worthwhile, yet did not translate this into perceived personal relevance or confidence to act.

Table 3: Knowledge and Health Belief Model construct scores at baseline (N = 300)

Measure	Possible range	Mean ± SD
Knowledge score	0–25	8.7 ± 3.2
Perceived susceptibility	1–5	2.95 ± 0.65
Perceived severity	1–5	3.35 ± 0.75
Perceived benefits	1–5	3.15 ± 0.65
Perceived barriers	1–5	3.45 ± 0.65
Cues to action	1–5	2.65 ± 0.75
Self-efficacy	1–5	2.85 ± 0.65

Higher scores indicate stronger endorsement of the construct; for perceived barriers, higher scores indicate greater perceived obstacles to screening. SD: standard deviation.

Determinants of VIA Screening Uptake

Over six months of follow-up, verified VIA screening uptake in the cohort was low overall, consistent with national coverage estimates. On univariate analysis, secondary or higher education (crude OR 1.88, 95% CI 1.09–3.24), higher knowledge score (crude OR 1.14 per point, 95% CI 1.05–1.24), and higher self-efficacy (crude OR 1.62 per unit, 95% CI 1.14–2.30) were associated with uptake. After mutual adjustment, knowledge (adjusted OR 1.11 per point, 95% CI 1.02–1.21, p = 0.02) and self-efficacy (adjusted OR 1.48 per unit, 95% CI 1.02–2.15, p = 0.04) remained independent predictors, whereas education was attenuated to borderline significance (adjusted OR 1.74, 95% CI 0.97–3.12, p = 0.06). Age, family income, and parity showed no significant association with uptake in either crude or adjusted models (Table 4).

Table 4: Crude and adjusted determinants of VIA screening uptake at 6 months

Predictor	Crude OR (95% CI)	Adjusted OR (95% CI)	p-value
Age (per year)	0.97 (0.93–1.01)	0.98 (0.94–1.02)	0.31
Education: secondary or above vs below	1.88 (1.09–3.24)	1.74 (0.97–3.12)	0.06
Income > ₹10,000 vs ≤ ₹10,000	1.52 (0.86–2.69)	1.39 (0.76–2.55)	0.29
Parity ≥ 3 vs < 3	0.79 (0.46–1.36)	0.83 (0.47–1.47)	0.53
Knowledge score (per point)	1.14 (1.05–1.24)	1.11 (1.02–1.21)	0.02
Self-efficacy (per unit)	1.62 (1.14–2.30)	1.48 (1.02–2.15)	0.04

OR: odds ratio; CI: confidence interval. Adjusted model includes all listed variables simultaneously.

DISCUSSION

This community-based study of 300 women aged 30–49 years in central India documents a profile that helps explain persistently low cervical screening coverage: knowledge of cervical cancer and VIA screening averaged barely a third of the maximum score, perceived barriers were the dominant health belief, and self-efficacy and cues to action were the weakest. Critically, knowledge and self-efficacy not socio-economic position independently predicted whether women went on to be screened.

The extent of the knowledge deficit is consistent with the Indian literature. Mixed-methods studies among rural women in Gujarat have reported that only 17% had good knowledge of cervical cancer and 9% had ever been screened, and that only about a quarter of women had even heard of the disease, with early marriage, high parity, low education, and low socioeconomic status predicting poor knowledge [10]. That women in our sample scored uniformly low, with no high-scoring subgroup, indicates that the deficit is population-wide rather than concentrated in a hard-to-reach minority, and that awareness-raising has room to produce broad gains.

The health belief profile is equally informative. Women recognized cervical cancer as serious and screening as beneficial in the abstract, but did not perceive themselves as susceptible, did not feel able to act, and reported few prompts to do so. This pattern maps closely onto the observation from Tamil Nadu that asymptomatic women do not perceive a need for screening and fear the implications of a positive test [6]. The dominance of perceived barriers echoes qualitative work in rural and slum communities in India identifying stigma, competing economic priorities, fear of pain and of the result, mistrust of public services, and distance to facilities as leading obstacles [7].

The regression findings carry the clearest practical implication. That knowledge and self-efficacy independently predicted uptake, while income and parity did not, suggests that the primary constraints in this population are cognitive and motivational rather than purely structural. This is encouraging, because both are modifiable through counselling. It also cautions against information-only approaches: because self-efficacy contributed independently of knowledge, programmes that raise awareness without building confidence and removing felt obstacles are likely to shift beliefs more than behaviour. The international literature supports this reading a community health worker–led multimedia pilot among South Asian women improved perceived benefits and barriers yet failed to change actual screening uptake [11]. Conversely, theory-based nurse-led programmes that combine education with barrier problem-solving and self-efficacy building have significantly increased screening uptake in Kenya and in rural China [9, 12].

The borderline association with education has equity implications. If screening promotion materials assume literacy, they risk widening the gradient they are meant to close; pictorial flip charts, video, and local-language delivery are likely to be necessary for the roughly one in three women in this population with no formal or only primary education.

Strengths and Limitations

Strengths include the community-based sampling frame spanning both rural and urban field practice areas, the use of a Hindi-validated adaptation of a widely used HBM instrument, interviewer administration that reduced literacy-related non-response, and ascertainment of the screening outcome through facility registers rather than self-report. Limitations include the cross-sectional design, which cannot establish causal direction between beliefs and behaviour; recruitment from a single institution's catchment area, limiting generalizability to other states and health systems; potential social desirability bias in interview-administered belief measures; and the exclusion of women screened within the preceding three years, which by design restricts the sample to under-screened women and precludes comparison with regular attenders.

CONCLUSION

Women aged 30–49 years in this central Indian community begin from a position of profound knowledge deficit, high perceived barriers, low perceived susceptibility, and low self-efficacy regarding cervical cancer screening. Because knowledge and self-efficacy independently predicted verified screening uptake while socio-economic factors did not, demand-generation strategies should pair education with explicit barrier problem-solving and confidence building, delivered in formats accessible to women with limited literacy. Structured, theory-based counselling delivered through the community nursing and ASHA workforce is a logical vehicle for this, and warrants evaluation and scale-up within national screening programmes.

Declarations

Ethical Approval: Obtained from the Institutional Ethics Committee [approval number to be inserted]. Written informed consent was obtained from all participants.

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Conflicts of Interest: None declared.

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