**Title: Effectiveness of community-based culturally tailored cervical cancer awareness interventions among women and decision-making men in low-resource settings: A pre-post design evaluation**

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## Abstract

**Background:** Cervical cancer (CC) disproportionately affects women in low-resource settings (LRS), where screening uptake remains low. Limited CC awareness remains a key screening barrier. Although male household decision-makers often influence women's health decisions, they are infrequently targeted in awareness interventions. This study evaluated culturally tailored interventions to improve CC awareness among women and male household decision-makers in rural Uganda and Bangladesh.

**Methods:** A quasi-experimental pre-post design was applied using data from the PRevention and SCReening Innovation Project Towards Elimination of Cervical Cancer (PRESCRIP-TEC). The culturally tailored awareness intervention combined mass media with community health worker-led outreach. Multivariable logistic regression analysed the intervention's effects in improving CC awareness, measured as risk factor (RFK) and symptom knowledge (SK).

**Findings:** A total of 1453 pre-intervention (721 females [49·6%], 732 males) and 1889 post-intervention (1478 females [78·2%], 411 males) respondents were included. Compared to pre-intervention, both females (RFK = OR: 9·51, 95%CI: 7·52-12·02; SK = OR: 6·24, 95%CI: 5·03-7·74) and male household decision-makers (RFK = OR: 11·72, 95%CI: 8·03-17·10; SK = OR: 4·53, 95%CI: 3·31-6·19) had a significant improvement in CC awareness at post-intervention after controlling for country, age, education, marital status, lifetime CC screening, and female health decision-making status.

**Interpretation:** Engaging male household decision-makers and integrating mass media with community health worker outreach in culturally tailored awareness interventions effectively improves CC awareness across two socio-culturally distinct LRS. This approach can inform future policy and screening campaigns in LRS.



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## Research into context

**Evidence before study (incl.: sources searched, criteria used, start-end dates of search).**
A PubMed search covering Jan 1, 2015 – May 6, 2025 without language restrictions used the following terms ("uterine cervical neoplasm", "cervical cancer", "early detection of cancer", "screen*", "test*", "pap smear", "pap test", "papanicolou test", "papanicolou smear", "thinprep cytology*", "TCT", "HPV test*", "HPV samp*", "visual inspection with acetic acid", "VIA", "VILI", "visual inspection with lugol's iodine", "VIAC", "educat*", "uptak*", "atten*", "particip*", "adheren*", "knowledge", "attitude", "awareness", "perception", "accep*", "intention", "will*", "health education", "early intervention, education", "health promotion", "health campaign*", "awareness program", "rural", "countryside*", "village", "low resource setting*", "resource limited region*", "resource limited area", low and middle income countries). Of the 211 results, we identified three systematic reviews and 19 cervical cancer (CC) awareness interventions in low-resource settings (LRS) within low- and middle-income countries. The three systematic reviews included two in Sub-Saharan Africa and one worldwide review in rural settings. The reviews emphasised engaging with the community, involving male household decision-makers, use of mass media and community health workers (CHW), and tailor awareness to local contexts (e.g., language, culture, literacy levels and resource availability). Only five of the 19 intervention studies involved men in the interventions. These studies were implemented using CHW who conducted education sessions in homes, study sites or locations near clinics. Only one of these studies measured men's post-intervention CC awareness.

**Added value of this study (incl.: how findings add value to existing evidence)**
This study provides the first evaluation of an integrated CC awareness intervention using both culturally tailored mass media and CHW-led outreach targeting both male household decision-makers and women in two distinct LRS (rural Uganda and rural Bangladesh). Unlike prior studies, this is one of the few studies to measure the intervention's impact on male's CC awareness. Our findings show that adapting content to local literacy levels, language, culture and available resources, can significantly improve CC awareness among both women and male household decision-makers.

**Implications of all the available evidence (incl.: for practice and policy and future research).**
Women's CC screening participation is influenced by their own awareness, that of their male household decision-makers, and broader community understanding. Stigma and misconceptions among men and the broader community affects understanding of CC risk and women's access to and uptake of screening. The significant improvements of CC awareness in both women and male household decision-makers in two diverse LRS demonstrate the value of integrated, context-specific strategies, offering a model that can inform future programs and policy in similar settings. Future research should explore the longitudinal sustainability of awareness and screening following such an intervention as well as the cost-effectiveness of this approach.

## Introduction

Cervical cancer (CC) is the fourth most common cancer affecting women worldwide, with approximately 660,000 cases and 350,000 deaths in 2022.[1] Over 80% of both cases and deaths occur in low- and middle-income countries (LMICs), highlighting a significant global disparity.[2] CC is largely preventable given its primary cause, persistent infection of high-risk human papillomavirus (hrHPV).[3] Timely screening (e.g., hrHPV self-sampling) followed by early treatment, significantly improves survival.[4] The World Health Organization's (WHO) 2021 CC elimination strategy set a 2030 goal of 70% screening and 90% treatment.[5] Yet despite these ambitions, two-thirds of women worldwide aged 30-49 have never been screened and are frequently diagnosed at advanced stages of CC.[6] Within LMICs, rural women are screened less often and have higher CC rates than urban women, pointing to growing intra-country disparities.[7,8] These inequalities reflect deeper challenges that limit access and uptake of screening, especially in these rural remote low-resource settings (LRS) within LMICs.

Awareness of CC risk factors and symptoms is a key barrier to screening participation[9], often shaped by broader challenges of sociocultural norms, low education, low socioeconomic resources, and inadequate and inaccessible healthcare resources.[10,11] Misconceptions and cultural taboos about the disease distort understanding of its risks.[12] This is especially true for men, who are often less aware of CC than women, yet as husbands or partners, they often serve as primary decision-makers to women's screening.[13,14] However, most CC awareness interventions in LRS continue to solely target women. Some interventions in LRS have involved men, and have involved community health workers (CHWs) using home visits or location-based sessions (e.g., study sites or locations near clinics).[15–19] These approaches, while effective, may miss hard-to-reach groups, and can be limited in their effectiveness without broader community engagement. Combining CHW-led outreach with community-tailored mass media approaches can broaden reach, and reinforce key messages, helping to address community-wide stigma, misconceptions and low awareness more comprehensively.[20] To our knowledge, there has been no intervention evaluated to target both male household decision-makers and women living in LRS using a combined mass media approach with CHW-led outreach.

Thus, the objective of the current study is to evaluate an intervention that utilises both mass media and CHW-led outreach methods, among both females and male household decision-makers, and tailored to the contexts of two LRS to improve CC awareness. By evaluating the intervention in two diverse LRS, the study provides insight into strategies to improve awareness in these settings. We hypothesised that such an intervention will significantly increase CC awareness post-intervention in females and male household decision-makers living in LRS.

## Methods

### Context

This study was conducted within the PRevention and SCReening Innovation Project Towards Elimination of Cervical Cancer (PRESCRIP-TEC).[21–23] PRESCRIP-TEC aimed to evaluate the feasibility of 2021 WHO guidelines by implementing primary hrHPV self-sampling in LRS, which includes rural Bangladesh and rural Uganda. PRESCRIP-TEC intervention activities (see table S1) included:

1. community sensitisation activities to raise awareness in women and household decisionmakers about CC screening and treatment,
2. hrHPV self-sampling offered at home by CHW and,
3. building capacity for visual inspection with acetic acid (VIA) triage (Bangladesh) or VIA for visual assessment of treatment (Uganda) in local health systems to improve screening outcomes.

The community sensitisation activities employed culturally and resource tailored multimedia mass communication tools and CHWs used interpersonal communications to raise awareness among both female and male household decision-makers. The following catchment areas were included per country as these were selected as part of the PRESCRIP-TEC project:[22,23]

- Uganda (mid-Western region): Kakumiro with sub-districts including Mpassaana, Katikara, Kitaihuka, Birembo and Kisengwe.
- Bangladesh (northern and southern region): Gaibandha and Kurigram in the north, and Sathkira intervention areas in the south.

The study was registered in ClinicalTrials.gov, NCT05234112. Favourable Ethical Opinion for PRESCRIP-TEC activities was obtained from the country-specific research ethics committees:

- Bangladesh: Institutional Review Board of International Centre for Diarrheal Disease Research, Bangladesh (ICDDR,B), approval number PR-21029, approved on 30th January 2022;
- Uganda: Uganda Cancer Institute Research Ethics Committee, registration number: UCI-2021-29, approved on 5th April 2022.

### Intervention

The exact dates and duration for each country and the specific activities are provided in supplementary table S1.

***Pre-intervention survey:*** Prior to the implementation of the first two intervention activities, pre-implementation surveys were carried out in eligible catchment areas in each country, and lasted around 1-3 months.

***Intervention:*** PRESCRIP-TEC consortium partners tailored country-specific community sensitisation and mobilisation strategies based on the pre-intervention survey, as well as identifying key needs, local literacy levels, and socio-cultural barriers to CC screening uptake. For the latter, various media formats were tested to ensure which formats had wide coverage and most engagement given conditions of limited resources (e.g., limited internet and/or electricity). These strategies leveraged existing networks, employing trained CHWs from target communities. Communication efforts combined mass and interpersonal approaches, including local radio segments, newspaper advertisements, social media, posters, SMS campaigns, flyer distribution, door-to-door visits, group sessions, community theatre, and community leader engagement. Activities and materials were adapted to each country's context to enhance reach and effectiveness. Local teams received in-house training from PRESCRIP-TEC partnered organisations and a communication partner specialising in event organisation and social media marketing. Hr-HPV self-sampling was offered by CHWs using a door-to-door strategy in both countries.[24]

***Post-intervention survey:*** Participants were re-sampled from the same intervention areas with the same eligibility criteria. Post-intervention survey data was collected 6–12 months from the pre-intervention surveys. Country-specific intervention dates are provided in supplementary table S1. Overlap in intervention and post-intervention dates is explained by the phased strategy that was used per area of rolling out the interventions. When one area's intervention was in process or completed the post-intervention survey was collected before moving to the next area.

**Pre-post Evaluation**

For the presented analysis, the focus is on the awareness activities using a quasi-experimental design with different subpopulations surveyed pre- and post-intervention. These groups were considered comparable, as participants were recruited from the same rural areas using identical eligibility criteria.

**Measurements**

Surveys included demographic and awareness questionnaires at both pre- and post-intervention levels. Surveys are provided in the supplementary materials.

***Demographics:*** These included sex, age, education status, and marital status. Three female-specific demographic questions were also included: 1. The lifetime CC screening history (a participant would respond "yes/no" on whether a healthcare worker ever screened them for CC). 2. Women were asked about who made decisions regarding their health - they could select the from following: "myself", "partner only", "myself and partner", "someone else in the household", or "myself and someone else in the household". 3. In the post-intervention survey, women were asked an additional closed Yes/No question on whether or not they participated in the hrHPV self-sampling that was offered as part of the PRESCRIP-TEC project.

***Awareness:*** The second questionnaire was the adapted CC sub-section of the African Woman Awareness of CANcer (AWACAN).[25] This 41-items validated questionnaire assesses CC awareness across several domains: risk factors, symptoms, lay beliefs, confidence in appraisal, help-seeking behaviours, and barriers to accessing health care. For this study, we focused on two AWACAN domains: risk factor knowledge and symptom knowledge. Items are a list of 11 risk factors to CC and 12 CC symptoms where participants respond with a "Yes", "No", or "I don't know". Only correct responses are scored on a continuous scale, with higher numbers indicating better awareness of CC risk factors and symptoms, respectively. Questionnaires were contextualised and translated using forward and backward translation. The questionnaire, originally intended for only females was also adapted to ask males. This was done in consultation with experts and members of the target groups in each country.

**Participants**

Female participants were eligible if they met pre-defined age groups in accordance with PRESCRIP-TEC CC screening practices, as determined by local implementing partners: Bangladesh (30-60 years) and Uganda (30-49 years). Exclusion criteria included pregnancy, a history of hysterectomy, current signs and symptoms suggestive of CC, prior ablative or excisional treatment for CC, or vaginal infection. Eligible females and male decision-makers from the same household had to provide written or oral informed consent with a representative signing for oral consent. They were also required to understand and respond to survey questions, and willing to be interviewed privately. Country-specific sampling procedures are detailed in pre-intervention publications,[22,23] and the same methods were applied during the post-intervention phase. All participants who completed the AWACAN at pre- or post-levels were included in the presented analysis in this study (see Figure 1).

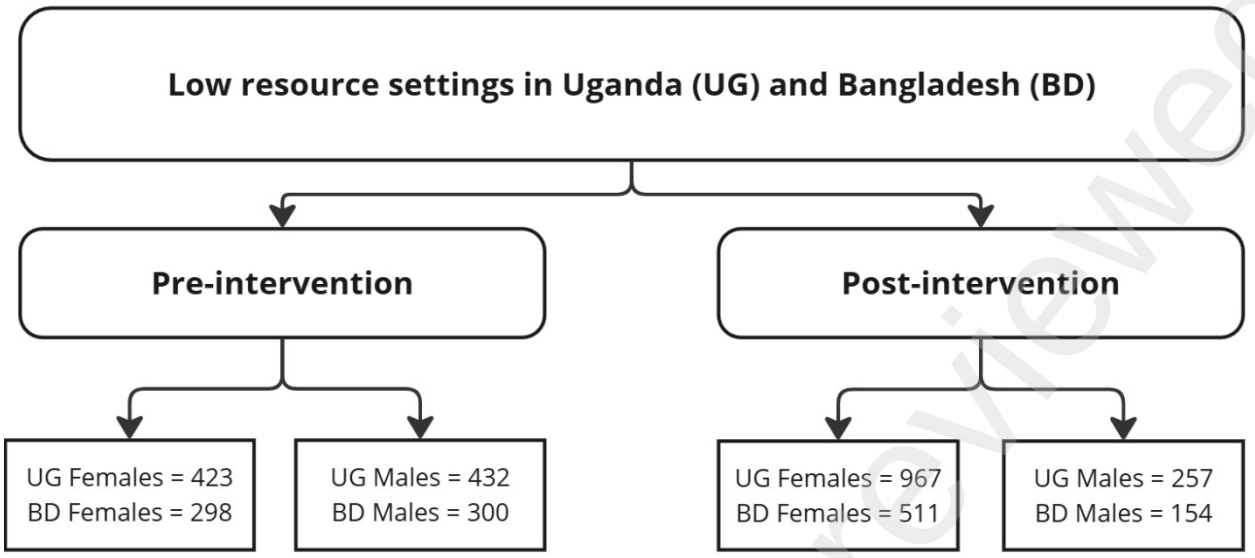


**Figure 1.** Participant flowchart used in the presented analysis for both low-resource settings stratified by pre- and post-intervention level

**Outcome**

The primary outcome of the presented analysis was CC awareness in females and male household decision-makers operationalised as risk factor knowledge and symptom knowledge as measured by the AWACAN.

**Covariates**

Covariates included country, age, education level, and marital status. Education was grouped as "No education" (no formal education or incomplete primary school) and "Primary education and higher." Marital status was collapsed into “with” (married or cohabiting) or “without” partner (never married/single, divorced, separated, or widowed). Female-specific question of health decision-making status’ responses were collapsed into "myself" or "not myself/joint decision-making".

**Statistical Analysis**

Baseline characteristics as well as risk factor knowledge and symptom knowledge scores were described at pre-/post-levels. This was done separately for female and male participants. Due to skewness, continuous variables were dichotomized at the median. Prior to performing the logistic regression analyses, we analysed missing data patterns and applied multiple imputations (n = 5) to fill in for missing values. Thereafter, univariate and multivariable analyses were performed for both sexes, where pre-/post-intervention level, country, age, education, marital status were used as predictors to risk factor and symptom knowledge scores. Lifetime CC screening and health decision-making status were an added predictor in the female-only models. Finally, a complete case analysis was conducted as a sensitivity analyses. All analyses used an alpha of 5% for significance and were conducted using Statistical Package for Social Sciences version 26.

**Role of the funding source**

The funding agencies of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

## Results

### Population Characteristics

Table 1 shows the population characteristics. The sample consisted of 1453 pre-intervention respondents and 1889 post-intervention respondents (57%). In total, 2199 females (66%) and 1143 male household decision-makers from both LRS across both pre-/post-intervention levels were included. Females were aged between 30 to 60 years ($M_{Age}$ = 37·11 years, $SD_{Age}$ = 6·09), while male household decision-makers were aged between 20 to 79 years ($M_{Age}$ = 41·36 years, $SD_{Age}$ = 7·95). Respondents often reported having a partner, and having no education. Females in both countries often reported that they did not make autonomous decision-makers regarding their health. Overall, the characteristics between the pre- and post-intervention samples were similar, although there were differences in education level for both sexes.

**Table 1. Demographic data stratified by country and pre-/post-intervention levels**

| | | Rural Uganda | | Rural Bangladesh | | Total |
|---|---|---|---|---|---|---|
| **Females** | | **Pre- (N = 423)** | **Post- (N = 967)** | **Pre- (N = 298)** | **Post- (N = 511)** | **Females (N = 2199)** |
| **Age[a] n, %** | | | | | | |
| < 36 years | | 147, 34·8% | 546, 56·5% | 137, 46·0% | 183, 35·8% | 1013, 46·1% |
| ≥ 36 years | | 208, 49·2% | 421, 43·5% | 161, 54·0% | 328, 64·2% | 1118, 50·8% |
| Missing | | 68, 16·1% | ·· | ·· | ·· | 68, 3·1% |
| **Marital status n, %** | | | | | | |
| No partner | | 51, 12·1% | 41, 4·2% | ·· | 10, 2·0% | 102, 4·6% |
| Partner | | 305, 72·1% | 926, 95·8% | 298, 100% | 501, 98·0% | 2030, 92·3% |
| Missing | | 67, 15·8% | ·· | ·· | ·· | 67, 3·0% |
| **Highest level of education n, %** | | | | | | |
| No education | | 254, 60·0% | 624, 64·5% | 275, 92·3% | 275, 53·8% | 1428, 64·9% |
| Primary Education and Higher | | 102, 24·1% | 343, 35·5% | 23, 7·7% | 236, 46·2% | 704, 32·0% |
| Missing | | 67, 15·8% | ·· | ·· | ·· | 67, 3·0% |
| **Health Decision-maker n, %** | | | | | | |
| Myself | | 114, 27·0% | 133, 13·8% | 8, 2·7% | 13, 2·5% | 268, 12·2% |
| Partner, Someone else in the household or Joint | | 309, 73·0% | 832, 86·0% | 289, 97·0% | 498, 97·5% | 1928, 87·7% |
| Missing | | ·· | 2, 0·2% | 1, 0·3% | ·· | 3, 0·1% |
| | | | | | | |
| **Male household decision-maker** | | **Pre- (N = 432)** | **Post- (N = 257)** | **Pre- (N = 300)** | **Post- (N = 154)** | **Males (N = 1143)** |
| **Age[a] n, %** | | | | | | |
| < 40 years | | 237, 54·9% | 100, 38·9% | 94, 31·3% | 26, 16·9% | 457, 40·0% |
| ≥ 40 years | | 149, 34·5% | 157, 61·1% | 206, 68·7% | 126, 81·8% | 638, 55·8% |
| Missing | | 46, 10·6% | ·· | ·· | 2, 1·3% | 48, 4·2% |
| **Marital status n, %** | | | | | | |
| No partner | | 71, 16·4% | 2, 0·8% | ·· | ·· | 73, 6·4% |
| Partner | | 313, 72·5% | 255, 99·2% | 300, 100% | 152, 98·7% | 1020, 89·2% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Missing | | 48, 11·1% | ·· | ·· | 2, 1·3% | 50, 4·4% |
| **Highest level of education n, %** | | | | | | | |
| | No education | | 285, 66·0% | 82, 31·9% | 259, 86·3% | 92, 59·7% | 718, 62·8% |
| | Primary Education and Higher | | 102, 23·6% | 175, 68·1% | 41, 13·7% | 60, 39·0% | 378, 33·1% |
| | Missing | | 45, 10·4% | ·· | ·· | 2, 1·3% | 47, 4·1% |

***Note.*** [a]*Age was split at the median.*

As shown in Table 2 below, higher scores were seen across the indicators of awareness between the pre- and post-intervention survey, such that the participants scored higher at post-intervention with some variation between countries (Table 2). CC screening was lowest at pre-intervention level but increases with the awareness-raising intervention and the implementation of hrHPV self-sampling.

**Table 2. Indicators for awareness stratified by country and pre-/post-intervention levels**

| | | | Rural Uganda | | Rural Bangladesh | | Total |
|---|---|---|---|---|---|---|---|
| **Females** | | | **Pre- (N = 423)** | **Post- (N = 967)** | **Pre- (N = 298)** | **Post- (N = 511)** | **Females (N = 2199)** |
| **Risk Factor knowledge[a] n, %** | | | | | | | |
| | Low scores | | 289, 68·3% | 370, 38·3% | 260, 87·2% | 151, 29·5% | 1070, 48·7% |
| | High scores | | 112, 26·5% | 560, 57·9% | 38, 12·8% | 360, 70·5% | 1070, 48·7% |
| | Missing | | 22, 5·2% | 37, 3·8% | ·· | ·· | 59, 2·7% |
| **Symptom knowledge[a] n, %** | | | | | | | |
| | Low scores | | 255, 60·3% | 199, 20·6% | 198, 66·4% | 138, 27·0% | 790, 35·9% |
| | High scores | | 135, 31·9% | 741, 76·6% | 100, 33·6% | 373, 73·0% | 1349, 61·3% |
| | Missing | | 33, 7·8% | 27, 2·8% | ·· | ·· | 60, 2·7% |
| **Lifetime cervical cancer screening prevalence n, %** | | | 28, 6·6% | 394, 40·7% | 29, 9·7% | 66, 12·9% | 517, 23·5% |
| | Missing | | 16, 3·8% | 27, 2·8% | 1, 0·3% | 11, 2·2% | 55, 2·5% |
| **Uptake of hrHPV self-sampling[b] n, %** | | | ·· | 618, 63·9% | ·· | 467, 91·4% | 1085, 73·4% |
| | Missing | | ·· | 317, 32·8% | ·· | 25, 4·9% | 342, 23·1% |
| | | | | | | | |
| **Male household decision-maker** | | | **Pre- (N = 432)** | **Post- (N = 257)** | **Pre- (N = 300)** | **Post- (N = 154)** | **Males (N = 1143)** |
| **Risk Factor knowledge[a] n, %** | | | | | | | |
| | Low scores | | 222, 51·4% | 17, 6·6% | 201, 67·0% | 27, 17·5% | 467, 40·9% |
| | High scores | | 176, 40·7% | 220, 85·6% | 95, 31·7% | 125, 81·2% | 616, 53·9% |
| | Missing | | 34, 7·9% | 20, 7·8% | 4, 1·3% | 2, 1·3% | 60, 5·2% |
| **Symptom knowledge[a] n, %** | | | | | | | |
| | Low scores | | 208, 48·1% | 44, 17·1% | 173, 57·7% | 45, 29·2% | 470, 41·1% |
| | High scores | | 199, 46·1% | 207, 80·5% | 120, 40·0% | 107, 69·5% | 633, 55·4% |
| | Missing | | 25, 5·8% | 6, 2·3% | 7, 2·3% | 2, 1·3% | 40, 3·5% |

***Note.*** *[a]Risk factor and symptom knowledge scores were split at the median. [b]hrHPV = high-risk human papillomavirus. HrHPV self-sampling was offered during the intervention and post-intervention period.*

**CC awareness improvement in LRS**

Univariate analyses for both females and male household decision-makers are provided in the supplementary tables S2 and S3. Figure 2 displays the Forest plot of the multivariable analysis assessing the association between post-intervention status and CC awareness outcomes, by sex. Compared to the pre-intervention group, post-intervention women had significantly higher odds of scoring high on both risk factor (N = 2140, OR = 9·51) and symptom knowledge (N = 2139, OR = 6·24), after adjusting for country, age, education, marital status, women's health decision-making status, and prior CC screening history.

Among male household decision-makers, post-intervention men had significantly higher odds of scoring high on both risk factor (N = 1083, OR = 11·72) and symptom knowledge (N = 1103, OR = 4·60), compared to their pre-intervention counterparts, after adjusting for country, age, education, and marital status.

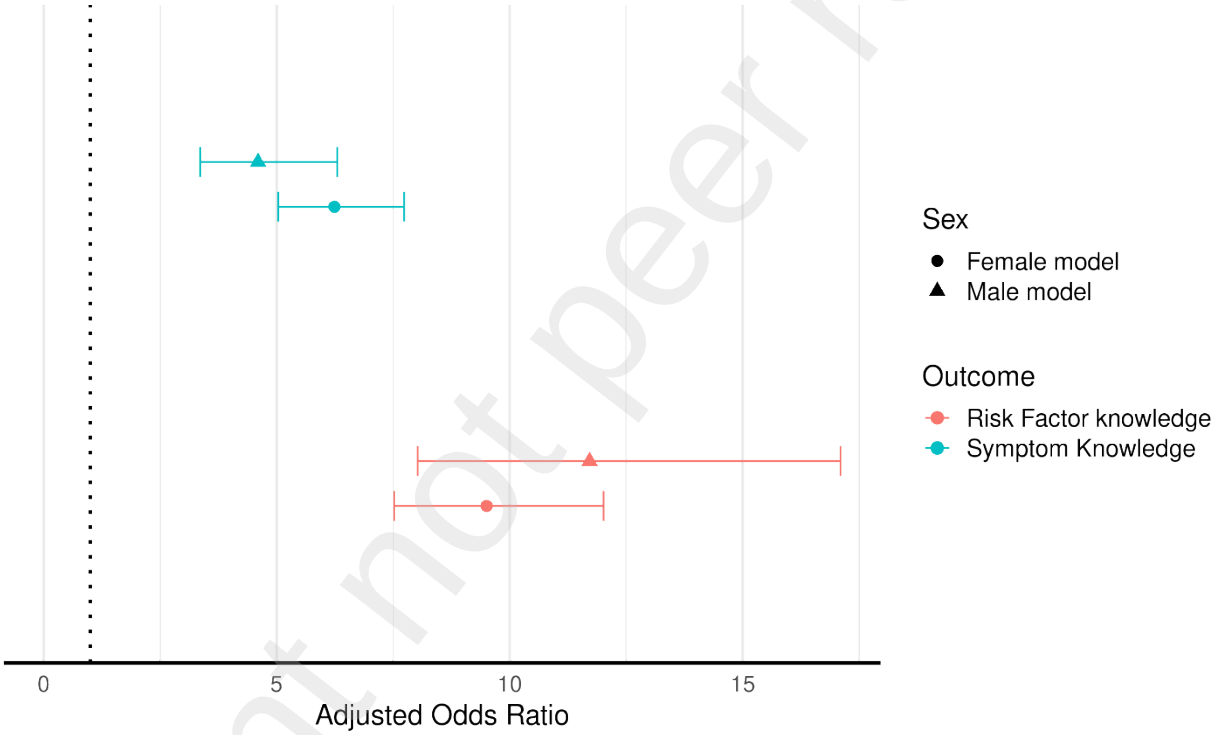


**Figure 2.** The association between pre-/post-intervention status and cervical cancer awareness outcomes, by sex (multivariable analysis, adjusted odds ratio)

***Note.*** Pre-intervention is used as the reference group. All models adjust for country, age, education and marital status. Female models additionally adjust for health decision-making status and lifetime cervical cancer screening.

Some determinants were associated with CC awareness and lifetime CC screening (see supplementary tables S4 and S5). Women with primary education or higher, showed smaller improvements in risk factor knowledge than those with no education. Similarly, women who reported previous CC screening showed smaller improvements in risk factor knowledge than those never screened. Among male household decision-makers, rural Ugandan males had higher CC awareness improvements than rural Bangladeshi males.

**Sensitivity analysis**

The results between the imputed dataset analysis and the complete case analysis were comparable and consistent. Both analyses found after adjustment significantly higher odds of scoring high in CC awareness domains in both females and male household decision-makers, see supplementary tables S6 and S7.

## Discussion

This study evaluated a CC awareness intervention that combined mass media and CHW-led outreach, tailored to local cultural and health system contexts in two distinct LRS (rural Uganda and rural Bangladesh) among both women and male household decision-makers. We hypothesised that this comprehensive tailored intervention would improve CC awareness (measured as risk factor and symptom knowledge). Our hypothesis was supported, in that both women and male household decision-makers living in LRS had significantly higher CC awareness following this intervention.

The results align with a systematic review about interventions in rural areas that focus on improving women's CC awareness.[11] However, only one previous study has assessed CC awareness change among men in LRS. Vahabi and colleagues[19] reported improvements in both men's and women's awareness after a CHW-led program in rural India, though women's attitudes toward CC decreased, possibly due to entrenched gender norms and sociocultural stigma. This can be alleviated through broader community engagement using mass media.[20,26] However, this approach was not included in their study, as the intervention took place at a study site. Their results are common challenges to community-based CC interventions as women often rely on other women for health information in LRS.[26] This often leads to inaccurate information due to community misconceptions and myths.[26] Mass media channels such as radio can reach the most remote communities with limited electricity or internet.[20,26] In many communities, it is part of the culture for people to gather in the evenings to listen to the radio together.[26] This might explain why the greatest improvements in our study were found among women with no education, no previous CC screening, and who had lower pre-intervention CC awareness.

There are several strengths to our study. We studied a unique intervention that targets both women and male household decision-makers in LRS through a combination of mass media and CHW-led outreach. Our study is innovative, in that it is one of the few studies that quantitatively evaluates both women's and men's post-intervention CC awareness. In doing so, we can evaluate the reach and impact of the intervention on males who play a pivotal role in women's CC screening but generally lack awareness of CC.[12] While male household decisionmakers' role are central, in Bangladesh, mothers-in-law also strongly influence women's health decisions. The study has strong external validity in its evaluation of the intervention in two continentally diverse LRS. While there are important contextual differences, the overall consistency of effect suggests that tailored comprehensive approach can be effective and applicable across diverse settings. We also demonstrate the feasibility of using the adapted AWACAN to measure awareness in different LRS. This addresses a common gap noted in systematic reviews of the overuse of self-developed unvalidated questionnaires which have shown high heterogeneity and make it difficult to perform meta-analyses.[11,27] Additionally, the study's sample size is larger than those in previous LRS interventions,[11,12,27] which increases the confidence in our findings. However, the results should be interpreted with some caution. It is possible that women at post-intervention misunderstood the question on lifetime CC screening prevalence and indicated "yes" to the question, thus demonstrating elevated prevalence at post-intervention due to PRESCRIP-TEC's implementation of the hrHPV self-sampling. Additionally, different but comparable groups were used for pre- and post-intervention surveys, wherein the intervention effect could be influenced by the characteristics of the population and reduce causality compared to repeated measures design. Nevertheless, the quasi-experimental design offers a practical and feasible design to reach hard-to-reach LRS, especially when long-term follow-up is not possible. It allows for timely evaluation of interventions under logistical and time constraints, which

limited the number of AWACAN invitations to male household decisionmaker respondents at the post-intervention stage.

The pre-intervention reported lifetime CC screening prevalence observed in our study is comparable to previous literature's findings for both countries.[6] After provision of hrHPV self-sampling, 73·4% of women in the study population participated in CC screening, meeting the World Health Organization's screening target.[5] This aligns with the literature of the effectiveness of hrHPV self-sampling in increasing uptake.[27,28]
Around 88% of women reported not being the sole decision-maker of their health. Male involvement is known to be a key facilitating factor to CC screening uptake.[12] The improvements in CC awareness among both women and men in our study suggest that engaging households and communities through a comprehensive approach can help address CC awareness gaps and increase demand for screening. As mass media is already part of community life, combining it with CHW outreach efforts offers a feasible and accessible way to disseminating CC information. This is necessary to supplement the challenges of CHW outreach efforts, such as high turnover which affect trust and long-term sustainability of CC screening uptake.[29,30]

In conclusion, this study demonstrates that involving male household decision-makers and engaging communities through a culturally tailored, comprehensive intervention using mass media and CHW outreach can effectively improve CC awareness among both women and male household decision-makers in two diverse LRS. Such an intervention can serve as a model for future implementation efforts and policy to reduce within-country disparities. Prioritising awareness and screening in LRS is a practical strategy for policymakers, as these areas carry a disproportionately high share of disease burden.[7,11] Exploring long-term effectiveness and cost-effectiveness of such an intervention will further support policymaker decision making, particularly in LRS.

**Contributors**
FAKS, JDZ, GHDB, JK, KV contributed to the development of the study, study design, data analyses and interpretation. FAKS, JDZ, GHDB, JK, KV, OCV contributed to the manuscript preparation. Prevention and Screening Innovation Project–Towards Elimination of Cervical Cancer (PRESCRIP-TEC) consortium members (JDZ, JK, OCV, CA, DA, NN, MUK, AR, MDF, CC) developed the surveys, were involved in the intervention implementation and data acquisition efforts in both countries. All authors contributed to the refinement and approval of the final manuscript. All authors had full access to study data and had final responsibility for the decision to submit for publication.

**Data Sharing**
De-identified participant data that underlie the results reported in this article will be made available for related research and analysis upon reasonable written request to the corresponding author following publication.

**Declaration of interests**
The Cepheid company made part of the laboratory equipment available for the PRESCRIP-TEC research in Bangladesh and Uganda, but was not involved in the research design, data collection or analysis. All authors declare that neither they or their institutions have received direct funding from industry for this or any other research project.

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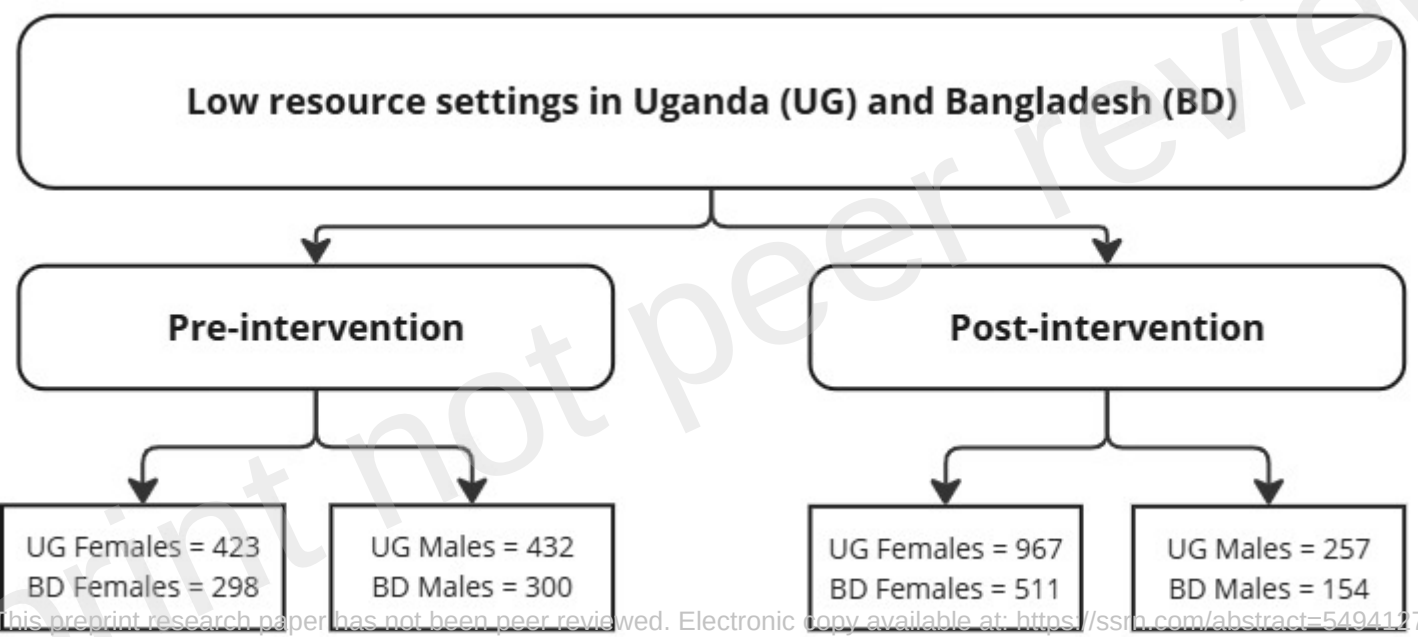

**Table 1. Demographic data stratified by country and pre-/post-intervention levels**

| | | Rural Uganda | | Rural Bangladesh | | Total |
|---|---|---|---|---|---|---|
| **Females** | | **Pre- (N = 423)** | **Post- (N = 967)** | **Pre- (N = 298)** | **Post- (N = 511)** | **Females (N = 2199)** |
| **Age[a] n, %** | | | | | | |
| < 36 years | | 147, 34·8% | 546, 56·5% | 137, 46·0% | 183, 35·8% | 1013, 46·1% |
| ≥ 36 years | | 208, 49·2% | 421, 43·5% | 161, 54·0% | 328, 64·2% | 1118, 50·8% |
| Missing | | 68, 16·1% | ·· | ·· | ·· | 68, 3·1% |
| **Marital status n, %** | | | | | | |
| No partner | | 51, 12·1% | 41, 4·2% | ·· | 10, 2·0% | 102, 4·6% |
| Partner | | 305, 72·1% | 926, 95·8% | 298, 100% | 501, 98·0% | 2030, 92·3% |
| Missing | | 67, 15·8% | ·· | ·· | ·· | 67, 3·0% |
| **Highest level of education n, %** | | | | | | |
| No education | | 254, 60·0% | 624, 64·5% | 275, 92·3% | 275, 53·8% | 1428, 64·9% |
| Primary Education and Higher | | 102, 24·1% | 343, 35·5% | 23, 7·7% | 236, 46·2% | 704, 32·0% |
| Missing | | 67, 15·8% | ·· | ·· | ·· | 67, 3·0% |
| **Health Decision-maker n, %** | | | | | | |
| Myself | | 114, 27·0% | 133, 13·8% | 8, 2·7% | 13, 2·5% | 268, 12·2% |
| Partner, Someone else in the household or Joint | | 309, 73·0% | 832, 86·0% | 289, 97·0% | 498, 97·5% | 1928, 87·7% |
| Missing | | ·· | 2, 0·2% | 1, 0·3% | ·· | 3, 0·1% |
| | | | | | | |
| **Male household decision-maker** | | **Pre- (N = 432)** | **Post- (N = 257)** | **Pre- (N = 300)** | **Post- (N = 154)** | **Males (N = 1143)** |
| **Age[a] n, %** | | | | | | |
| < 40 years | | 237, 54·9% | 100, 38·9% | 94, 31·3% | 26, 16·9% | 457, 40·0% |
| ≥ 40 years | | 149, 34·5% | 157, 61·1% | 206, 68·7% | 126, 81·8% | 638, 55·8% |
| Missing | | 46, 10·6% | ·· | ·· | 2, 1·3% | 48, 4·2% |
| **Marital status n, %** | | | | | | |
| No partner | | 71, 16·4% | 2, 0·8% | ·· | ·· | 73, 6·4% |
| Partner | | 313, 72·5% | 255, 99·2% | 300, 100% | 152, 98·7% | 1020, 89·2% |
| Missing | | 48, 11·1% | ·· | ·· | 2, 1·3% | 50, 4·4% |
| **Highest level of education n, %** | | | | | | |
| No education | | 285, 66·0% | 82, 31·9% | 259, 86·3% | 92, 59·7% | 718, 62·8% |
| Primary Education and Higher | | 102, 23·6% | 175, 68·1% | 41, 13·7% | 60, 39·0% | 378, 33·1% |
| Missing | | 45, 10·4% | ·· | ·· | 2, 1·3% | 47, 4·1% |

***Note.*** [a]*Age was split at the median.*

**Table 2. Indicators for awareness stratified by country and pre-/post-intervention levels**

| | | Rural Uganda | | Rural Bangladesh | | Total |
|---|---|---|---|---|---|---|
| **Females** | | **Pre- (N = 423)** | **Post- (N = 967)** | **Pre- (N = 298)** | **Post- (N = 511)** | **Females (N = 2199)** |
| **Risk Factor knowledge[a] n, %** | | | | | | |
| Low scores | | 289, 68·3% | 370, 38·3% | 260, 87·2% | 151, 29·5% | 1070, 48·7% |
| High scores | | 112, 26·5% | 560, 57·9% | 38, 12·8% | 360, 70·5% | 1070, 48·7% |
| Missing | | 22, 5·2% | 37, 3·8% | ·· | ·· | 59, 2·7% |
| **Symptom knowledge[a] n, %** | | | | | | |
| Low scores | | 255, 60·3% | 199, 20·6% | 198, 66·4% | 138, 27·0% | 790, 35·9% |
| High scores | | 135, 31·9% | 741, 76·6% | 100, 33·6% | 373, 73·0% | 1349, 61·3% |
| Missing | | 33, 7·8% | 27, 2·8% | ·· | ·· | 60, 2·7% |
| **Lifetime cervical cancer screening prevalence n, %** | | 28, 6·6% | 394, 40·7% | 29, 9·7% | 66, 12·9% | 517, 23·5% |
| Missing | | 16, 3·8% | 27, 2·8% | 1, 0·3% | 11, 2·2% | 55, 2·5% |
| **Uptake of hrHPV self-sampling[b] n, %** | | ·· | 618, 63·9% | ·· | 467, 91·4% | 1085, 73·4% |
| Missing | | ·· | 317, 32·8% | ·· | 25, 4·9% | 342, 23·1% |
| | | | | | | |
| **Male household decision-maker** | | **Pre- (N = 432)** | **Post- (N = 257)** | **Pre- (N = 300)** | **Post- (N = 154)** | **Males (N = 1143)** |
| **Risk Factor knowledge[a] n, %** | | | | | | |
| Low scores | | 222, 51·4% | 17, 6·6% | 201, 67·0% | 27, 17·5% | 467, 40·9% |
| High scores | | 176, 40·7% | 220, 85·6% | 95, 31·7% | 125, 81·2% | 616, 53·9% |
| Missing | | 34, 7·9% | 20, 7·8% | 4, 1·3% | 2, 1·3% | 60, 5·2% |
| **Symptom knowledge[a] n, %** | | | | | | |
| Low scores | | 208, 48·1% | 44, 17·1% | 173, 57·7% | 45, 29·2% | 470, 41·1% |
| High scores | | 199, 46·1% | 207, 80·5% | 120, 40·0% | 107, 69·5% | 633, 55·4% |
| Missing | | 25, 5·8% | 6, 2·3% | 7, 2·3% | 2, 1·3% | 40, 3·5% |

***Note.*** *[a]Risk factor and symptom knowledge scores were split at the median. [b]hrHPV = high-risk human papillomavirus. HrHPV self-sampling was offered during the intervention and post-intervention period.*