

# Community-Based Education on Cervical Cancer Screening Uptake in Rural Women

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## ABSTRACT

**Background:** Cervical cancer is largely preventable through timely screening, yet screening participation remains limited in many rural communities because of inadequate awareness and sociocultural and healthcare-access barriers. **Objective:** To evaluate changes in cervical cancer knowledge and Pap-smear screening uptake following structured community-based health education among rural women in Quetta, Pakistan, and to identify barriers to screening. **Methods:** A single-group quasi-experimental pre-test and post-test study included 220 married women aged 21–60 years recruited through non-probability convenience sampling from selected rural communities. Participants completed a structured questionnaire before receiving small-group education delivered by trained female health workers and were reassessed after the intervention. Knowledge of symptoms, risk factors, prevention, and Pap-smear screening was assessed using dichotomously scored items, while screening behaviour and barriers were recorded descriptively. **Results:** The mean total knowledge score increased from  $5.8 \pm 2.4$  before the intervention to  $15.5 \pm 2.9$  after the intervention, an absolute increase of 9.7 points ( $p < 0.001$ ). Improvements were also observed in knowledge of symptoms, risk factors, prevention, and Pap-smear screening (all  $p < 0.001$ ). At baseline, 17 women (7.7%) reported previous Pap-smear screening, whereas 64 women (29.1%) reported undergoing screening following the educational intervention. Persistent barriers included fear or shyness, family permission, lack of female healthcare providers, transportation difficulties, distance, financial constraints, and uncertainty regarding where screening was available. **Conclusion:** Community-based education was followed by substantial improvement in cervical cancer knowledge and greater screening participation; however, persistent sociocultural and service-access barriers indicate that education should be integrated with accessible, culturally acceptable screening pathways. **Keywords:** Cervical cancer; Pap smear; Screening uptake; Community-based education; Rural women; Health education; Pakistan.

## INTRODUCTION

Cervical cancer remains an important preventable cause of cancer morbidity and mortality among women, with a disproportionate burden in low- and middle-income countries. The disease typically develops through a prolonged precancerous phase, creating an opportunity for prevention and early detection through organized screening. Persistent disparities in cervical cancer incidence and mortality are strongly associated with inadequate screening coverage, limited access to preventive services, delayed diagnosis, and unequal availability of human papillomavirus (HPV) vaccination and treatment services (1–5).

Persistent infection with oncogenic HPV types is the principal biological determinant of cervical carcinogenesis, and high-risk HPV infection has been demonstrated among women with cervical cancer in Pakistan (6,7). Screening strategies including cervical cytology, HPV testing, and visual inspection

approaches can identify precancerous cervical abnormalities before progression to invasive disease. Evidence from low-resource settings has demonstrated that appropriately implemented screen-and-treat and HPV-based screening strategies can reduce advanced disease and cervical cancer mortality when screening is accompanied by effective follow-up and treatment pathways (8,9).

Despite the preventability of cervical cancer, awareness and utilization of screening services remain limited in Pakistan. Studies conducted among Pakistani women have identified inadequate knowledge of cervical cancer, HPV infection, cervical screening, and HPV vaccination, together with low participation in preventive screening practices (10–14). These deficiencies have been observed even among women attending healthcare facilities, indicating that awareness may be particularly limited among women in geographically underserved communities with less routine contact with formal preventive health services (10–13).

Women living in rural communities may encounter interacting informational, sociocultural, and health-system barriers to cervical cancer screening. Fear of the procedure or diagnosis, embarrassment associated with reproductive health examinations, limited knowledge of where screening is available, financial constraints, transportation difficulties, and dependence on family support may all influence screening behaviour. Systematic evidence indicates that educational, cultural, interpersonal, and service-access barriers are particularly relevant when cervical cancer prevention programmes are implemented in rural and otherwise underserved populations (15,16). These constraints may be especially important in communities surrounding Quetta, where distance from healthcare facilities and limited availability of female healthcare providers can further restrict access to preventive services.

Community-based health education offers a potentially practical strategy for addressing informational and behavioural barriers because preventive messages can be delivered within communities through female health workers, community volunteers, counselling sessions, and culturally appropriate educational material. Community- and health-worker-led interventions have improved cervical cancer knowledge and screening participation in settings including Nepal, Bangladesh, Ethiopia, and Nigeria (17–21). These studies suggest that locally delivered education can increase awareness and facilitate screening behaviour, although educational interventions are likely to have greater impact when accessible screening and referral services are available.

Evidence concerning community-delivered cervical cancer education among rural women in Balochistan remains limited. Understanding whether a structured educational intervention is followed by improved cervical cancer knowledge and greater screening participation may therefore inform locally appropriate prevention strategies. The present study evaluated changes in cervical cancer knowledge and Pap-smear screening uptake following structured community-based health education among married rural women in Quetta, Pakistan, and identified the principal barriers reported by women who did not undergo screening.

## MATERIALS AND METHODS

A quasi-experimental single-group pre-test and post-test study was conducted in selected rural communities surrounding Quetta, Pakistan. The study evaluated changes in cervical cancer knowledge and Pap-smear screening behaviour following a structured community-based health education intervention. Participants underwent a baseline assessment before receiving the educational intervention and were subsequently reassessed to determine changes in knowledge and screening behaviour.

The study population comprised married women aged 21–60 years residing in the selected rural communities. Women who were seriously ill, previously diagnosed with cervical cancer, pregnant at the time of data collection, unwilling to participate, or unable to complete both the pre-intervention and post-intervention assessments were excluded. A total of 220 women fulfilled the eligibility requirements and completed both assessments.

Participants were recruited using non-probability convenience sampling. Potential participants were approached through community meetings, lady health workers, and local female volunteers. The purpose and procedures of the study were explained in accessible language, participation was voluntary, and written consent or a thumb impression was obtained before enrolment. Participants were informed that they could discontinue participation without penalty.

Data were collected using a structured questionnaire developed following review of previous literature concerning cervical cancer awareness and screening. The instrument comprised four principal domains. The first collected sociodemographic information, including age, education, marital status, occupation, parity, monthly household income, and distance from the nearest healthcare facility. The second assessed knowledge of cervical cancer, including symptoms, risk factors, HPV infection, and prevention. The third evaluated awareness of Pap-smear screening and previous screening history, while the fourth assessed potential barriers to screening, including fear, embarrassment or shyness, family permission, cost, availability of female healthcare providers, transportation difficulties, distance from healthcare facilities, and uncertainty regarding where screening was available.

Before the main study, the questionnaire was pre-tested among a small group of women from a neighbouring rural community who were not included in the final study population. Pre-testing was used to assess comprehensibility and linguistic suitability, and terminology that participants found difficult was simplified. The questionnaire was translated into Urdu, with additional explanation in the local language when required to facilitate understanding.

The intervention consisted of structured community-based cervical cancer health education delivered in small groups. Each educational session lasted approximately 40–50 minutes and addressed cervical cancer, its causes and warning signs, the role of HPV infection, preventive measures, the importance of early detection, the Pap-smear procedure, and locations where cervical screening could be obtained. Simple illustrations, culturally appropriate explanations, and practical examples were used to facilitate comprehension. Particular emphasis was placed on misconceptions, fear, and concerns related to Pap-smear screening.

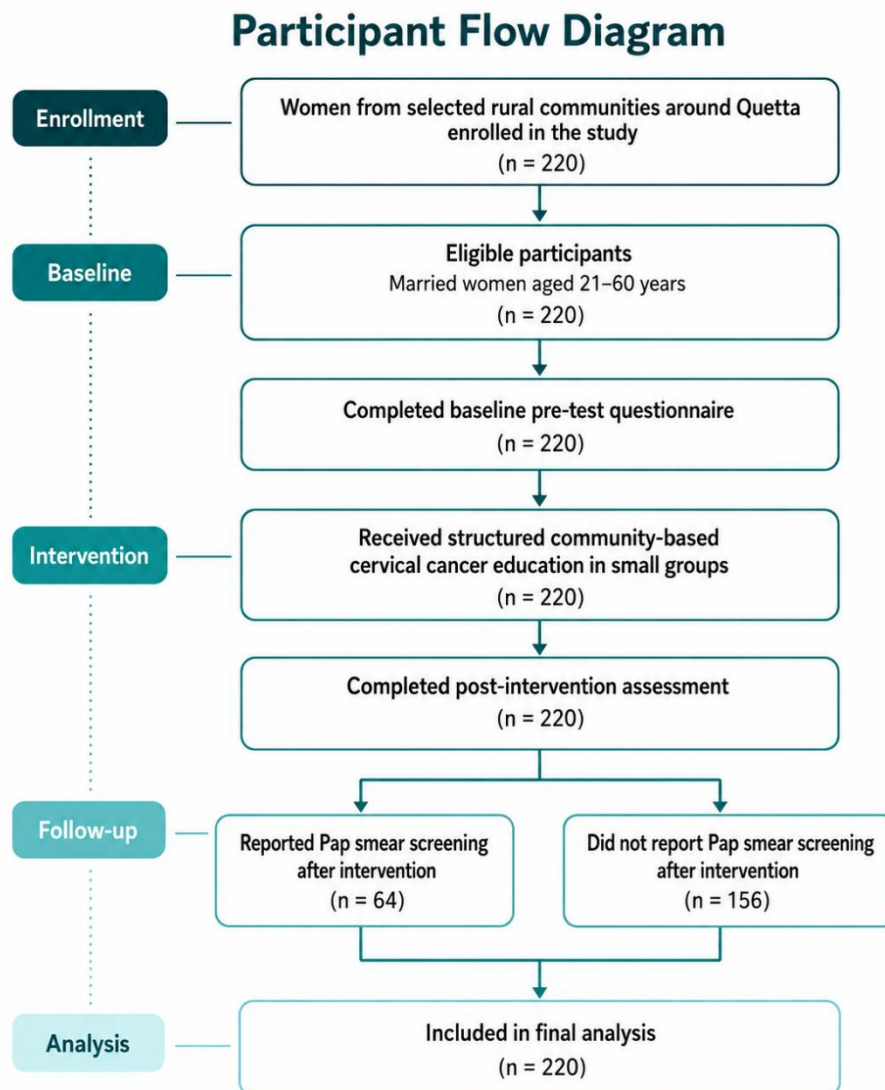
Educational sessions were delivered by trained female health workers together with members of the research team. Male personnel were not involved in direct educational delivery in order to maintain cultural acceptability and participant comfort. Participants were encouraged to ask questions and discuss concerns at the end of each session. Brief counselling regarding screening services was provided, and information about nearby healthcare facilities was shared when available.

Data collection was undertaken in two phases. The baseline questionnaire was administered immediately before the educational intervention. At follow-up, the same knowledge questionnaire was administered to assess post-intervention knowledge, and participants were asked whether they had undergone Pap-smear screening following the educational session. Women who had not undergone screening were asked to identify the reasons that had prevented them from doing so.

The principal outcomes were change in cervical cancer knowledge and Pap-smear screening uptake following the intervention. Knowledge items were scored dichotomously, with one point assigned to each correct response and zero points assigned to an incorrect or “do not know” response. Domain scores were calculated for knowledge of symptoms, risk factors, prevention, and Pap-smear screening, and these were combined to generate the total knowledge score. Screening history at baseline represented previous Pap-smear experience, whereas post-intervention uptake represented women reporting that they had undergone Pap-smear screening following the educational intervention. Reported reasons for non-participation in screening were examined descriptively as barriers to screening.

Data were checked for completeness before analysis. Categorical variables were summarized using frequencies and percentages, while knowledge scores were summarized using means and standard

deviations. Pre-intervention and post-intervention knowledge scores were compared statistically, with a two-sided p-value <0.05 considered statistically significant. Because baseline previous screening history and post-intervention screening uptake represented temporally distinct measures, they were summarized descriptively rather than treated as an equivalent paired binary outcome in the revised analysis.



*All enrolled participants completed both pre-intervention and post-intervention assessments.*

**Figure 1 CONSORT Flowchart**

Administrative permission was obtained from the relevant authority before data collection. Participant privacy was maintained throughout the study, identifying names were not recorded on study questionnaires, and information obtained during the study was used for research purposes. Written or thumb-impression informed consent was obtained before participation.

## RESULTS

A total of 220 women completed both the pre-intervention and post-intervention assessments and were included in the analysis. Participants were 21–60 years of age. The largest age group comprised women aged 31–40 years (79/220, 35.9%), followed by those aged 21–30 years (58/220, 26.4%), 41–50 years (55/220, 25.0%), and 51–60 years (28/220, 12.7%). Ninety-six women (43.6%) had no formal education, 61 (27.7%) had primary education, 43 (19.5%) had secondary education, and 20 (9.1%) had intermediate-level education or above. Most participants were housewives (182/220, 82.7%). With respect to

geographical access, 64 women (29.1%) lived <5 km from the nearest healthcare facility, 91 (41.4%) lived 5–10 km away, and 65 (29.5%) lived >10 km away. At baseline, only 17 participants (7.7%) reported a previous Pap smear, whereas 203 (92.3%) had never undergone the test.

*Table 1. Sociodemographic and baseline screening characteristics of participants (n=220)*

| Characteristic                                   | n   | %    |
|--------------------------------------------------|-----|------|
| <b>Age group, years</b>                          |     |      |
| 21–30                                            | 58  | 26.4 |
| 31–40                                            | 79  | 35.9 |
| 41–50                                            | 55  | 25.0 |
| 51–60                                            | 28  | 12.7 |
| <b>Education level</b>                           |     |      |
| No formal education                              | 96  | 43.6 |
| Primary education                                | 61  | 27.7 |
| Secondary education                              | 43  | 19.5 |
| Intermediate or above                            | 20  | 9.1  |
| <b>Occupation</b>                                |     |      |
| Housewife                                        | 182 | 82.7 |
| Working woman                                    | 38  | 17.3 |
| <b>Distance from nearest healthcare facility</b> |     |      |
| <5 km                                            | 64  | 29.1 |
| 5–10 km                                          | 91  | 41.4 |
| >10 km                                           | 65  | 29.5 |
| <b>Previous Pap-smear history</b>                |     |      |
| Yes                                              | 17  | 7.7  |
| No                                               | 203 | 92.3 |

Baseline cervical cancer knowledge was low across all assessed domains. Following the educational intervention, mean scores increased for knowledge of symptoms from  $2.1 \pm 1.1$  to  $4.8 \pm 0.9$ , corresponding to an absolute mean increase of 2.7 points; knowledge of risk factors increased from  $1.7 \pm 1.0$  to  $4.1 \pm 1.0$ , an increase of 2.4 points; knowledge of prevention increased from  $1.2 \pm 0.8$  to  $3.9 \pm 1.1$ , an increase of 2.7 points; and knowledge of Pap-smear screening increased from  $0.8 \pm 0.6$  to  $2.7 \pm 0.6$ , an increase of 1.9 points. Each reported pre-post comparison had a p-value <0.001.

The total knowledge score increased from  $5.8 \pm 2.4$  before the intervention to  $15.5 \pm 2.9$  after the intervention, representing an absolute mean increase of 9.7 points ( $p < 0.001$ ). The direction and magnitude of change were therefore consistent across all four knowledge domains, with higher scores observed at post-intervention assessment.

*Table 2. Pre-intervention and post-intervention cervical cancer knowledge scores (n=220)*

| Knowledge domain             | Pre-intervention, mean $\pm$ SD | Post-intervention, mean $\pm$ SD | Absolute mean change | p-value |
|------------------------------|---------------------------------|----------------------------------|----------------------|---------|
| <b>Symptoms</b>              | $2.1 \pm 1.1$                   | $4.8 \pm 0.9$                    | +2.7                 | <0.001  |
| <b>Risk factors</b>          | $1.7 \pm 1.0$                   | $4.1 \pm 1.0$                    | +2.4                 | <0.001  |
| <b>Prevention</b>            | $1.2 \pm 0.8$                   | $3.9 \pm 1.1$                    | +2.7                 | <0.001  |
| <b>Pap-smear screening</b>   | $0.8 \pm 0.6$                   | $2.7 \pm 0.6$                    | +1.9                 | <0.001  |
| <b>Total knowledge score</b> | $5.8 \pm 2.4$                   | $15.5 \pm 2.9$                   | +9.7                 | <0.001  |

At baseline, 17 of 220 women (7.7%) reported having undergone a Pap smear previously. At post-intervention follow-up, 64 of 220 participants (29.1%) reported undergoing Pap-smear screening following the educational intervention. These findings represent distinct baseline-history and post-intervention uptake measures; therefore, the proportions are presented descriptively rather than as equivalent repeated measurements of the same screening-status variable.

Among women who did not undergo post-intervention screening, reported barriers included fear or shyness, the need for permission or support from husbands or other family members, lack of female healthcare staff, transportation difficulties, distance from healthcare facilities, financial constraints, and uncertainty regarding where screening services were available. The findings indicate that barriers persisted despite the observed improvement in cervical cancer knowledge and that screening participation was influenced by both individual and healthcare-access factors.

## DISCUSSION

The present study demonstrated substantial improvement in cervical cancer knowledge following structured community-based health education among rural women in Quetta. The total knowledge score increased from  $5.8 \pm 2.4$  before the intervention to  $15.5 \pm 2.9$  after the intervention, with parallel improvements in knowledge of symptoms, risk factors, prevention, and Pap-smear screening. Screening participation also increased after the intervention, although the baseline measure represented previous screening history whereas the follow-up measure represented screening undertaken after the educational session. The findings therefore support an important temporal association between community-based education, improved knowledge, and subsequent screening behaviour, while the uncontrolled pre-test/post-test design does not permit definitive causal attribution.

The low baseline level of awareness observed in this study is consistent with evidence from Pakistan showing persistent gaps in knowledge of cervical cancer, HPV infection, screening, and preventive vaccination. Shamaun et al. documented limited awareness of cervical cancer screening and vaccination even among women attending a tertiary-care gynecology service, while studies from Karachi and Azad Kashmir similarly identified inadequate knowledge and low preventive practice among adult women (10–13). These findings suggest that insufficient awareness is not restricted to women who have limited contact with healthcare services and may be particularly important in rural populations where preventive health information and screening opportunities are less accessible.

The marked improvement in knowledge following the educational intervention is consistent with evidence demonstrating that structured, culturally appropriate education can improve cervical cancer awareness and screening-related understanding. Community health volunteer-led interventions in Nepal have increased screening participation, while studies from Bangladesh, Ethiopia, and Nigeria have similarly shown improvements in knowledge, perceptions, and screening behaviour following targeted education and counselling (17–21). Systematic reviews have also concluded that educational interventions can improve cervical cancer screening behaviour, particularly when interventions are adapted to the cultural and practical circumstances of the target population (15,16). The use of female health workers, simple language, small-group education, and opportunities for discussion in the present study may have increased acceptability and comprehension among participating women.

The increase in reported post-intervention Pap-smear uptake is clinically and programmatically relevant because baseline screening exposure was uncommon, with only 7.7% of participants reporting previous screening. Following education, 29.1% reported undergoing Pap-smear screening. Although these proportions represent different temporal constructs and should not be interpreted as an equivalent paired binary comparison, the post-intervention uptake indicates that a proportion of participants translated newly acquired knowledge into preventive health action. Similar behavioural effects have been reported following community-delivered interventions in Nepal, Bangladesh, and Nigeria, supporting the role of health education as one component of broader cervical cancer prevention strategies (17,19,21).

Education alone, however, did not eliminate barriers to screening. Women who remained unscreened reported fear or shyness, dependence on family permission, limited availability of female healthcare staff, transport difficulties, distance from facilities, financial constraints, and uncertainty about where screening could be obtained. Such barriers reflect the interaction between individual perceptions, family decision-making, cultural acceptability, and health-system accessibility. Reviews of cervical cancer screening interventions in rural populations have emphasized that improvements in knowledge may not translate fully into screening when structural and sociocultural barriers remain unresolved (15,16). Consequently, interventions that increase awareness without improving service availability may achieve only partial gains in screening coverage.

Family influence was particularly relevant because some participants reported requiring permission or support from husbands or other family members before seeking screening. Couple-focused education has improved screening uptake in other low-resource settings, suggesting that prevention strategies may be strengthened when influential family members are included in culturally appropriate counselling (20). Community programmes in rural Pakistan may therefore benefit from engaging husbands, mothers-in-law, community leaders, and other trusted individuals while maintaining women's privacy, autonomy, and informed decision-making.

The reported shortage of female healthcare providers represents another important implementation barrier. In conservative settings, the sex of the healthcare provider may strongly influence willingness to undergo intimate examinations or reproductive-health procedures. The effectiveness of female community health volunteers in Nepal supports the feasibility of female-led models for cervical cancer education and referral (17,18). Expanding access to trained female providers and integrating education with clearly identified female-led screening services may therefore reduce the gap between willingness to be screened and actual service utilization.

Geographical and financial barriers also remained important. Approximately 70% of participants lived at least 5 km from the nearest healthcare facility, and women reported transportation, distance, and cost as reasons for not obtaining screening. Evidence from community-based cervical cancer programmes indicates that bringing screening closer to underserved populations can improve accessibility and participation. Community health campaigns using HPV testing in rural Kenya demonstrated the feasibility of delivering screening outside conventional facility-based models (22), while randomized and population-based studies in other low-resource settings have shown that effective screening must be linked with appropriate follow-up and treatment pathways to achieve meaningful reductions in disease burden (8,9).

The findings have practical implications for cervical cancer prevention in rural Balochistan. Community education appears useful for improving knowledge and encouraging preventive health-seeking behaviour, but its impact is likely to be greater when combined with accessible screening, female healthcare personnel, clear referral pathways, affordable services, and family-sensitive counselling. The intervention should therefore be viewed as one component of a multilevel prevention strategy rather than as an isolated solution. This interpretation is consistent with evidence that educational interventions are most effective when barriers to service access and follow-up are addressed alongside knowledge deficits (15–17,22).

Several limitations should be considered when interpreting the findings. The single-group pre-test/post-test design did not include a concurrent control group, limiting the ability to attribute observed changes exclusively to the educational intervention. Convenience sampling may also limit representativeness beyond the participating rural communities. Screening behaviour at follow-up was self-reported, and baseline previous screening history and post-intervention screening uptake represented different temporal constructs, preventing direct interpretation of the two proportions as equivalent repeated measurements. In addition, the study primarily evaluated short-term changes in knowledge and screening behaviour and did not determine whether improvements were sustained over longer periods. Nevertheless, inclusion of the same 220 participants at both assessments, delivery of culturally adapted education through female health workers, and simultaneous assessment of knowledge, screening behaviour, and practical barriers provide useful community-level evidence for designing cervical cancer prevention initiatives in rural settings.

## CONCLUSION

Structured community-based health education was followed by substantial improvement in cervical cancer knowledge and increased participation in Pap-smear screening among rural women in Quetta. However, persistent fear, cultural hesitation, family-related constraints, limited availability of female

healthcare providers, transportation difficulties, distance, and financial barriers continued to restrict screening participation. These findings indicate that community education is a useful component of cervical cancer prevention but is likely to achieve greater impact when integrated with accessible female-led screening services, affordable referral pathways, and culturally appropriate family and community engagement.

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