Community-based Screening of Cervical Cancer in an Urban Setting in Nepal: A Cross-sectional Study

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ABSTRACT

Background

In Nepal, cervical cancer is among the most prevalent cancers among females, yet only about 8% of women have undergone screening, highlighting significant barriers to access in low-resource settings.

Objective

To assess and report the outcomes of a community-based cervical cancer screening with visual inspection of acetic acid and an active follow-up program in Budhanilkantha municipality, Kathmandu Valley.

Method

We conducted a cross-sectional study in Budhanilkantha Municipality among 1360 women aged 30 to 60 who attended community-based cervical cancer screening camps. Trained research assistants collected socio-demographic and reproductive health data through interviews, abstracted medical records about Visual Inspection with Acetic Acid outcomes, and made follow-up calls to those who screened positive. We conducted descriptive analysis and logistic regression to assess associations between screen positivity and women's characteristics.

Result

A total of 1,360 women visited the camp, with 98.3% undergoing visual inspection with acetic acid, and 7.25% screening positive. Among those referred, 78% followed up at the recommended hospital; diagnostic tests indicated that 12.3% had low-grade lesions and 1.36% had high-grade pre-cancerous lesions. The adjusted model revealed no statistically significant associations between Visual Inspection with Acetic Acid positivity and variables such as age, ethnicity, education, and reproductive history.

Conclusion

This study demonstrates that the community-based Visual Inspection with Acetic Acid (VIA) cervical cancer screening method was highly acceptance and had high treatment follow-up among women in urban Nepal.

KEY WORDS

Cervical cancer, Screening, Visual inspection with acetic acid

INTRODUCTION

Cervical cancer is the fourth most common cancer in the world among women, with an estimated age-standardized incidence of 13.3 per 100,000 women and mortality of 7.3 per 100,000 women in 2020.[1,2] Around 90% of cervical cancer deaths worldwide occurs in Low and Middle-Income Countries (LMICs).[3] In Nepal, cervical cancer incidence is 21.5 per 100,000 women and ranks as the most common cancer in females.[4,5] It contributed to 1.2% of total women deaths and 0.8% of total women DALYs in 2019.[5] During the 1970s, the incidence rate and mortality of cervical cancer in high-income countries were similar to cases seen now in the LMICs and the incidence and mortality rate declined due to effective screening programs and Human papillomavirus (HPV) vaccinations.[6-9] Cervical cancer screening programs are identified as an effective strategy for substantial reductions in cancer cases and deaths and gains in life-years.[8] However, only around 8% of women reported having ever screened for any test for cervical cancer screening in Nepal.[9] Regular screening for cervical cancer is essential for early detection and effective treatment, yet many women in low-resource settings face barriers to accessing these services. To address this gap, our study aimed to report the outcomes of a community-based cervical cancer screening with Visual Inspection with Acetic Acid (VIA) and an active follow-up program in Budhanilkantha Municipality, Kathmandu Valley.

METHODS

We conducted a cross-sectional study in a community setting in Budhanilkantha municipality, Kathmandu Valley. Prior to the screening, we carried out an intensive educational campaign about cervical cancer and screening, engaging local Female Community Health Volunteers (FCHVs) to lead the efforts. The FCHVs encouraged women aged 30 to 60 to attend the screening on a designated day. These screening camps were primarily conducted to develop a Machine Learning-Based Cervical Screening Tool for Nepal.

The study was conducted in Budhanilkantha Municipality from October 2022 to July 2023. We included all eligible women (n=1360) attending screening camps across the municipality. We organized 30 mobile screening camps. The inclusion criteria were women aged 30 to 60 who attended screening camps. We excluded those who did not have an intact uterus, had a previous history of cervical intraepithelial neoplasia (CIN), or had cancer but did consent to participate.

At the screening camps, trained research assistants interviewed the participants face-to-face to gather data on their socio-demographic and reproductive health. Trained nurses conducted screening using Visual Inspection with Acetic Acid (VIA) free of cost using standard techniques10.

Briefly, after the insertion of a sterile Cusco's self-retaining vaginal speculum, the nurses performed the Visual Inspection with Acetic Acid (VIA) test by applying freshly prepared 4% acetic acid to the cervix. The results were recorded after one minute using a halogen lamp to ensure optimal illumination. The test results were classified as positive when a well-defined, dense acetowhite area with regular margins was observed at the squamocolumnar junction. The test was reported as positive if an acetowhite area was seen in the transformation zone, negative if no changes were observed, or suspicious for invasive cancer if a growth or ulcerative lesion was detected. This standardized procedure aimed to enhance the accuracy of cervical cancer screening in the community. A consultant gynecologist was present at the camp to provide immediate access to expert medical advice and timely intervention and support for those in need. For those who were screen-positive, the nurses referred them to the Hospital for Advanced Medicine & Surgery (HAMS) hospital, which was free to the patients. Further, we also collected data from medical charts on cervical cancer screening attendance and the screen positivity rate. We conducted follow-up calls with screen-positive women to collect information about their treatment-seeking behavior and outcomes. Additionally, we obtained the cost of screening from administrative data.

We conducted a descriptive analysis of the data, reporting the mean and standard deviation of the numeric data and the frequency and percentage of categorical data. We performed logistic regression to assess the association between screen positivity and women's characteristics.

Ethical approval: We obtained informed consent from all participants, ensuring that each individual understood the purpose of the study, the procedures involved, and any potential risks. We maintained confidentiality by anonymizing data and securely storing personal information. Participants also retained the right to withdraw from the study without facing repercussions. The Nepal Health Research Council, Ethical Review Board, granted ethical approval (Registration No. 4537)

RESULTS

The study population had a mean age of 40.5 years (SD = 9.7), with the majority belonging to the Janajati (46.47%) or Brahmin/Chhetri ethnicity (46.39%) ethnic groups. Most participants were married (95.66%), identified as Hindu (80.59%), and had an average of 7.08 years of education. The majority were housewives (69.12%), while others held private jobs (6.03%) or government positions (3.46%). Regarding reproductive health, participants reported an average age of 16.4 years at first menstruation, 20.6 years at first childbirth, and 20.0 years at marriage, with an average of 2.36 pregnancies. Around 19% were currently in menopause, 24.8% had undergone a cesarean section, and 26.4% currently use family planning devices. Few

participants reported a history of sexually transmitted infections (0.3%), a family history of cervical cancer (3.75%), or receiving the HPV vaccine (0.07%) (Table 7).

Table 1. Characteristics of the study participants (n=1360)

Characteristics	Frequency	Percentage
Age in years (Mean, SD)	40.5 (9.7)	
Ethnicity		
Brahmin/Chettri	631	46.39
Dalit	90	6.62
Janajati	632	46.47
Madheshi	6	0.44
Muslim	1	0.07
Marital Status		
Divorced	7	0.51
Married	1,303	95.80
Unmarried	5	0.37
Widow	45	3.31
Religion		
Buddhist	212	15.59
Christian	31	2.28
Hindu	1,096	80.59
Others	21	1.54
Education in years	7.08 (8.01)	
Occupation, mean (SD)		
Farmer	24	1.76
Government Job	47	3.46
Housewife	940	69.12
Private job	82	6.03
Others	267	19.6
Member in Family, mean (SD)	4.47 (1.58)	
Age at first menstruation	16.4	55.9
Age at last menstruation (n=250)	46.5	6.0
Age at first childbirth	20.6	5.8
Number of pregnancy	2.36	1.34
Age at Marriage	20.0	9.5
Currently Menopause	253	19.0
Cesarean Section	324	24.8
Use of family planning device	366	26.4
Presence of STI	4	0.3
Family History of Cervical Cancer	51	3.75
HPV vaccine	1	0.07

The majority (90.6%) had never smoked, and 4.8% were current smokers. About 78.6% of participants reported never drinking alcohol, 20.88% consumed alcohol occasionally, and only 0.51% drank alcohol regularly.

A total of 1360 women visited the camp; 1337 (98.3%) screenings were successfully conducted. Table 3 presents data from the outcomes of the screening and screen-positive women. About 7.25% were screened positive for

Table 2. Lifestyle factors among the study participants (n=1360)

Characteristics	Frequency	Percentage
Chronic disease	357	26.25
Smoking history		
Current smoker	66	4.85
Former Smoker	61	4.49
Never smoked	1,233	90.66
Alcohol		
Always	7	0.51
Never	1,069	78.6
Sometimes/occasionally	284	20.88

VIA, and 0.67% were suspicious for cancer. Among the 106 VIA-positive, 97.2% were referred to hospitals for further evaluation, while 2.8% received thermocoagulation on-site. In terms of health-seeking behavior, 68.8% of VIA-positive cases visited the referral hospital recommended by the study personnel, 10.4% went to other hospitals, and 17.9% were lost to follow-up. Diagnostic tests performed on the 73 individuals who followed up included the PAP test (86.3%), HPV test (9.5%), colposcopy (1.3%), and biopsy (26.9%). The test results revealed that 86.3% were negative for intraepithelial lesions, 12.3% had low-grade lesions, and 1.36% had high-grade precancerous lesions.

Table 3. Screening and treatment outcomes of the study population (n=1337)

Screening	Frequency	Percentage
VIA result (n=1337)		
Negative	1,231	92.1
Positive	97	7.25
Suspicious Cancer	9	0.67
Management of VIA positive cases (n=106)		
Thermocoagulation on site	3	2.8
Referred to hospital	103	97.2
Health care seeking status (n=106)		
VIA positive visiting our referral hospital	73	68.8
VIA positive visiting other hospitals	11	10.4
Loss to follow-up	19	17.9
Test done (n=73)		
PAP test	63	86.3
HPV	7	9.5
Colposcopy	1	1.3
Biopsy	27	26.9
Results (n=73)		
Negative for intraepithelial lesion	63	86.3
Low-grade intraepithelial lesions	9	12.3
High-grade intraepithelial lesions (pre-cancerous lesions)	1	1.36

Table 4 presents the bivariate and multivariate association between VIA positivity and various characteristics of women. In the adjusted model, there were no statistically significant associations between VIA positivity and the variables analyzed, including age, ethnicity, religion, education, occupation, age at first menstruation, age at marriage, and number of pregnancies all showed non-significant results.

Table 4. Association between VIA positivity and characteristics of women

Variables	cOR (95%)	p-value	aOR(95% CI)	p-value
Age	0.98(0.96-1.00)	0.079	0.98(0.96-1.01)	0.211
Ethnicity				
Brahamin/ Chettri	1		1	
Janajati	1.09(0.71-1.66)	0.688	1.22(0.76-1.97)	0.413
Others	0.711(0.27-1.84)	0.484	0.66(0.25-1.74)	0.395
Religion				
Buddhist	1		1	
Christian	1.22(0.26-5.76)	0.800	1.67(0.34-8.16)	0.527
Hindu	1.35(0.72-2.53)	0.344	1.84(0.88-3.84)	0.106
Others	1.83(0.38-8.84)	0.450	2.07(0.42-10.23)	0.373
Education (number of years)	1.01(1.00-1.03)	0.041	1.01(1.00-1.03)	0.102
Occupation				
Employed	1		1	
Unemployed	0.70(0.45-1.08)	0.107	0.75(0.48-1.17)	0.208
Age at first menstruation	0.98(0.91-1.07)	0.753	0.98(0.88-1.08)	0.651
Age at marriage	0.99(0.96-1.02)	0.776	0.99(0.95-1.03)	0.623
Number of pregnancy	0.99(0.84-1.16)	0.923	1.06(0.89-1.27)	0.499

DISCUSSION

The study reports the experience of a community-based VIA-based cervical cancer screening method in urban Nepal. The screening was well-accepted by 98% of the women. About 7% of these women had results that were positive for signs of abnormal cells, and 0.7% showed signs that could indicate cancer. Among the women who tested positive, almost all (97%) were sent to hospitals for more tests, while a few (3%) received immediate treatment at the camp. Regarding follow-up, about 69% of these women went to the hospital recommended by the study, 10% went to other hospitals, and nearly 18% didn't go for follow-up care. Of those who did follow-up in the referred hospital, most had a PAP test (86%), while some had an HPV test, colposcopy, or a biopsy. The test results showed that 12% had mild intraepithelial lesions, and 1% had signs of pre-

cancerous cells. There was no association between VIA-positivity and women's characteristics.

In our study, the acceptance rate of the Visual Inspection with Acetic Acid (VIA) screening among women was 98%, indicating a strong willingness to participate in the cervical cancer screening program free of cost. There can be several reasons for this. The camp was set up within walking distance of women's residences; other studies have shown that when women can easily access health services, they are more inclined to participate.[11] Secondly, we conducted education and awareness programs through female community health volunteers, which might have contributed to women accepting the screening.[12]

In our study, about 7% of these women had results that were positive for signs of abnormal cells, and 0.7% showed signs that could indicate cancer. Other studies have reported VIA-positivity rates of 5.9% to 14% in Asia and up to 26% in Africa.[13-17] The lower VIA-positivity rate in our population might be due to the low prevalence of other risk factors such as HIV, HPV-DNA, and higher age of sexual initiation.[18]

A total of 79% of the screen-positive women sought further healthcare. About 69% visited the recommended hospital, indicating a positive response to health guidance. About 10% chose to go to other hospitals, indicating flexibility and alternative preferences for women. These follow-up rates were much higher compared to different contexts, reporting follow-up rates of around 50% or less.[19-21] Treatment acceptance after screening positivity for cervical cancer is affected by various reasons such as socio-economic status, systemic barriers such as long waiting time and complex referral process, knowledge and awareness and cultural barriers.[22-24] We addressed these barriers by providing counseling, free referral services, and assisted care at the referral center for women, which might have resulted in higher follow-up rates. However, nearly 18% of the women were lost to follow-up, which is concerning. This lack of follow-up could lead to delayed diagnosis or treatment, resulting in adverse health outcomes.[25]

In our study, we did not find an association between VIA positivity and women's characteristics. Other studies have shown that VIA positivity is associated with socio demographics such as higher age, smoking, and reproductive health, such as onset of sexual activity, multiple sexual partners, and HPV infection.[26-28] In our population, though, the variation in these characteristics was low, which might have resulted in a lack of statistically significant association.

The study has several strengths. The participants were recruited community-based, utilizing Female Community Health Volunteers (FCHVs) to lead an educational campaign in Budhanilkantha municipality, which likely improved awareness and participation in cervical cancer screening. We collected comprehensive data through

face-to-face interviews, medical chart reviews, and follow-up calls, which provided complete data on the screening outcomes and treatment-seeking behavior. The logistic regression analysis was also utilized to assess the relationship between screen positivity and socioeconomic status. However, we acknowledge the study's limitations, too. This convenience sampling may introduce selection bias, limiting the generalizability of the study findings. Furthermore, there might be social desirability bias while reporting reproductive and lifestyle factors among women in face-to-face interviews.

CONCLUSION

This study shows that a community-based Visual Inspection with Acetic Acid (VIA) cervical cancer screening method in urban Nepal was highly accepted by women. About 7% tested positive for abnormal cells, with 79% of screen-positive women seeking further healthcare. There was no significant association between VIA positivity and women's characteristics, likely due to low variability in sociodemographic factors. Future research can focus on exploring the factors associated with the loss-to-follow-up of screen-positive women who participated in the cervical cancer screening program.

ACKNOWLEDGEMENTS

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