Acceptability of Self-sampling in Human Papillomavirus Deoxyribonucleic acid based Cervical Screening in Nepal: A Mixed-Methods Study

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ABSTRACT

Background

Cervical cancer is the most common cancer among women in Nepal. Traditionally, healthcare professionals collect cervical specimens for Human Papillomavirus testing. Still, many women prefer self-collection, allowing them to sample in the comfort of their homes. Self-sampling has shown promise in other countries, but its acceptability in Nepal remains unexplored.

Objective

To assess the acceptability of Human papillomavirus self-sampling among women in Nepal.

Method

This community based single arm implementation study was conducted from 5 February 2021 to 17 July 2022 using mixed methods approach. For Cervical Cancer Screening, 1625 women aged 30-60 years were recruited and vaginal samples were collected using self-sampling technique. Quantitative data were collected by assessing sociodemographic, sexual and reproductive characteristics, awareness on cervical cancer and human papillomavirus vaccination, and acceptability. Qualitative data were obtained through in-depth interviews among 31 participants. Descriptive data were reported using frequencies and percentages. In-depth interviews were transcribed and coded using inductive and deductive methods.

Result

Among 1625 participants, 74% agreed to self-sample for screening. Among them, 98% found it easy to understand the directions to collect vaginal swabs, 96% reported ease in using a brush for sample collection, 89.6% found it painless and comfortable, 19.2% were afraid of hurting themselves while using the brush. Only 5.3% women felt embarrassed while self-collecting the sample. Qualitative results support these findings.

Conclusion

Increase cervical cancer screening participation rate with positive response towards self-screening indicates that Human papillomavirus self-sampling methods have potential to increase screening uptake, and achieve the national target of 70% screening coverage.

KEY WORDS

Cervical cancer screening, Human papillomavirus self-sampling, women, Nepal

INTRODUCTION

Cervical cancer is the fourth most prevalent cancer among women worldwide, with 660,000 new cases and 350,000 deaths reported in 2022.[1] Nearly all cases, 99%, are associated with high-risk Human papillomavirus (hr-HPV).[2] The burden is high in LMICs, with 94% of the 350 000 deaths caused by cervical cancer.[3] In 2023, Nepal recorded 2,244 new cases and 1,493 deaths annually, with incidence rate of 16.4 per 100,000 women.[4] Population-based studies in Nepal reported an hr-HPV prevalence of 7.7%, and about 2% of women carry HPV-16/18 strains, responsible for 80.3% invasive cervical cancer cases.[5,6]

Despite being preventable through established screening methods, it still causes significant mortality in Nepal.[6] HPV self-sampling where women collect their own vaginal samples, has emerged as promising alternative to clinician-based screening, especially using careHPV tests, which detect 14 high-risk HPV types.[7] Research from LMICs shows that self-sampled HPV testing using care HPV has shown good sensitivity and is more effective than Visual Inspection with Acetic Acid (VIA) or cytology.[8]

Self-sampling may overcome cultural, psychological, and logistical barriers that prevent women from attending clinic-based screenings.[9,10] It has shown high acceptability in several countries, including India, Thailand, Bhutan, Nigeria, USA and Japan.[11-16] However, for HPV-based screening to be effective, it must be adapted to the local context. In Nepal, the acceptability of self-sampling in HPV-DNA-based cervical screening has not yet been explored. Therefore, this study aimed to assess the acceptability of self-sampled HPV screening.

METHODS

A single-arm implementation study was conducted from February 5, 2021 to July 17, 2022 using a mixed-method approach to assess the acceptability of HPV self-sampling. The study was conducted in Dhulikhel and Banepa Municipalities within the Kavrepalanchowk district located in central Nepal. Banepa has 14,143, and Dhulikhel has 6,899 women aged 30 to 60.[17] The two municipalities host 17 government health facilities, 7 in Banepa and 10 in Dhulikhel, but only 11% of these facilities provide free screening service by VIA method.[18,19] The VIA positive women are referred to a tertiary care centre, Dhulikhel Hospital for further management.

Inclusion criteria were; a) aged 30 to 60 years, b) had an intact uterus, and c) were residents of Dhulikhel or Banepa.[20] Exclusion criteria were; a) pregnant or b) had a history of CIN or cancer and c) Not responding to the telephonic invitation, d) Hysterectomy.

The quantitative data includes baseline data: 1) Sociodemography: age (in years), ethnicity, level of education, religion, and occupation, smoking habit, 2) sexual and reproductive characteristics, 3) awareness about cervical cancer and HPV vaccination, and 4) willingness to provide self-collected sample if given instructions

To capture participants' experience during self-sample collection, we used structured questionnaires for HPV self-sampling acceptability (Understanding how to use a brush, easy or difficult while using it, comfortable while collecting samples, afraid of hurting oneself, Embarrassed or ashamed when using the self-collection brush, future preference: self-collection or by healthcare professional, reason for self-collection and reason for collection by healthcare professional).

Furthermore, we collected information from participants on partners' support, reassurance, encouragement and emotional support concerning cancer screening.

We coordinated with municipalities to conduct a one-day orientation for 22 FCHVs. They were introduced to the study and HPV self-sampling and asked to prepare name lists of women aged 30–60 years through home visits. FCHVs provided list of 2,066 potential participants within two months.

Two field nurses were trained to use illustrative cards to guide women in HPV self-sample collection and sample transport to the molecular laboratory at Dhulikhel Hospital.

Trained nurses contacted all listed women by phone, screened them for eligibility, obtained verbal consent, and collected baseline socioeconomic and health information. Women were informed about HPV self-sampling and invited for screening once dates were confirmed. After COVID-19 delays, nurses made reminder calls, re-screened participants, and scheduled eligible women in groups of 10-15 per day.

At the screening venue, nurses explained the study, obtained written consent, and provided step-by-step instructions for self-sample collection using a brush and Viral Transport Media (VTM). Samples were collected privately and transported in iceboxes to Dhulikhel Hospital for HPV DNA testing. Participants completed an acceptability questionnaire afterward. Screening camps ran from 9:00 AM–4:00 PM, with Saturday sessions for working women, following strict COVID-19 safety protocols.

We purposely selected 16 women who accepted screening and 15 who declined. Interviews continued until code saturation was reached. This study received approval from the Ethical Review Board, Nepal Health Research Council (44469/ 20 Jan 2020).

For quantitative data we summarised participants' sociodemographic characteristics, sexual and reproductive characteristics and awareness on cervical cancer and HPV vaccination using frequencies and percentages for categorical data and means and standard deviations for numerical data. We also reported frequency and percentage for acceptability and partners' support. Data

cleaning, coding and statistical analysis were conducted using STATA version 13.0 (Stata Corp., College Station, Texas, USA).

For qualitative data, the audio recordings from In-depth Interviews (IDIs) were transcribed verbatim in Nepali. Then, we utilised both inductive and deductive coding, starting with predetermined codes based on existing knowledge and adding new codes as interviews progressed. Using the thematic framework method , we identified themes related to acceptability, which were subsequently condensed. Condensed units were abstracted and labelled with codes using Dedoose software. The codes were compared for similarity and differences and sorted into categories.

RESULTS

During participants recruitment process FCHVs compiled a list of 2,066 women using convenient sampling. A team of two trained nurses attempted to contact all the women on the list through mobile phones. Among them, 129 did not respond despite being called 3 to 4 times by respondents and 312 were not eligible; 58 women did not lie in the age group 30-40, years, 40 women were pregnant, 59 had hysterectomy and 155 women had a history of recent screening. The remaining 1625 (100%) eligible women were invited for screening, out of which 1206 (74%) women attended the screening camp and provided self-collected samples (Fig. 1).

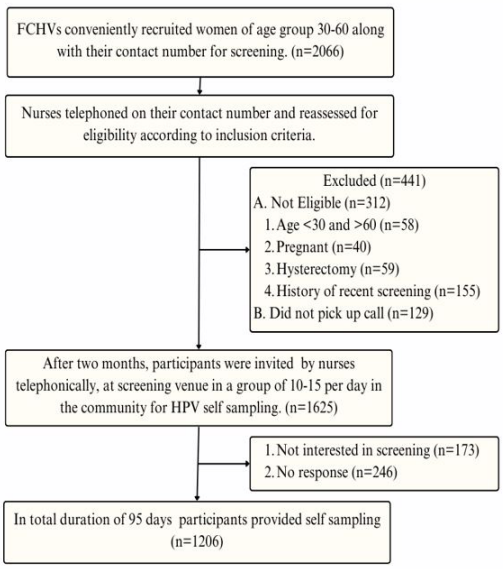

Figure 1. Participants' flow diagram

Among the women who provided self-collected samples, the mean age was 41.7 (8.1) years and almost half were in the age group 30-40. More than half (56.9%) of them belong to the Brahmin/Chhetri ethnic group, and around 89.3% responded that they were Hindu. Most of them were married (94%) and among married, the husbands of 11.9% women had to migrate for work. One-third (32.8%) had no formal education, and more than half (53.7%) were engaged in farming. Only 8.1% of the participants smoked tobacco daily (Table 1).

Table 1. Sociodemographic characteristics of Participants (n=1206)

Characteristics	n (%)
Age (Years)	
30-40	596 (49.4)
41-50	421 (34.9)
51-60	189 (15.7)
Mean (SD)	41.7 (8.1)
Ethnicity	
Brahmin/Chhetri/Thakuri	687 (56.9)
Newar	296 (24.5)
Magar/Rai/Tamang	137 (11.4)
Damai/Kaami/Sunwar	70 (5.8)
Others	16 (1.3)
Religion	
Hindu	1077 (89.3)
Buddhist	92 (7.6)
Muslim	1 (0.1)
Christian	36 (2.9)
Marital Status	
Married	1127 (94)
Separated	16 (1)
Widowed	23 (5)
If married, husband migration for work	132 (11.9)
Educational status	
No formal education	369 (32.8)
Primary level	200 (16.6)
Secondary level	209 (17.3)
Above secondary level	401 (33.3)
Occupation	
Farmer	684 (53.7)
Homemaker	244 (20.2)
Business	106 (8.8)
Service	69 (5.7)
Self-employed	38 (3.2)
Others	101 (8.4)
Current smoking habit	
Daily	98 (8.1)
Less than daily	6 (0.5)
Not at all	1102 (91.4)

Less than half of the women, 43.9% participants had their first sex at age 15 to 19 years and 98.7% had already given birth. Among those who had given birth, 66.7% had hospital delivery while the remaining had home delivery. On asking about contraceptives, more than half (75.5%) had used contraceptives and among them 60.7% were currently using it, however, 85.2% were sexually active within the

past twelve months. Only 20.6% participants said that they had abnormal vaginal discharge and 8.37% had genital sore/ulcer in the past twelve months, but, only 53.5% had seeked advice or treatment for genital sore/ulcer (Table 2).

Table 2. Sexual and reproductive characteristics of participants (n=1206)

Characteristics	n (%)
Age at sexual debut	
Less than 15	155 (12.9)
15-19	529 (43.9)
20 and above	522 (43.3)
Had sexual intercourse within 12 months	**1027 (85.2)**
If yes, used condom in last sexual intercourse	**76 (7.40)**
Had abnormal genital discharge in 12 months	**248 (20.6)**
Had genital sore/ulcer in last 12 months	**101 (8.4)**
Seeked advice/treatment for genital sore/ulcer (n=101)	**54 (53.5)**

Less than half of the women (43.5%) had heard about cervical cancer. Among those who have heard; the major source of information was television (51%) followed by FCHVs (41%), 32.8% says cervical cancer is a terminal illness, 84.9% says having multiple partners is a risk factor for cervical cancer, 59.7% says smoking is a risk factor for cervical cancer, 79.01% says giving birth to many babies is a risk factor for cervical cancer, 89.7% thinks cervical cancer is associated with sexually transmitted infection, and 92.6% says cervical cancer is preventable.

Furthermore, only 2.9% had heard about HPV vaccination. Among those who have heard the major source of information was health personnel (34%) followed by television (29%), FCHVs (20%) and health related books and posters (20%). When asked about willingness to collect the sample by themselves at home after getting instructions, 98.7% showed willingness. More than half (60.9%) of the participants said they had heard about Sexually Transmitted Infection (STI) (Table 3).

In general, participants demonstrated a high level of acceptance towards self-sampling. Among 1206 participants who did self-sample collection, 98% of the participants found it easy to understand the directions to collect the vaginal swab, while 96% reported ease in using a brush for sample collection (Table 4). These findings are consistent with our qualitative results, further supporting the high acceptability of self-sampling.

"Initially, I was afraid because this was our first time for self-collection. Previously, I had done screening by a health professional using a machine, which was difficult and painful. That's why I was afraid, but you (Nurses) guys taught in a very easy way. Everyone was happy by saying such an easy and comfortable method. We were like, Oh! It can be done this way also…….. I felt happy and comfortable as well." Participant number 013, 38 years.

Table 3. Awareness about cervical cancer and HPV vaccination (n=1206)

Characteristics	n (%)
Heard about cervical cancer	524 (43.5)
1. Cervical cancer is a terminal illness.	172 (32.8)
2. The risk factor for having cervical cancer is having multiple partners.	445 (84.9)
3. Smoking is a risk factor for cervical cancer.	313 (59.7)
4. Giving birth to many babies is a risk factor for cervical cancer.	414 (79.01)
5. Cervical cancer is associated with sexually transmitted infection.	461 (87.9)
6. Cervical cancer is preventable.	485 (92.6)
Heard about (HPV) vaccine against cervical cancer.	35 (2.9)
Willing to collect a sample by themselves for cervical cancer at home, if given instructions on how to collect the samples.	1190 (98.7)
Heard about STI	734 (60.9)

Ninety percent of participants were comfortable with self-sampling although 20% were afraid of hurting themselves. Ninety five percent of participants were not embarrassed when using the self-collection brush. Sixty-nine percent of participants preferred self-sampling over clinician sampling (Table 4).

Table 4. Participants' acceptability for HPV self-sample (n=1206)

Characteristics	n (%)
Easy to understanding how to use a brush	1183 (98)
Easy to use a brush for sample collection	1156 (96)
Painless/Comfortable while collecting samples	1080 (90)
Afraid of hurting yourself	231 (20)
Not embarrassed or ashamed when using the self-collection brush	1143 (95)
In future, preferred method:	
Self-collection	833 (69)
Collection by health professional	101 (8)
Indifferent	272 (23)

Among those who preferred self-collection, the major reason was less shame or embarrassment (85%) followed by practicality (9%), less pain and discomfort (5%), and its possibility of collection at home(2%). It is supported by our qualitative findings as well (Table 5).

"The test done earlier by inserting the machine was painful. We had to bear the pain. We used to be embarrassed, as the sample had to be drawn by other people. But drawing samples ourselves through this technology was easy, and I find this very comfortable." Participant number 013, Age 38 years.

However, among those who preferred collection by healthcare professional, more than half of the participants (52%) had fear of not collecting the sample properly and remaining 49% thought that the healthcare professional

Table 5. Reason participants opted for self-collection and a health professional

Characteristics	n (%)
Self-collection	
Less Pain or discomfort	45 (5)
Less shame or embarrassment	700 (84)
Possibility of collecting the sample at home	13 (2)
Practicality	75 (9)
Collection by healthcare professional	
Fear of not collecting the sample properly	52 (52)
I wouldn't- The healthcare professional can do a better job.	49 (49)

could do a better job (Table 5). It is also supported by our qualitative interviews with women who declined screening. Interviews showed low trust in the screening camp, absence of symptoms, and a heavy workload that left them with no time to attend the screening.

"I did not come because we went to the hospital. You can also imagine nothing more happens in camp. Doctors were saying my problem was due to increased infection. So, I thought it's better to go to hospital than camp." Women who declined screening, Participant number 09, Age 41 years.

"I did not have any health issues. I, alone, have to look after my shop also. I did not have time, So, I did not come for checkups." Women who declined screening, Participant number 10, Age 43 years.

Overall, the majority of the married participants providing a self-sample stated that they had really good support from their husband. Husbands of 89% gave advice about cancer screening, 94% gave assistance with things related to cancer screening, 96.9% gave reassurance, encouragement and emotional support concerning cancer screening, 96.9% listened to and tried to understand worries about health. Ninety eight percent of participants could relax, be themselves and open up to their husband if they needed to talk about their worries about their health. Furthermore, husbands of 97.5% participants did not argue with them relating to their health, 98.7% did not criticize their wife relating to their health, 98.3% did not let their wife down when they are counting on them and 98.2% stated that their husband did not withdraw from discussions about their illness or try to change the topic away from their illness (Table 6).

Table 6. Partner's support in screening and treatment decisions for cervical cancer (n=1127)

Characteristics	n (%)
Gives you advice or information about your cancer screening.	1008 (89)
Gives you assistance with things related to your cancer screening.	1056 (94)
Gives you reassurance, encouragement, and emotional support (affection) concerning your cancer screening.	1092 (96.9)
Listens to and tries to understand your worries about your health.	1092 (96.9)
You can relax and be yourself around your husband.	1107 (98)
You can open up to your husband if you need to talk about your worries about your health.	1107 (98)
Does not argue with you relating to your health.	1099 (97.5)
Does not criticize you relating to your health.	1112 (98.7)
Does not let you down when you are counting on him.	1108 (98.3)
Do not withdraw from discussions about your illness or try to change the topic away from your illness.	1107 (98.2)

DISCUSSIONS

Screening is a crucial step for detection of precancerous lesions and treatment which if left untreated develops into cervical cancer.[21] In our study, 74% of the eligible participants provided self-collected samples, which aligns well with global and national cervical cancer elimination strategies that aim for at least 70% of women to be screened.[2] It shows screening through self-sampling has potential in Nepal. The screening rates may have been slightly higher due to several factors. One reason could be the impact of COVID-19; to reduce crowding at the camp, we collected baseline information from women by phone and invited them for screening 2 months later. Unfortunately, we could not reach 246 (15.14%) women. If we had conducted baseline assessments and screenings on the same day in the community, it might have further increased the screening rate.

The mean age of the women who provided HPV self-sample for screening was 41.7 years which aligns with both the national cervical cancer screening guidelines of Nepal and WHO's recommended screening age.[20] In our study, most participants (94%) were married, and 11.9% had husbands who travelled for work, a group considered vulnerable to STIs.[22] Although STIs are a known risk factor for cervical cancer, fewer women in our sample were exposed to this risk due to partner travel.[23] Among women who had heard of cervical cancer, 87.9% were aware that STIs increase its risk. Smoking is another established risk factor.[23] In our study, 57.9% recognized smoking as a risk factor, which might explain why only 8.1% of women were daily smokers.

In many studies that offered HPV self-sampling tests, there was an increase in participation rates.[24,25] A systematic review conducted in LMICs showed that convenience of self-sample collection from home, less embarrassment, and less travel were major beneficial aspects of self-sampling.[26] Similarly, in our study, out of 101 participants who had genital sore/ulcer only 53.5% sought medical advice/treatment. Even so, while visiting the community 74% of eligible participants provided self-sampling in the community itself. This shows health seeking behavior can be improved through people's participation in their own community given that self-sampling provides flexibility to collect samples at their own home by themselves.[27]

Studies have shown that women with high HPV knowledge were more likely to self-sample and low HPV literacy acted as a barrier in self-sampling for HPV.[28,29] In our study only 43.5% and 2.9% had heard about cervical cancer and HPV vaccination respectively, however, 98.7% showed checked on willingness to collect self-sample for cervical cancer screening at home, if given instructions on how to collect samples. Also irrespective of educational level and occupational status women were willing to provide self-collected samples for cervical cancer screening. This high willingness to self-sample despite having low awareness depicts that if awareness is provided, there is possibility of wide coverage of cervical cancer screening through HPV self-sampling.

Acceptance of self-sampling requires the newly introduced procedure to be easily understandable and comfortable.[30] A meta-analysis conducted in LMICs in 2021 included 38 studies, which revealed that most participants found HPV self-sampling easy (75-97%) and painless (60-90%).[31] In our study, we observed similar positive results, with approximately 98% reporting it was easy to understand how to use a brush, 96% reporting it was easy to use and 90% describing it as painless. Similarly, self-sampling was highly acceptable among women residing in various countries, including India, Thailand, Bhutan, Nigeria, USA, and Japan.[11-16] This acceptability extends to women belonging to special populations, such as those living with HIV, or residing in rural or indigenous communities.[32] Additionally, women in high-income countries and those who had never been screened before expressed high acceptability, and this trend persisted regardless of age, income, or country of residence.[11,33] In this study, additional interviews were conducted among those refusing for screening to explore reasons for being non-screened, where none of the participants mentioned concerns about self-sampling as a method, nor did they raise any related questions.

Regarding future screening preferences, our study revealed a preference for screening with self-collected samples over clinician-collected samples by 69% of women, consistent with previous research.[12,14,15,34] A 2017 meta-analysis involving 37 studies and 18,516 women from 24 countries indicated that 59% of women preferred self-sampling to physician-collected samples.[35] Despite the overall favourable acceptability of the test, concerns about the self-sampling procedures were acknowledged. Another 8% preferred clinician collected samples, the reason being fear of not collecting the sample properly and the healthcare professional could do a better job. Some women experienced a loss of confidence in their sampling, possibly attributed to the unfamiliarity of the test among Nepalese women. This unfamiliarity arises because the self-sampling HPV test has just recently been recommended as a primary screening strategy by official guidelines and has rarely been implemented in Nepal.[20]

A qualitative evidence metaanalysis showed that women's participation in screening is influenced by the partners' support and women felt more comfortable going for the self-collection procedure when they had their partner's support.[36] However, an article highlighted the importance of education to increase male engagement and partner's support for self-collection HPV-based screening.[37] Also, women from Central Uganda reported low screening emotional support (2.3%) from their partners.[38] In our study, married participants reported significant partner support for cervical cancer screening, with 89% of women receiving advice and encouragement on screening, 94% receiving assistance with cancer screening-related matters and 96.9% gave reassurance, encouragement and emotional support concerning cancer screening. This discrepancy could contribute to our study's high acceptance of screening.[38,39]

This is Nepal's first HPV-DNA self-sampling based cervical cancer screening in the community with a sufficiently large sample size, showing the acceptability among women residing in the sub-urban community. Those who verbally accepted our invitation showed up at the screening venue in the community on the scheduled day, and all succeeded in providing their self-collected samples for HPV testing. We also employed a mixed-methods approach, allowing us to quantitatively assess acceptability while exploring these factors in depth through qualitative analysis. Additionally, we conducted interviews to explore why women did not participate in the screening, providing further insights into potential barriers to participation in the screening.

The study has several limitations. First, women were contacted by FCHVs, but detailed enumeration was not performed due to COVID-19 pandemic with frequent lockdown. Consequently, we could not determine the actual percentage of women reached. This approach may have introduced selection bias, as those with better access to FCHVs were more likely to enroll, potentially affecting the study's generalizability. Second, we could not contact 15% women for screening because we only collected their contact details. We could have reached them if we had obtained additional contact information from their husbands or family members.

CONCLUSION

This study highlights high acceptability of self-sampled HPV testing among women in two semi-urban municipalities of Nepal. The positive response to self-sampling suggests it could significantly improve cervical cancer screening rates, addressing barriers related to traditional methods. However, further interventions are needed to maximise its effectiveness, particularly in increasing follow-up attendance for positive results.

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