

# Knowledge, attitude, and practice on and willingness to pay for human papillomavirus vaccine: a cross-sectional study in Hanoi, Vietnam

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**Background:** Despite its effectiveness in preventing human papillomavirus (HPV) infection, the rate of uptake of the HPV vaccine is low in Vietnam. This study aimed to investigate barriers related to knowledge–attitude–practice (KAP) about the HPV vaccine and willingness to pay (WTP) for the vaccine among those using services in an urban vaccination clinic in Hanoi, Vietnam.

**Materials and methods:** A cross-sectional study was conducted in a vaccination clinic of the Institute for Preventive Medicine and Public Health in Hanoi, Vietnam, from March to April 2016. KAP on the HPV vaccine was collected using a structured questionnaire. Double-bounded dichotomous-choice questions with open-ended questions were used to examine the WTP of respondents. Interval regression and stepwise logistic models were used to identify factors associated with WTP and the average amount that people would be willing to pay for the vaccine.

**Results:** Of 492 vaccination service users, 67.9%, 94.6%, and 12.3% of respondents were aware of the best age for HPV vaccination, its benefits, and the target group for vaccination, respectively. While the majority believed that the HPV vaccine was safe (92.8%) and effective (90.8%), and desired to be vaccinated (71.1%), only 31.8% of users were vaccinated. Most of the respondents were willing to pay for the HPV vaccine (86.6%), and willing to pay an average amount of US\$49.3. Those aged 20–29 years and earning more than 22 million VND/month (very rich) were more likely to pay for the HPV vaccine than people aged <20 years and earning <7 million VND/month. Users who had attained more than a high-school education and heard about the HPV vaccine from doctors, nurses, or other health professionals tended to be willing to pay for the vaccine at a lower price than individuals with below secondary-level education and who had not heard about the vaccine from these health professionals.

**Conclusion:** Sexual health education and financial assistance should be imparted alongside the HPV vaccination program.

**Keywords:** willingness to pay, knowledge, attitude, practice, HPV vaccine, Vietnam

## Introduction

Human papillomavirus (HPV) is associated with various cancer types in both men and women. Among women, in 2012, HPV was associated with 74% of cancer cases, 70% of which were cervical cancer.<sup>1</sup> In men, HPV DNA is detected in around 50% of all penile cancers.<sup>2</sup> HPV 16, HPV 18, and HPV 6/11 are considered the most common causes of HPV-related penile tumors.<sup>3</sup>

HPV vaccination is an effective method to diminish the risk of HPV transmission in both genders.<sup>5</sup> In 2008, the US Food and Drug Administration licensed the first vaccine that could prevent 70% of cervical cancers and diseases associated with HPV 16 and

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HPV 18. A systematic review of cost-effectiveness analyses endorsed the need for HPV vaccine combined with screening tests to reduce costs, save time, and prolong the effects of the vaccine.<sup>4</sup> However, in developing countries, the uptake of HPV immunization among the target population remains low.<sup>12–14</sup> One study revealed that HPV vaccine uptake among Vietnamese young people (5.7%) was significantly lower than that of their US counterparts (42%).<sup>15</sup> Reasons for this phenomenon include high cost,<sup>6,7</sup> lack of knowledge about the HPV vaccine,<sup>8</sup> negative attitudes toward the HPV vaccine,<sup>9</sup> and fear of side effects.<sup>10,11</sup> Moreover, empirical evidence indicated that the integration of HPV vaccination into preventive strategies may face several barriers related to knowledge, attitude, practice, and willingness to pay (WTP) for this vaccine.<sup>16,17</sup>

The Ministry of Health in Vietnam has exempted fees for vaccine services to children aged under 6 years, but people need to provide co-payment for other vaccines such as rubella, *Haemophilus influenzae*, hepatitis B, and HPV vaccines.<sup>18</sup> During 2006–2010, the Vietnam National Institute of Hygiene and Epidemiology collaborated with the Program for Appropriate Technology in Health to implement school-based and health center-based HPV vaccine demonstration projects to 11-year-old females.<sup>19</sup> The project ended successfully and gained a high level of public acceptability.<sup>20</sup> Since 2016, the country has no longer qualified for support from the Global Alliance for Vaccines and Immunization.<sup>21</sup> People have to pay the full price for each dose of HPV vaccine, which costs around US\$100, and this could be a financial burden.

Our study aimed to investigate knowledge–attitude–practice (KAP), WTP, and factors associated with WTP for the HPV vaccine among those using the services of an urban vaccination clinic in Hanoi, Vietnam. Our findings could be useful for the Ministry of Health in Vietnam, which is considering incorporating HPV vaccination into the national Expanded Program on Immunization.

## Materials and methods

### Study setting and sampling method

We conducted a cross-sectional study at the Institute of Preventive Medicine and Public Health vaccination clinic, Hanoi, Vietnam, from March to April 2016. We chose this clinic based on several factors. First, it is located in the center of Hanoi; thus, the characteristics of users were likely to reflect the dynamic socioeconomic characteristics of urban people. Second, this clinic has sufficient service users to meet the study sample size. Subjects were included in the study

if they met the eligibility criteria: 1) were vaccine service users, 2) were at least 18 years old, 3) agreed to enroll in the study and signed a written informed consent, and 4) were cognitively healthy.

Under the scope of this study, a convenience sampling approach was applied to recruit both male and female participants. This method allowed us to reach all available subjects in the clinic where the sampling frame was not available. After eligible subjects provided written informed consent to confirm they were invited to a private room for face-to-face interviews to ensure confidentiality. A total of 429 subjects participated in this study.

### Measurements and instruments

Face-to-face interviews were conducted using a structured questionnaire to collect self-reported data. We were aware that our study might be affected by recall bias and social desirability bias. The former bias could occur when service users incompletely remember events in the past, while the latter bias may occur when respondents want to please the medical staff, resulting in overestimating or underestimating the outcomes of interest. We applied several solutions to address these biases. First, we recruited interviewers who were not affiliated with the vaccination clinic and received sufficient training. Second, the interviewers explained clearly the purpose of the study to the subjects before interviewing and allowed sufficient time for subjects to recall accurate memories. Third, the questionnaire was designed in an understandable way. Finally, because some couples brought their children to the clinic together, we ensured that the mother and father were not interviewed twice by checking when we invited them to the study.

### Sociodemographic characteristics

We collected data about age, gender, educational attainment, marital status, current occupation, and monthly household income.

### Knowledge, attitude, and practice about HPV vaccination

Since a validated questionnaire is not available in Vietnam, we developed a series of questions based on previous studies in settings with a similar sociocultural context to Vietnam to examine KAP about HPV vaccination, and conducted a pilot study to test the validity and reliability of the questionnaire. Knowledge about HPV vaccination was measured by asking the respondents about the target group for HPV vaccination, benefits of HPV vaccination, and the best age

for vaccination. In terms of attitude, we asked people about their belief in the safety and efficacy of the vaccine and their desire for vaccine uptake by asking the following questions: “Do you believe that HPV vaccine is safe?”, “Do you believe that HPV vaccine is efficient?”, and “Do you want to get the HPV vaccine?” In terms of practice, we asked whether subjects have received HPV vaccinations before and, if not, the reasons why they had not received the vaccine.

### Willingness to pay for HPV vaccination

We used a contingent valuation method to examine the WTP for HPV vaccination services, with a starting price of 1.8 million VND (~US\$81, 2016 exchange rate) (Figure 1). First, subjects were asked “Are you willing to pay 1.8 million VND per dose for HPV vaccine?” The price doubled or dropped by a half depending on the respondent’s answer (Yes or No). The question was repeated until the last price reached four times higher or eight times lower than the initial price. Finally, subjects were asked about the maximum price that they were willing to pay for a dose of HPV vaccine.

### Statistical analysis

Data were analyzed using STATA software (version 12.0). For missing data, the highest proportion of missing data was 6.1%, for the desire to be vaccinated. The chi-squared test was used to assess differences in sociodemographic variables (age, education, marital status, and occupation), sources of seeking HPV information, KAP about the HPV vaccine, sexually transmitted infections (STIs), and use of reproductive health services between the genders. Logistic and interval regressions were used to identify factors associated with WTP and the amount that people were willing to pay.

A forward stepwise strategy with a threshold of  $p < 0.2$  was applied to shorten the regression model. A  $p$ -value  $< 0.05$  was considered statistically significant.

### Ethics approval and informed consent

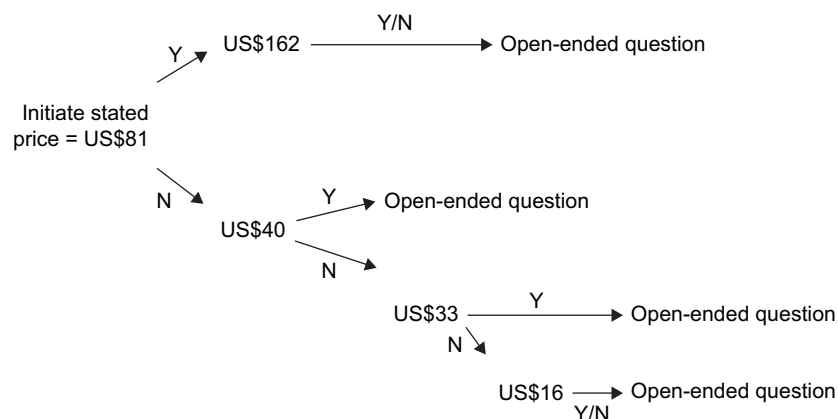
The study was approved by Ethical Committee of Hanoi Medical University. Subjects were told about the purpose of this study and asked to give their written informed consent if they agreed to participate in the study. Subjects could withdraw from the study at any time without any interruption of their services at the clinic. They were assured that their information would remain confidential.

### Results

The majority of the sample had received at least a high-school level of education (63.2%). Half of the respondents were single, divorced, or widowed (50.6%). The mean  $\pm$  SD age was  $26.8 \pm 6.2$  years and the average monthly household income was  $15.9 \pm 32.2$  million VND (Table 1).

Table 2 presents the different ways of seeking HPV-related information. Social networks and the internet (56.8%), and doctors, nurses, and other health professionals (41.9%) were common channels used to obtain information on the HPV vaccine. Of note, the internet, news, and television were the most popular channels used to seek HPV vaccine information, accounting for 66.8%. The rate of seeking HPV vaccine information in females was significantly higher than that in males ( $p < 0.01$ ).

Table 3 summarizes KAP about HPV vaccination. The percentages of subjects correctly answering questions regarding the best age for HPV vaccination, the benefits of HPV vaccination, and the target subject for HPV vaccination were 67.9%, 94.6%, and 12.3%, respectively.



**Figure 1** Contingent valuation of willingness to pay.  
**Abbreviations:** Y, yes; N, no.

**Table 1** Characteristics of respondents

Characteristics	Female		Male		Total		p-value
	n	%	n	%	n	%	
Age (years)							<0.05
≤25	118	37.6	62	54.8	180	42.2	
25–40	180	57.3	44	38.9	224	52.5	
>40	16	5.1	7	6.2	23	5.4	
Ethnicity							0.09
Kinh	308	98.4	108	95.6	416	97.7	
Other	5	1.6	5	4.4	10	2.4	
Educational level							<0.01
Secondary school or less	13	4.1	2	1.8	15	3.5	
High school	85	27.1	57	50.4	142	33.3	
Greater than high school	216	68.8	54	47.8	270	63.2	
Religion							0.01
None	308	98.7	106	93.8	414	97.4	
Other	4	1.3	7	6.2	11	2.6	
Marital status							<0.01
Single/divorced/widowed	138	44.0	78	69.0	216	50.6	
Living with spouse/partner	176	56.1	35	31.0	211	49.4	
Occupation							<0.01
Freelancer	34	11.0	12	10.6	46	10.9	
White-collar worker	149	48.1	34	30.1	183	43.3	
Student	100	32.3	60	53.1	160	37.8	
Other	27	8.7	7	6.2	34	8.0	
	Mean	SD	Mean	SD	Mean	SD	p-value
Age (years)	27.0	5.7	26.3	7.6	26.8	6.2	0.31
Monthly household income (million VND <sup>a</sup> )	14.3	11.3	20.0	58.0	15.9	32.2	0.46

**Note:** <sup>a</sup>1 US\$ = 22,222 Vietnamese dong (VND).

Regarding attitudes, the majority believed that the HPV vaccine was safe (92.8%) and effective (90.8%), and desired to get vaccinated (71.1%). However, the vaccination rate was only 31.8%, and the vaccination rate in males was nearly four

times lower than in females ( $p < 0.01$ ). The most common reasons for not having the HPV vaccine were being male (33.3%), high cost (38.2%), and the vaccine being seen as unnecessary (34.5%).

**Table 2** Finding information on the HPV vaccine

Characteristics	Female		Male		Total		p-value
	n	%	n	%	n	%	
Heard about HPV vaccine	276	91.4	87	77.7	363	87.7	<0.01
Seeking HPV vaccination information	233	84.4	46	52.9	279	76.9	<0.01
Source of hearing about HPV vaccine							
Friends	52	22.5	8	16.7	60	21.5	0.37
Relatives	49	21.2	4	8.7	53	19.1	0.05
Doctors/nurses/health professionals	99	42.9	18	37.5	117	41.9	0.49
Books/newspapers	65	28.1	14	29.8	79	28.4	0.82
Social network/internet	134	58.0	24	51.1	158	56.8	0.38
Source for finding HPV vaccine information							
Community health worker	29	11.5	4	5.8	33	10.3	0.17
Staff at vaccination clinic	74	29.0	8	11.6	82	25.3	<0.01
Internet/news/television	167	65.2	50	72.5	217	66.8	0.26
National guideline	13	5.1	3	4.4	16	5.0	0.79
Relatives/friends/colleagues	95	37.0	23	33.3	118	36.2	0.58
Other	11	4.2	9	11.5	20	5.9	0.02

**Abbreviation:** HPV, human papillomavirus.

**Table 3** Knowledge–attitude–practice about the HPV vaccine

Characteristics	Female		Male		Total		p-value
	n	%	n	%	n	%	
Knowledge about HPV vaccine							
Targeted subject for HPV vaccination							
Male	32	11.9	15	19.5	47	13.6	0.09
Female	264	98.5	77	100.0	341	98.8	0.28
Both male and female	28	10.3	15	19.2	43	12.3	<0.05
Benefits of HPV vaccine							
Prevent cervical cancer	263	97.2	67	86	330	94.6	<0.01
Treat cervical cancer	2	0.8	4	5.1	6	1.7	
Unknown	7	2.6	9	11.5	16	4.6	
Places providing HPV vaccine service							
Hospital	145	56.9	48	68.6	193	59.4	0.08
Immunization facility	221	87.0	56	80.0	277	85.5	0.14
Age for highest effectiveness of vaccine							
9–25 years, never had sex	197	73.0	38	50.0	235	67.9	<0.01
9–25 years	24	8.9	4	5.3	28	8.1	
Before having sex	6	2.2	2	2.6	8	2.3	
Other	30	11.1	20	26.3	50	14.5	
Unknown	13	4.8	12	15.8	25	7.2	
Attitude about HPV vaccine							
Believes that HPV vaccine is safe	251	92.6	70	93.3	321	92.8	0.83
Believes that HPV vaccine is effective							
Yes	244	90.0	70	93.3	314	90.8	0.63
No	8	3.0	1	1.3	9	2.6	
Unknown	19	7.0	4	5.3	23	6.7	
Desire to have HPV vaccine injection							
Yes, certainly	212	78.5	54	72.0	266	77.1	0.36
Possibly	53	19.6	18	24.0	71	20.6	
No	5	1.9	3	4.0	8	2.3	
Most influential person to inject HPV vaccine							
Doctor/nurse/health professional	96	32.2	38	34.9	134	32.9	0.62
Teacher	15	5.0	4	3.7	19	4.7	0.58
Friend	23	7.7	17	15.6	40	9.8	0.02
Family	48	16.1	18	16.5	66	16.2	0.92
Oneself	127	42.6	37	34.6	164	40.5	0.15
Other	4	1.3	3	2.7	7	1.7	0.33
Practice of HPV vaccine							
Has ever had HPV vaccine injection	102	37.6	8	10.7	110	31.8	<0.01
Reason not to inject							
High cost	51	56.0	7	11.5	58	38.2	<0.01
Unnecessary	39	44.3	12	20.0	51	34.5	<0.01
Male	3	3.7	44	73.3	47	33.3	<0.01
Unsuitable age	49	30.6	2	2.9	51	22.4	<0.01
Lack of knowledge	14	8.8	4	5.9	18	7.9	0.46
Not sufficient condition	14	8.8	1	1.5	15	6.6	<0.05
Lack of trust	2	1.3	0	0.0	2	0.9	0.35
Using other vaccine	1	0.6	0	0.0	1	0.4	0.51
Afraid of pain	1	0.6	0	0.0	1	0.4	0.51

**Abbreviation:** HPV, human papillomavirus.

The subjects' history of STIs and use of reproductive health service are shown in Table 4. Most subjects had never been infected with STIs (90.1%) or genital herpes (94.4%). Nearly 30% of subjects had ever had a reproductive health examination, and 46% of these respondents were examined every 6 months.

The WTP for the HPV vaccine is presented in Table 5. Most respondents were willing to pay for the HPV vaccine (86.6%), with an average amount of 1.119 million VND.

Table 6 shows that those aged 20–29 years were more likely to be willing to pay for HPV vaccine than those aged <20 years (OR = 6.99, 95% CI 1.62 to 30.21).

**Table 4** History of STIs and reproductive health service use

Characteristics	Female		Male		Total		p-value
	n	%	n	%	n	%	
Ever had STI							0.08
Yes	27	8.9	3	2.7	30	7.3	
No	268	88.7	104	93.7	372	90.1	
Unknown	7	2.3	4	3.6	11	2.7	
Ever had genital herpes							0.39
Yes	5	1.7	3	2.7	8	1.9	
No	283	94.0	106	95.5	389	94.4	
Unknown	13	4.3	2	1.8	15	3.6	
Family member ever had STI							0.24
Yes	7	2.3	0	0.0	7	1.7	
No	272	90.1	104	93.7	376	91.0	
Unknown	23	7.6	7	6.3	30	7.3	
Knows people who have had cervical cancer							0.23
Yes	12	4.0	1	0.9	13	3.1	
No	277	91.1	107	95.5	384	92.3	
Unknown	15	4.9	4	3.6	19	4.6	
Ever examined reproductive health	105	34.8	6	5.4	111	26.9	<0.01
Frequency of reproductive health examination							0.09
Every 3 months	14	13.3	3	50.0	17	15.3	
Every 6 months	50	47.6	1	16.7	51	46.0	
Every 1 year	33	31.4	2	33.3	35	31.5	
Over 1 year	8	7.6	0	0.0	8	7.2	

**Abbreviation:** STI, sexually transmitted infection.

People who earned more than 22 million VND/month (very rich) were willing to pay for HPV vaccine at a higher price than those who earned <7 million/month (very poor) (coefficient = 474.91, 95% CI 82.19 to 867.63). Service users who had attained education above high school were will-

ing to pay for the vaccine at a lower price than those had less than secondary education (coefficient = -572.98, 95% CI -936.33 to -209.64). Those who had children above 6 years old were willing to pay a higher price for the HPV vaccine (coefficient = 1,294.77, 95% CI 161.91 to 2,427.63).

**Table 5** WTP for the HPV vaccine

Characteristics	WTP		p-value	Amount willing to pay (VND)	
	n	%		Mean	95% CI
Total	349	86.6		1,119.9	1,010.3 to 1,229.4
Gender			0.18		
Female	256	88.0		1,084.0	962.1 to 1,206.0
Male	92	82.9		1,231.7	990.9 to 1,472.6
Age (years)			0.97		
<20	8	88.9		1,523.1	619.1 to 2,427.1
20–29	248	86.7		1,119.9	993.4 to 1,246.3
≥30	93	86.1		1,084.6	864.0 to 1,305.3
Educational level			0.86		
Secondary school or less	11	91.7		782.7	243.7 to 1,321.6
High school	119	86.9		1,279.0	1,085.2 to 1,472.8
More than high school	218	86.2		1,056.7	920.3 to 1,193.1
Marital status			0.65		
Single/divorced/widowed	179	87.3		1,141.9	993.4 to 1,290.5
Living with spouse/partner	169	85.8		1,101.8	939.4 to 1,264.3
Employment			0.13		
Freelancer	33	75.0		864.3	568.6 to 1,160.0
White-collar worker	152	88.4		1,107.8	936.9 to 1,278.7
Student	134	87.6		1,202.9	1,022.4 to 1,383.4
Other	27	87.1		1,230.6	838.1 to 1,623.0

**Abbreviations:** WTP, willingness to pay; HPV, human papillomavirus.



**Table 6** Factors associated with WTP and amount willing to pay for the HPV vaccine

Characteristics	WTP for HPV vaccine		Amount willing to pay (VND)	
	OR	95% CI	Coefficient	95% CI
Vaccine service user (vs children)				
Adult male	0.12***	0.03 to 0.52	−271.32	−664.03 to 121.40
Age (vs <20 years)				
20–29 years	6.99***	1.62 to 30.21		
≥30 years			−323.61*	−683.20 to 35.98
Marital status (living with spouse/partner vs single/divorced/widowed)			532.75***	167.71 to 897.78
Education (vs secondary school or less)				
High school	3.30	0.72 to 15.06		
More than high school			−572.98***	−936.33 to −209.64
Employment (vs freelancer)				
White-collar worker	6.00**	1.35 to 26.59		
Household income (million VND/month) (vs <7 million VND/month, very poor)				
7–10 (poor)	0.28**	0.09 to 0.95		
10–20 (rich)			303.64	−102.51 to 709.79
20–600 (very rich)	11.61*	0.66 to 203.74	474.91**	82.19 to 867.63
Has children (vs no children)				
Has children >6 years old			1,294.77**	161.91 to 2,427.63
Source of hearing about HPV (vs no)				
Doctors/nurses/health professionals	0.18***	0.05 to 0.59	−443.34***	−719.17 to −167.51
Social network/internet			204.28	−79.47 to 488.03
Source for finding HPV information (vs no)				
Community health worker			−550.15***	−967.00 to −133.31
Website/newspaper/television			−324.51**	−616.88 to −32.14
Believes that HPV vaccine is safe (yes vs no)			440.58*	−20.91 to 902.07
Believes that HPV vaccine is effective (yes vs no)	0.08**	0.01 to 0.62		
Has ever examined reproductive health (yes vs no)	0.23**	0.06 to 0.91		
Has family member who ever had STI (yes vs no)	13.26*	0.73 to 241.17		

**Note:** \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

**Abbreviations:** HPV, human papillomavirus; WTP, willingness to pay; VND, Vietnamese dong; STI, sexually transmitted infection.

People who were informed about HPV by doctors, nurses, or other health professionals were willing to pay a lower price for the HPV vaccine (coefficient = −443.34, 95% CI −719.17 to −167.51).

## Discussion

This study provides a step toward a better understanding of barriers to HPV vaccination uptake in Hanoi, Vietnam. Our findings highlighted a low rate of service users having sufficient KAP towards HPV vaccination, but a high proportion of respondents were willing to pay for HPV vaccine, at an average cost of 1.119 million VND (US\$49.3) per dose. Moreover, some factors associated with the WTP for HPV vaccine were found, suggesting potential implications for further scaling-up of HPV vaccination in Vietnam.

In this study, we found that one-third of service users were vaccinated against HPV infection. This vaccine uptake rate (31.8%) was higher than a previous study in Vietnam (2.3%)<sup>24</sup> but lower than a study in China (47.2%), and

in European countries such as Germany (53%)<sup>25</sup> and the Netherlands (49.9%).<sup>26</sup> Of note, we observed that very few people answered correctly the question about the target group for HPV vaccination. This may be explained by the fact that HPV vaccination programs have largely focused on women and young adolescent girls as there is a close link to cervical cancer.<sup>22</sup> However, this may lead to erroneous perceptions of the target group for HPV vaccination in that this vaccine is for both males and females. Moreover, men may perceive that the HPV vaccine is not necessary.<sup>23</sup> This raises the need for knowledge enhancement efforts which emphasize the benefits of HPV vaccination in both men and women.

The estimated amount that people were willing to pay for the HPV vaccine in this sample was approximately two-thirds of the actual price in the vaccination clinic (1.8 million VND per dose). This amount was lower than that in the USA,<sup>27</sup> where mothers would pay an average of US\$663 for the three-dose course. In other studies in Thailand and Mexico, people were willing to pay US\$200 for three doses

and US\$45–240 for three doses,<sup>28</sup> respectively. The reason for this may be because this amount could still be a financial burden as the three-dose HPV vaccine course represented about 21% of general monthly household income and nearly 7% of Vietnamese annual income.<sup>29</sup> A previous study conducted in Binh Dinh, Vietnam, also indicated the high cost as a major barrier to HPV vaccination.<sup>24</sup> Our results highlight the need for financial support and the inclusion of the HPV vaccine in the National Immunization Program.

Our findings suggest that individuals between the ages of 20 and 29 years were most likely to pay for the vaccine. Sexual health topics are often avoided in discussions at school or in the family.<sup>30</sup> Some people even believe that sexuality and relationships are not appropriate for adolescents and young adults because education must be prioritized.<sup>31</sup> However, this may lead to a lack of essential knowledge about sexual health. In the context of Vietnam, those between 20 and 29 years old are more likely than others to be in a romantic relationship, become sexually active, and care about sexual health. Thus, the expansion of school-based sexual health education could be a vital aspect of any public health initiative to increase the knowledge regarding prevention of STIs. Although receiving HPV vaccination before becoming sexually active can reduce the risk of cervical cancer, the rate of vaccination uptake remains low owing to high prices, especially in developing countries.<sup>32</sup> Very rich subjects were more willing to pay the higher price than their very poor counterparts. While this result is in line with a previous study in Vinh Long, Vietnam,<sup>18</sup> a study in Binh Dinh, Vietnam, found no association between household economics and HPV vaccination.<sup>24</sup> Nevertheless, our study affirms the existence of financial barriers to HPV vaccination.

This study suggests that those had higher than a high-school level of education tended to pay for the vaccine at a lower price than those who had lower than the secondary-school level. This finding is in line with the previous literature.<sup>33,34</sup> It is widely acknowledged that well-educated people tend to chart their own course on the issue of vaccines.<sup>35,36</sup> In this respect, these people may enrich their knowledge themselves by cross-referencing reputable information on the internet, where they gather a lot of misinformation about vaccination. While a large body of literature shows that physicians play an important role in increasing HPV vaccine uptake,<sup>37,38</sup> we found that subjects who had heard about the HPV vaccine from doctors, nurses, health professionals, and community health workers were less likely than others to be willing to pay for the vaccine. Several studies have pointed out that the high cost of the HPV vaccine is a

major barrier to recommending the HPV vaccine.<sup>39,40</sup> More affordable alternatives, such as using condoms and having a single sexual partner, may be prioritized. This could orientate people towards alternatives other than HPV vaccination. Future studies should draw attention to physicians' perceived barriers to recommending HPV vaccine. This may enrich the understanding about barriers to expanding HPV vaccine from the physician's perspective.

Several recommendations can be drawn from the study. First, sexual health education should be extensively implemented in dynamic forms such as media, workshops, and school curriculums to promote KAP about HPV vaccination among the target populations. Second, the government should mobilize financial resources to reduce the cost of the HPV vaccine. Finally, there needs to be a strong collaboration among stakeholders to introduce the HPV vaccine into the National Immunization Program. Future research could focus on physicians' perceived barriers to recommending the HPV vaccine in the context of Vietnam, and the characteristics of those people who know little about HPV and are not willing to pay for the HPV vaccine.

This study reflects viewpoints from both males and females, which allows us to capture a more comprehensive picture of KAP and WTP for the HPV vaccine in the general population. However, we acknowledge several limitations. First, owing to the nature of the design, we cannot establish causal links between WTP for the HPV vaccine and its associated factors. Second, we recruited our sample by using the convenience sampling technique, which limits the capacity to generalize our results to other settings. Moreover, this study was carried in the vaccination clinic, where people may have better KAP and a high WTP for the HPV vaccine than those in the community. Finally, although some preventive procedures were followed, recall bias and social desirability bias may have occurred, which could affect the main findings of this study.

## Conclusion

Most subjects in this study had misconceptions about the target group for HPV vaccination, and the vaccination rate was low, especially in males. The majority was willing to pay for the vaccine and the average amount they were willing to pay was 1.119 million VND per dose. Age, monthly household income, having children above 6 years old, and sources of hearing about HPV were factors associated with WTP and the amount that people were willing to pay for the HPV vaccine. Enhancing sexual health education among adolescents, reducing the costs of the HPV vaccine, and



introducing the HPV vaccine into the National Immunization Program could be pragmatic solutions to increase levels of HPV vaccination.

## Data sharing statement

The data from this study are available from the Institute for Preventive Medicine and Public Health, Hanoi Medical University, but restrictions apply to the availability of these data, which were used under license for the current study and so are not publicly available. However, data are available from the authors upon reasonable request and with permission from the Institute for Preventive Medicine and Public Health, Hanoi Medical University.

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## Author contributions

BXT, PTQT, and TTND conceived the study. BXT, PTQT, CAL, MWBZ, and RCMH designed the study. TTND, HLTN, and HTL implemented the study. BXT, PTQT, HLTN, HTM, and THTN analyzed the data. BXT, PTQT, TTND, HLTN, HTL, HTM, and THTN produced the first draft of the manuscript. All authors contributed toward data analysis, drafting and revising the paper and agree to be accountable for all aspects of the work. All authors read and approved the final manuscript.

## Disclosure

The authors report no conflicts of interest in this work.

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