

Prevalence of High-Risk HPV Infection in Community Women at Ho Chi Minh City in 2024: A Cross-Sectional Study with Self-Collect Sampling

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Objective: HPV infection is a major contributor to cervical cancer, a common type of cancer affecting Vietnamese women. To develop effective prevention strategies for cervical cancer, it is crucial to understand the prevalence of high-risk HPV infection in communities. The objectives of this study were to determine the prevalence and distribution of HPV types among female residents in Ho Chi Minh City.

Methods: This cross-sectional study employed a self-collection method, involving 775 participants selected using a Probability Proportional to Size technique (PPS) between January and December 2024.

Results: The study found that 7.5% [95% CI: 5.6–9.3] of the 775 specimens tested positive for high-risk HPV infection, with HPV-16 accounting for 9.7%, HPV-18 for 3.2%, and other high-risk types for 87.1% (31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 66 và 68). Compared to similar studies many years ago in Vietnam, the prevalence of high-risk HPV infection has not changed much. However, among high-risk HPV infections, the ratio of types 16 and 18 has decreased dramatically.

Conclusion: Findings from this investigation reveal that the high-risk HPV infection prevalence in Ho Chi Minh City communities is consistent with earlier research. Nevertheless, a significant change has been observed in the distribution of high-risk HPV genotypes. Specifically, the proportional representation of HPV types 16 and 18 within the high-risk HPV infection group has substantially diminished, now representing only approximately 30% of their prevalence a decade prior.

Keywords: HPV specimen self-collection, high-risk HPV, cervical cancer, probability proportional to size

Introduction

Cervical cancer is a type of cancer that predominantly affects women worldwide, with a significant prevalence in developing countries.¹ According to 2020 Globocan statistics from Global Cancer Observatory (GCO), cervical cancer ranked fourth in terms of incidence and mortality among women globally.² Despite the presence of effective prevention, diagnosis, and treatment strategies, cervical cancer remains a major health issue, particularly in countries with low Human Development Index (HDI), such as those in Africa and Southeast Asia, where it ranks second only to breast cancer in terms of prevalence and mortality. In Vietnam, cervical cancer accounted for the eighth most common cause of cancer in women, as reported by The International Agency for Research on Cancer (IARC) in 2020.³

High-risk human papillomavirus (HPV) infection is identified as the primary cause of cervical cancer.^{4,5} A notable aspect of HPV infection is that most cases are cleared naturally within two years. However, prolonged high-risk HPV infection can lead to precancerous lesions and ultimately, cervical cancer, if left undiagnosed and untreated.⁶ Highly sensitive high-risk HPV tests have been shown to significantly increase the detection of precancerous lesions in the cervix, compared to traditional cytology methods.^{7–9}

The World Health Organization (WHO) suggested using self-collected HPV tests as a cervical cancer screening tool worldwide in 2022.^{4,10} HPV testing can increase the number of women participating in global cervical cancer screening



programs significantly.¹¹ Implementing self-collected HPV tests in screening programs can lead to a 97% coverage of cervical cancer screening.¹² The Vietnamese Ministry of Health approved self-collected HPV tests as one of the cervical cancer screening methods in 2021.¹³ Previous studies in Vietnam found high-risk HPV infection rates between 4.1% and 9.5%,^{14–17} with specimens collected by medical staff. The current study aims to determine the HPV infection rate and types in Ho Chi Minh city communities using a new self-collect sampling technique. This study aims to assess any changes in HPV infection rates and types due to the increased availability of HPV vaccination and socio-economic changes in Vietnam over the past decade. The study’s findings will help health policymakers update existing policies accordingly.

Methods

Study Design and Participants

The study employed a cross-sectional design, utilizing HPV testing with self-collected specimens in HCMC communities from January to December 2024, as part of the study’s methodology.

The research participants consisted of women residing in Ho Chi Minh City (HCMC) who had undergone cervical cancer screening utilizing Human Papillomavirus (HPV) tests, specifically those between the ages of 25 and 65 years who were sexually active.

Excluded from the study were women who had been diagnosed with or were undergoing treatment for precancerous lesions or cervical cancer, as well as those with abnormal cytology under regular monitoring, or those with disabilities impacting their listening and reading comprehension skills.

Sample Size

To determine the required sample size, a formula was used to estimate the proportion with absolute precision. Due to the absence of valid data in Vietnam, a 0.50 proportion for HPV infection in HCMC communities was hypothesized to achieve the largest possible sample size, which was then doubled to account for design effects. Consequently, the minimum sample size required was 772 individuals. Notably, a total of 775 women participated in the study.

Data Collection Tools

Data collection involved the use of a pre-structured interview questionnaire to gather relevant information from the participants. The questionnaire comprised 36 questions covering epidemiology, medical history, and knowledge related to HPV testing.

HPV infection status was measured through the results of the HPV tests, which were communicated to the research team by the Department of Medical Genetics at Tu Du Hospital and subsequently informed the study participants.

Study Procedure

Step 1: Sampling

Two-stage sampling using the Probability Proportional to Size (PPS) technique was utilized. Initially, 30 commune clusters were randomly selected from 312 communes in HCMC. Next, 26 women aged 25 to 65 years were randomly selected from each chosen commune. A total of 780 women participated in the study over the period of January-December 2024. Almost all invited participants accepted to join the study, with only five refused. The consent rate was 99.4%, with childcare responsibilities and private business being the primary reasons for refusal (Figure 1).

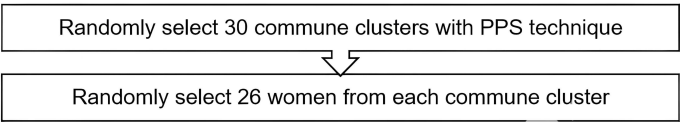


Figure 1 Sampling process.

Step 2: Pilot Trial

Ten women participated in a pilot trial to test an HPV testing method and demonstrate self-collection. The interview trial process informed revisions to the questionnaire to make it more relevant to local customs and everyday conversations. Those 10 women were not included into the study.

Step 3: Data Collection

Meetings were held with Heads of Communal Health Station to organize home visits and schedule sample collection, as well as ensure sufficient support for staff. The research team, along with a guide, visited participant residences listed for recruitment at specified times on Saturdays and Mondays to collect specimens and relevant information. A structured questionnaire was used to gather epidemiology and illness history data from participants, after which they were instructed on self-collecting samples at home.

Specimen tubes submitted by participants were labelled with a unique ID code to prevent collection errors, and the specimens were stored in specialized containers as per the manufacturer's instructions. Before transport, the research team verified specimen ID codes against participant records and test indication sheets to ensure consistency.

Specimens were sent to the Department of Medical Genetics at Hoa-Hao Hospital on the same day, where they were processed according to the hospital's current testing procedure using the Roche Cobas Z480 system. Once results were available, participants were contacted to inform them of their test outcomes. For participants testing positive for high-risk HPV types, they received guidance and follow-up according to guidelines set by the Vietnamese Ministry of Health.

Data Analysis

Statistical software, Stata 17.0, was employed to examine data. Continuous data was expressed as mean values along with standard deviations, whereas categorical data was presented in rates and percentages. To determine the relationship between HPV infection prevalence and other relevant factors, univariate and multivariate logistic regression analysis were conducted. Prevalence Odds Ratios (POR) and their respective 95% confidence intervals were documented.

Ethical Considerations

This study was conducted in accordance with the Declaration of Helsinki. The Medical Ethics Council of the University of Medicine and Pharmacy of HCMC granted approval to conduct the study via Decision No. 1257/HĐĐĐ-ĐHYD on December 14, 2023. District health centers and communal health stations cooperated with the study by agreeing to its proposal. Written informed consent was obtained from all participants. Data was kept anonymous and confidential during all stages of the study.

Results

The study participant demographics are outlined in [Table 1](#). The average age of participants is 46 years with a standard deviation of 10 years, ranging from 25 to 65 years. Most participants (82.2%) are above the age of 35. A small percentage (1.7%) of participants have never been married; however, they still have families of their own. The average age at marriage is 25.5 years with a standard deviation of 5 years, with the earliest marriage occurring at 16 years and the latest at 58 years.

[Figure 2](#) presents HPV infection prevalence in HCMC communities. HPV infection prevalence with self-collect sampling is 7.5% [95% CI: 5.6–9.3].

Three statistically significant factors associated with a higher risk of HPV infection have been identified from a study of 20 variable pairs: having a history of previous cervical cancer screening tests, a higher number of births, and being unmarried. A multivariate logistic regression model was constructed, incorporating the previously identified factors along with two additional variables: the number of sexual partners and previous HPV vaccinations, to account for potential confounders and co-impact factors. [Table 2](#) outlines the five variables included in the multivariate analysis.

After multivariate regression analysis, for those who were separated/divorced/widowed have adjusted POR for HPV infection 3 times (95% CI: 1.45–6.23) that of married women (adjusted $p < 0.05$).

Table 1 Study Participation Characteristics

Characteristics	Number (n = 775)	Percent (%)
Age: 46 ± 10 yrs [25–65]		
≤ 35 yrs	138	17.8
> 35 yrs	637	82.2
Occupation		
Housework	328	42.3
Manual labor	43	5.6
Intellectual labor	299	38.6
Business	105	13.6
Marital status		
Currently married	701	90.5
Divorced/Separated/Widowed	61	7.9
Unmarried	13	1.7
Age of marriage (n = 762): 25 ± 5 yrs [16–58]		

Table 3 presents the distribution of HPV types in communities. The prevalence of HPV-16 was 9.7%, HPV-18 was 3.2%, and other 12 high risk types (31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 66 and 68) 87.1%.

Discussion

Comparing with other studies using HPV self-collection to understand high risk HPV prevalence in community women (Table 4), we find that our prevalence is pretty equivalent to that of Aitken¹⁸ in 5800 Dutch women with 7.6% HPV positive. In that study, the author also used Cobas 4800 system similar to ours for HPV test analysis. However, when comparing with Hang¹⁹ study on 375 Khmer women, our study's prevalence was recorded higher. The discrepancy might be due to large difference in sample sizes and HPV test kit (Hang used cervical brush – care Brush for self-collection and test kit care HPV with Hybrid Capture 2 technology). Compared with Modibbo,²⁰ Wong,²¹ Carozzi²² our prevalence is lower. This might be due to differences in territory locations, sample sizes, and post-collection analysis approaches. For instance, in Modibbo study, beside 14 high risk HPV types - the same as those in our test kit – other high-risk types were recorded at 6.1% but no identification available for those other types. It is found that high risk HPV infection prevalence in our study through self-collection has a certain difference from those of overseas studies, but it still fits the population and epidemiology in Vietnam.

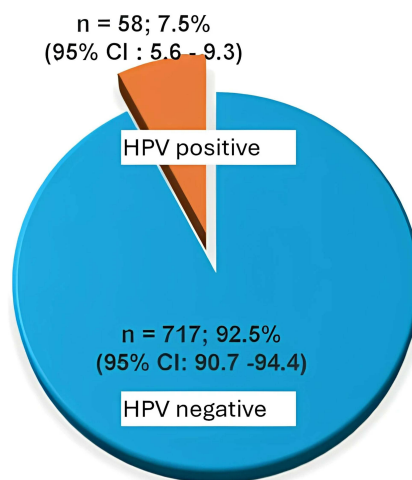


Figure 2 HPV infection prevalence in HCMC community women.

Table 2 Relationship Between HPV Infection and Related Factors

Characteristics	HPV infection		POR	Adjusted POR	95% CI	Adjusted p
	Yes n = 58 (%)	No n = 717 (%)				
Ever had cervical cancer screening						
Ever	21 (5.4)	366 (94.6)	0.54	0.59	0.33–1.03	0.07
Never	37 (9.5)	351 (90.5)	1	1		
Number of births						
1–2	44 (7.2)	566 (92.8)	0.39	0.46	0.17–1.24	0.12
> 2	7 (5.7)	116 (94.3)	0.30	0.34	0.10–1.14	0.08
None	7 (16.7)	35 (83.3)	1	1		
HPV vaccination						
Yes	5 (9.6)	47 (90.4)	1.34	1.16	0.42–3.20	0.77
No	53 (7.3)	670 (92.7)	1	1		
Marital status						
Never married	2 (15.4)	11 (84.6)	2.65	1.14	0.20–6.40	0.88
Separated/Divorced/Widowed	11 (18.0)	50 (82.0)	3.2	3.00	1.45–6.23	0.003
Currently married	45 (6.4)	656 (93.6)	1	1		
Number of partners						
≥ 2	8 (8.3)	88 (91.7)	1.14	1.00	0.45–2.23	0.99
1	50 (7.4)	629 (92.6)	1	1		

Notes: Bold values imply statistical significance. Adjusted by multivariate regression analysis model.

Table 3 Distribution of HPV Types in HCMC Communities

HPV Types Acquired *	Number	Percent (%)
HPV-16	6	9.7
HPV-18	2	3.2
Other 12 high risk types	54	87.1
Total observations	62	100

Notes: *Among 58 women, there were 4 infected with two HPV types, therefore number of observations was 62.

Table 4 Comparison Between Prevalences of High-Risk HPV Types with Self-Collection

Authors	Countries	Sample size	High-Risk HPV Prevalence (%)
Modibbo ²⁰ (2017)	Nigeria	185	8.9
Aitken ¹⁸ (2022)	The Netherlands	5800	7.6
Wong ²¹ (2022)	Hongkong	166	10
Hang ¹⁹ (2024)	Cambodia	375	6.4
Carozzi ²² (2024)	Bolivia	2043	12.5
Our study (2024)	Viet Nam	775	7.5

When comparing medical staff collection in other studies in Viet Nam, we find some differences (Table 5). Although participant groups looked well comparable and study implementation were on the same location, HPV infection prevalence is lower in our study than in Loi.T.T.¹⁵ study in 2010. Another study by Huy.N.V.D²³ implemented in central provinces in 2012 recorded HPV infection prevalence 0.9% only; however, the distribution of high risk HPV types seemed to differ for ours with

Table 5 Comparison with Test Results with Medical Staff Specimen Collection in Viet Nam

Authors	Sample Size	High Risk HPV Infection (%)	Distribution of HPV Types (%)		
			HPV-16	HPV-18	Other 12 high Risk Types
Loi.T.T. ¹⁵ (2010)	1550	9.1	–	–	–
Huy.N.V.D ²⁴ (2012)	1034	0.9	30.0	20.0	50.0
Tam L.D ¹⁷ (2013)	512	4.1	22.7	0.0	77.2
Ho ²⁵ M.N. (2020)	2478	3.5	21.8	9.2	69
Our study (2024)	775	7.5	9.7	3.2	87.1

quite high rates for HPV-16 and HPV-18. Similarly, Tam L. D’s findings¹⁷ show lower HPV infection rates, but higher HPV-16 rates compared to our study, indicating a possible change in high-risk HPV infection prevalence over time in Vietnam. The observed reduction in HPV types 16 and 18 could be a result of steadily decreasing high-risk HPV infections in the region. The varying results may also be attributed to the promotion of the HPV vaccination program. A previous study in Ho Chi Minh city collected data from 2020 reported lower HPV infection rates and higher HPV-16 and HPV-18 rates,²⁵ raising questions about methodological differences between the initial study and ours. Our study used a different method, relying on community health workers for speculum examinations and cervical swab collection, whereas we employed HPV sample self-collection, which has gained recognition globally for cervical cancer screening. The first part of our study in Ho Chi Minh City 2024 has been published.²⁶ The data show that 99.9% of 775 women successfully collected their own samples during a first-time HPV testing process. This is based on the confirmation by Hoa-Hao Hospital Lab that the sample quality is similar to other conventional methods. The method for detecting high-risk HPV genotypes demonstrates a high degree of reliability. A study conducted in the UK in 2021, involving 5,314 women who collected their own samples for HPV testing using a method comparable to that employed in our research, reported a sensitivity of 91.4% and a specificity of 88%.²⁷

The secondary objective of the study was to identify factors associated with high-risk HPV infection. Multivariate analysis showed that individuals with unstable family relationships had a higher risk of high-risk HPV infection in the general population. This may be explained by the fact that the risk of STDs in this group was significantly higher than in those with stable families.

New point in applicability: The study makes history by being the first to assess the prevalence of HPV infection among community women in HCMC and Vietnam using the self-collection method. This study provides reliable data on HPV infection and the distribution of high-risk types, aiding in the understanding of the effectiveness of the HPV vaccination promotion campaign in preventing the virus in communities.

The study had certain limitations. Although specimen self-collection for HPV tests has been approved by the Ministry of Health for cervical cancer screening, it is still a relatively new method with limited use in Vietnamese communities. As a result, there is a scarcity of local studies that can be used for comprehensive review. HPV test results are subject to false positives, which can skew the prevalence determination.

Conclusion

The prevalence of HPV infection in communities of Ho Chi Minh City using self-collection of specimens is comparable to other studies using the same method. The distribution of high-risk HPV types may have shifted following HPV vaccination campaigns, with notable reductions in HPV-16 and HPV-18, which are commonly linked to cervical cancer.

Disclosure

The authors report there are no conflicts of interest in this work.

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