RESEARCH ARTICLE

Acceptance of Self-Sampling and Knowledge about Human Papillomavirus among Women in Mongolia

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Abstract

  Background: Mongolia faces a significant burden of cervical cancer, with the highest prevalence of Human Papillomavirus (HPV) in the region. Cervical cancer ranks as the third most common cancer among women in the country. This study aimed to assess the acceptance of self-sampling among young women in Mongolia and evaluate their knowledge regarding HPV and cervical cancer. **Methods:** In this study, participants provided a self-administered vaginal swabs to detect high-risk HPV genotypes. Both acceptability of self-sampling using swabs and participants knowledge regarding HPV and cervical cancer through a scored questionnaire were assessed. The knowledge scale was categorized into three groups: low (0-2), moderate (3-4) and high (5-6). **Results:** A total of 203 women aged 24-28 years completed the questionnaire and provided self-administered vaginal swabs. The majority (95.1%) found self-sampling technique using Copan Self Vaginal FLOQSwabs® easy to perform. Additionally, 98.5% indicated that the self-swab instructions were clear and comprehensive, while 94.1% reported no pain during the process. Furthermore, 67.8% of participants expressed a preference for performing the swab in a clinic rather than at home. All respondents chose self-sampling due to greater personal privacy, tranquility, reduced anxiety and time optimization. The questionnaire results revealed an overall low level of knowledge about HPV among participants, with a mean score at 1.9 out of 6 [95%CI 1.67-2.21] and a moderate level of knowledge regarding cervical cancer risks, with a mean score at 3.7 out of 6 [95%CI 3.19-4.21]. This pattern was consistent across both vaccinated and unvaccinated cohorts, indicating a strong demand for enhanced awareness of HPV and cervical cancer. **Conclusions:** This study demonstrates the high acceptance of self-sampling among young women aged 24-28 years in Mongolia. However, it also underscores a significant need for improved awareness initiatives concerning HPV and cervical cancer in Mongolia.

  Keywords: Human Papilloma Virus- HPV vaccine- self sampling Mongolia

Introduction

Cervical cancer ranks as the fourth most common cancer in women worldwide, yet it remains one of the most preventable and treatable forms of cancer [1]. Recognizing its significance, the World Health Organization (WHO) launched a global initiative in 2020 with the aim of eliminating cervical cancer as a public health problem by the end of the 21st century [2]. Despite these efforts, approximately 90% of cervical cancer-related deaths occur in low and middle-income countries [1]. In Mongolia, cervical cancer stands as the third most prevalent cancer among women [3], with cervical cancer emerging as the leading cause of cancer-related deaths in women aged 15 to 44 years [4].

Persistent infection of the cervix with high-risk genotypes of Human Papillomavirus (HPV) accounts for 95% of cervical cancer cases, with 70% attributed to HPV types 16 and 18 [1]. The prevalence of HPV among Mongolian women remains notably high. A 2018 study among young women 18-23 years revealed a crude prevalence of any high-risk HPV genotype at 39.6% [5, 6]. These findings align with earlier studies conducted in Mongolia's capital city, which estimated an HPV prevalence among women approximately 35-47% in women aged 15-65 years [7, 8]. Although a pilot HPV vaccination program was initiated in Mongolia in 2012, targeting 9,111 girls aged 11-17 years, it failed to achieve full coverage due to community resistance. Consequently, the vaccine has not been available in the country following the pilot program [5].

Self-collection of samples for HPV testing has been demonstrated to be as reliable as samples collected by healthcare providers and is considered a preferred choice for women [9]. This approach offers a safe and straightforward method, increasing the likelihood of

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reaching women who might not otherwise participate in clinician-based screenings or have access to screening tests [9]. Furthermore, self-sampling is highly acceptable for cervical cancer screening due to its ease of use, convenience, privacy, and ability to provide physical and emotional comfort, regardless of the country's income level [10]. Recognizing its advantages, both the World Health Organization and the International Agency for Research on Cancer now recommend HPV-based screening, including self-sampling, in their guidelines [9, 11]. However, only 17 (12%) of countries with established cervical cancer screening programs recommend the use of self-sampling, with nine endorsing it as the primary collection method and eight targeting under-screened populations [10]. In Mongolia, studies assessing the effectiveness of the HPV vaccine have utilized the self-sampling method [5, 6]. Another Mongolian study introducing self-sampling for early detection of cervical cancer revealed that 44% of women opted for self-sampling due to embarrassment during gynecological examinations [12].

As a follow-up study aimed at evaluating the effectiveness of the HPV vaccine 11 years post-vaccination, this research utilized the self-sampling method to collect samples for HPV testing. Additionally, it assessed women's perceptions of self-sampling and their knowledge about HPV and cervical cancer. The findings from this study will serve as a valuable resource for future decision-making regarding the use of self-sampling for cervical cancer screening in our country.

Materials and Methods

Study design and participants

This retrospective paired cohort study was conducted between July 2023 and December 2023 among participants from the Bayangol and Baganuur districts of Mongolia's capital city, Ulaanbaatar, as well as the Umnugovi and Selenge provinces. The study involved 99 women aged 24-28 years who had received three doses of the 4vHPV vaccine, Gardasil®, as part of the 2012 pilot HPV vaccination program. Additionally, 104 women matched by age and place of residence served as a control group. Both vaccinated and vaccine-naïve women had participated in our previous study in 2018. The study employed a self-swab technique for HPV detection using Copan Self Vaginal FLOQSwabs® 552C.80 (Copan Italia S.p.A.) eluted in Copan MSwab ® 5ml (6E067N) (Copan Italia S.p.A.) and analyzed on the Cepheid Xpert® HPV assay and included a questionnaire to assess participant acceptability of self-sampling and their knowledge about HPV and cervical cancer. To maintain confidentiality, all participants were de-identified using a unique study ID.

Participants were provided with an information sheet and consent form written in Mongolian language. Individual written informed consent was obtained from all participants. To compensate for their time and travel expenses, all participants received a nominal fee.

Questionnaire methods

The survey questionnaire used to assess knowledge included a combination of closed-ended and semi-open-ended questions. This questionnaire aimed to gather data on participants' demographics, sexual history, relevant lifestyle factors, as well as their knowledge about HPV and cervical cancer. Participants from both cohorts assessed the questionnaire through an online form. Knowledge-based questions required responses of either 'true',' false', 'don't know' or 'yes', 'no', or 'don't know', each earning an assigned score for correct answers. Based on the final scores, knowledge scales were categorized as low, medium, or high for each topic (HPV and cervical cancer).

All participants were asked to provide self-administered vaginal swabs. Research assistants provided detailed instructions, accompanied by pictorial guides to instruct participants on how to perform the self-administered vaginal swab. Additionally, the survey questionnaire assessing the acceptance utilized closed-ended questions.

Statistical analysis

Statistical analyses were conducted using SPSS version 23, with significance defined by p-values and ratios. A two-sided P value of ≤0.05 was considered statistically significant. The endpoints were assessed using a Chi-square test and categorized based on knowledge about HPV and cervical cancer.

Results

Demographic characteristics

A total of 203 participants were enrolled in the study; with 104 (51.2%) in the vaccinated group and 99 (48.8%) in the control group. The representation from each location was proportional to its population size among the four sites: Bayangol district accounted for the highest representation at 37%, followed by Selenge Province at 21.7%, Baganuur district at 21.2%, and Umnugovi province at 20.7%. The mean age of participants at recruitment was 26.1 years. The majority (79.8%) were employed, while 3.4% were unemployed at the time of the survey. Additionally, 57.3% of the participants reported being married. Regarding lifestyle factors, 12.3% of respondents smoked, while nearly half (49.8%) consumed alcohol. Demographic characteristics were consistent between the two groups, as shown in Table 1.

The percentage of engagement in sexual intercourse remained consistent between the vaccinated and unvaccinated cohorts; with 92.3% (95% CI: 87.1-97.5) and 91.9% (95% CI: 86.5-97.4), respectively. The mean age at first sexual intercourse was 19.4 years for the unvaccinated group and 18.9 years for the vaccinated women. Although there were slight differences in the data regarding the number of pregnancies between the cohorts, overall findings related to sexual experience, number of sexual partners, and pregnancies were consistent across both groups, as summarized in Table 2.

Questionnaire results – primary endpoint

A total of 203 participants responded to all questions regarding the acceptability of self-sampling. The majority of participants (193, 95.1%) found the self-sampling technique using Copan Self Vaginal FLOQSwabs® easy to perform. Additionally, 199 participants (98.5%) indicated that the self-swab instructions were clear and

Table 1. General Characteristics of Participants According to Vaccination Status (n=203)

Characteristic	Control group		Vaccine group		P value
	No	%	No	%	
Place of residence					0.05
Bayangol district	40	40.4	34	32.6	
Baganuur district	16	16.2	27	26	
Umnugobi province	26	26.3	16	15.4	
Selenge province	17	17.1	27	26	
Relationship status					0.96
Single	20	20.2	17	16.3	
Couple, not living together	10	10.1	10	9.6	
Couple living together	15	15.2	16	15.4	
Divorced	3	3	3	2.9	
Separated but not divorced	0	0	0	0	
Married	51	51.5	58	55.8	
No answer	0	0	0	0	
Highest level of education					0.08
High school	3	3	12	11.5	
Technical or further education institution	2	2	1	1	
College/university	93	94	91	87.5	
No answer	1	1	0	0	
Job status					0.15
Employed	86	86.9	76	73.1	
Unemployed	3	3	4	3.8	
Employed but away from work	10	10.1	20	19.2	
Unemployed	0	0	2	1.9	
No answer	0	0	1	1	
Student	0	0	1	1	
	No	% (CI)	No	% (CI)	
Smoking status					0.83
Yes	13	13.1	12	11.5	
		6.4-19.9		5.3-17.8	
Alcohol consumption					0.67
Yes	51	51.5	50	48.1	
		41.5-61.5		38.3-56.7	

comprehensive, and 191 (94.1%) reported experiencing no pain during the process. Regarding comfort during the procedure, most participants found the standing position most comfortable (45.5%), followed by standing with legs apart position (38.1%), and sitting forward on a toilet with legs apart (16.3%) position.

A significant proportion of participants (137, 67.8%) expressed a preference for conducting self-collection in a clinic rather than at home. Participants were given a choice to collect specimens by themselves or the clinician. When asked about their reason for choosing self-sampling, all respondents cited factors, such as increased personal privacy, tranquility, reduced anxiety, and time optimization (Table 3). Knowledge about HPV was assessed using a series of six subsequent "true/false/don't know" questions, with one point awarded for each correct answer, resulting in a knowledge scale ranging from 0 to 6 scores. The

knowledge scale was categorized into three groups: low (0-2), moderate (3-4), and high (5-6).

Based on the HPV-related questions, 25% of participants scored zero, indicating that they answered no questions correctly. Most respondents (60.5%) fell into the low knowledge category, while 35.5% had a moderate level of knowledge, and only 3.9% achieved a high score, with a mean score of 1.9.

The question that garnered the most correct responses was related to whether HPV can cause cervical cancer, with 61.6% of participants answering correctly. Interestingly, a common misconception was observed, as most participants incorrectly believed that HPV is a rare virus that only affects individuals with multiple sexual partners, with only 11% providing the correct response. The knowledge about HPV remained consistent between the vaccine and control groups (Table 4).

Table 2. Characteristics of of Sexual Experience and Pregnancy According to Vaccination Status (n=203)

Characteristic	Control group			Vaccine group			
	N=	%	95% CI	N=	%	95% CI	P value
Sexually active	99	91.9	86.5-97.4	104	92.3	87.1-97.5	0.92
Age of first vaginal intercourse, years	97	19.4	18.9-19.9	102	18.9	18.5-19.3	0.09
Number of lifetime sexual partners							
0	4	4	1.4+9.3	2	1.9	0.4-6.0	0.5
1	33	33.3	24.6-43.0	35	33.7	25.1-43.1	
2 - 4	50	50.5	40.8-60.2	49	47.1	37.7-56.7	
5 - 10	11	11.1	6.0-18.4	18	17.3	11.0-25.4	
≥11	1	1	0.1-4.6	0			
Pregnancy							
Yes	72	72.7	63.8-81.7	75	72.1	63.4-80.9	0.52
Number of pregnancies							
0	29	29.3	21.0-38.8	27	26	18.3-35.0	0.73
1	30	30.3	21.9-39.8	27	26	18.3-35.0	
2	25	25.3	17.5-34.4	29	27.9	20.0-37.0	
3	9	9.1	4.6-15.9	13	12.5	7.2-19.9	
4	5	5.1	2.0-10.7	8	7.7	3.7-14.0	
6	1	1	0.1-4.6	0	0		
Number of births							0.62
0	41	41.4	32.1-51.2	39	37.5	28.6-47.0	
1	37	37.4	28.3-47.2	36	34.6	26.0-44.1	
2	18	18.2	11.6-26.6	26	25	17.4-33.9	
3	3	3	0.9-7.9	2	1.9	0.4-6.0	
4	0	0		1	1	0.1-4.4	

Knowledge about cervical cancer was assessed using six "yes/no/don't know" questions related to factors that reduce the risks of cervical cancer. Each correct answer received one point, resulting in a knowledge scale categorized into three groups: low (0-2), moderate (3-4), and high (5-6). Of the participants, 13.7% demonstrated low knowledge, 37.9% had moderate knowledge and 18.9% exhibited high knowledge levels. The overall mean score was moderate, at 3.7 [95%CI 3.19-4.21], a consistency observed across both cohorts.

A significant proportion of the participants correctly identified that the Papanicolaou test reduces an individual's

Table 3. Acceptance of Self-Sampling (n=203)

Characteristic	N	% of positive responses to question	95% CI
1. Were the FLOQSwabTM swab for Vaginal self-sampling easy to use?	193	95.10%	92.7-98.4
2. Were the instructions clear and comprehensive	199	98.50%	96.8-100.2
3. Did you experience pain during self sampling?	12	5.90%	2.7-9.2
4. Which of the following 3 positions were comfortable for you?			
Standing	92	45.50%	38.8-52.4
Sitting forward on a toilet with the legs apart	33	16.30%	11.7-21.9
Standing with the legs apart	77	38.10%	31.6-44.9
5. Do you prefer self- sampling at Home or performed at the Clinic?			
At the Clinic	137	67.80%	61.2-74.0
At home	65	32.20%	26.0-38.8
Specify the reasons of choosing self-sampling			
6a. Greater personal privacy	114	56.20%	49.3-63.0
6b. Greater tranquillity	53	26.10%	20.0-32.2
6c. Less anxiety	90	44.30%	37.4-51.2
6d. Time Optimization / I have little time to see a doctor	81	39.90%	33.1-46.7

Table 4. Knowledge about HPV

	Correct Answer Rates to Each Question about HPV	
	Groups	
	Control group	Vaccine group
Sexually transmitted infection (T)	55.6	45.2
Common virus (T)	38.4	31.7
Inherited virus (F)	38.4	28.8
Rare virus that infects only people with many sexual partners (F)	15.2	7.7
Affects only the elderly (F)	64.6	57.7
Related to CC (T)	73.7	50

T, True; F, False

Table 5. Knowledge about Cervical Cancer Risks

Correct Answer Rates to Each Question about cervical cancer		
	Groups	
	Control group	Vaccine group
Papanicolaou test (T)	81.8%	83.7%
Safe sex (T)	75.8%	79.8%
HPV vaccine (T)	48.5%	52.9%
Refrain from smoking (T)	14.1%	22.1%
Exercize (F)	81.8%	80.8%
Healthy food (F)	63.6%	58.7%

T, True; F, False

risk of cervical cancer (82.7%) and that exercise does not reduce the risk of cervical cancer (81.3%). However, only half of the respondents (50.7%) were unaware that the HPV vaccine protects against cervical cancer (Table 5).

Discussion

Cervical cancer presents a significant public health challenge in LMICs, attributed to limited access to screening, HPV vaccination, inadequate healthcare infrastructure, and constrained resources. The new WHO and HRP guidelines introduce pivotal shifts in the WHO's recommended approaches to cervical cancer screening. Specifically, the guidelines recommend a HPV DNA-based test as the preferred method over visual inspection with acetic acid (VIA) or cytology (commonly known as a 'Pap smear'), which are currently the most widely utilized methods globally for detecting pre-cancerous lesions [13]. HPV testing offers better sensitivity, reproducibility, and negative predictive value compared to cytology and VIA [14]. Furthermore, the WHO suggests considering increased access to self-sampling for HPV DNA testing as a viable strategy to achieve the global strategy target of 70% testing coverage by 2030 [15].

In Mongolia, cervical cancer screening for women aged 30 to 60 commenced in 2011, however, the coverage has not improved significantly over the past decade, with rates at 46.5% in 2019 [16] and declining to 28,6% in 2021 [17]. Research indicates that many women prefer the self-sampling method over traditional screening methods, as it offers increased comfort and accessibility, particularly for those with limited access to healthcare facilities or discomfort with traditional screening approaches [15].

This study demonstrated high acceptance of self-sampling and all respondents chose self-sampling due to perceived benefits, including enhanced privacy, tranquility, reduced anxiety and time efficiency. These results were similar to the findings of our previous study involving young women aged 18-23 [6]. Women expressed greater confidence in taking self swabs at the clinic rather than at home, as they could ask questions to health providers and redo the collection if needed.

A recent meta-analysis encompassing 154 observational studies and randomized clinical trials revealed self-sampling procedures nearly doubled the likelihood of cervical cancer screening uptake compared to clinician-collected samples. Moreover, swabs and brushes demonstrated even greater potential for improving cervical cancer screening rates [18, 19]. A study conducted in Australia found that 94% of women perceived home-based self-sampling as less embarrassing, 90% as less uncomfortable, and 98% as more convenient than traditional PAP tests [20]. Similarly, a UK study confirmed the feasibility of offering self-sampling opportunistically to cervical screening non-attenders in primary care settings [21]. Additionally, self-sampling initiatives have proven effective in increasing screening rates among the never and under-screened groups of women in New Zealand [22].

Furthermore, research indicates a high acceptability rate (83%) for vaginal self-sampling for HPV testing among multi-ethnic Asian female populations [23]. Similar findings were reported in Nigeria, where self-sampling significantly boosted the uptake of HPV DNA-based tests for cervical cancer screening [24]. In Mongolia, a pilot study highlighted the positive reception of self-sampling as an alternative screening option for non-attendees or rural residents [12].

A systematic review examining barriers to cervical cancer screening uptake in LMICs identified various challenges, including individual, cultural/traditional, societal, health system, and structural barriers. Notably, a lack of knowledge and awareness about cervical cancer and of screening emerged as predominant individual-level barriers, underscoring the need for enhanced educational efforts [25]. Despite launching a pilot HPV vaccination program in Mongolia in 2012, it reached only 9,111 girls aged 11-17 years, but the initiative failed to achieve its full target coverage due to community resistance. Consequently, the vaccine has not been available in-country post-pilot phase [5].

The questionnaire results revealed a generally low level of knowledge about HPV and a moderate level of awareness regarding cervical cancer risks among participants, consistent across both cohorts. These findings, coupled with the knowledge scores, emphasize the urgent need for enhanced awareness-raising efforts about HPV and cervical cancer.

A limitation of this study was the inclusion of women aged 24-28, who are younger than the target age group for screening. Additional limitations include the selection of women who previously participated in our earlier study, suggesting they may possess greater knowledge about HPV, vaccination, and screening than other women. The strength of this study lies in its execution 11 years after vaccination, which represents a valuable contribution to the data preceding the reintroduction of the HPV vaccine in the country.

In conclusion, this study demonstrates high acceptance of self-sampling and low knowledge on HPV, vaccine among young women aged 24-28 years in Mongolia. The findings underscore a significant need for improved awareness initiatives concerning HPV and cervical cancer in Mongolia.

Author Contribution Statement

Tsetsegsaikhan Batmunkh, Otgonjargal Amraa, Unursaikhan Surenjav, Narantuya Namjil and Gantuya Dorj designed the study. Otgonjargal Amraa collected or generated study data. Tsetsegsaikhan Batmunkh and Tsegmed Sambuu analysed and interpreted the data. Tsetsegsaikhan Batmunkh drafted the first edition of the paper. All authors reviewed and approved the final version for submission. All authors attest they meet the ICMJE criteria for authorship.

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Conflict of Interest
The authors have no conflicts of interest to declare.

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