

RESEARCH ARTICLE

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Human Papillomavirus Vaccination for Boys: Insights into Knowledge, Acceptance, and Willingness to Pay among Parents in Yogyakarta, Indonesia

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Abstract

Objective: This study aimed to measure knowledge, acceptance, and willingness to pay (WTP) towards Human Papillomavirus (HPV) vaccination for boys among parents in Yogyakarta Province, Indonesia. **Methods:** The cross-sectional, descriptive study was conducted from September to November 2023 through electronic self-reported questionnaires survey. The parents of boys aged 11 to 15 years of age and had never had an HPV vaccination for their son before were recruited as survey respondents. The study respondents were recruited through school-based approach involving 12 elementary schools and 15 junior high schools that distributed in 3 districts of Yogyakarta Province. The survey examined demographic details, knowledge about HPV and its vaccine, understanding of HPV-related issues, willingness to receive the HPV vaccination, and readiness to pay for the vaccine. **Result:** A total of 410 parents that coincidentally all were women participated in this study. The average knowledge score was 6.58 (43.9%), indicating that overall knowledge about HPV was moderate among the respondents. In contrast, a total of 346 parents (84.4%) expressed their willingness to vaccinate their son. The bivalent vaccine had mean of an out-of-pocket WTP of IDR 172,279 (USD 11.11) and the quadrivalent vaccine of IDR 223,144 (USD 14.39), with a median WTP of IDR 100,000 (USD 6.4) for both vaccines. These WTP values were about 20% of the market price. There was significant difference of WTP mean between group of respondents' characteristics for variables such as marital status, education, and income. There was also significant relationship between knowledge, acceptance, and WTP toward HPV vaccine. **Conclusion:** Despite the high acceptance towards HPV vaccination, knowledge and WTP were still considered low. Such strategies are required to increase awareness regarding impact of HPV toward men's and women's health. In addition, at current situation voluntary HPV vaccination for boys was not favourable program.

Keywords: HPV-related cancer- vaccine preventable cancer- awareness- immunization

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Introduction

Approximately 13% of global cancer cases were attributable to infection-related factors such as *Helicobacter pylori*, Human Papillomavirus (HPV), Hepatitis B and C viruses, and Epstein-Barr virus, as reported in 2018 [1]. HPV is one of the most prevalent sexually transmitted infections worldwide and a major contributor to infection-associated cancers, accounting for 4.8% of the global cancer burden [2]. Cervical cancer remains one of the most common cancers and a leading cause of death in low- and middle-income countries. Persistent infections with high-risk HPV types can result in cancers in various anatomical sites, such as the cervix, oropharynx, anus, penis, vagina, and vulva [3]. Despite cervical cancer in women, both men and women in Indonesia face significant

burdens from other cancers caused by HPV infection, such as colorectal, thyroid, lung, and nasopharyngeal cancers [4].

In Indonesia, cervical cancer ranks as the second most frequent cancer among women and among women aged 15 to 44 years of age. Approximately 4% of women in the general population are estimated to harbour cervical HPV-16/18 infection and 87% of invasive cervical cancers are attributed to HPVs 16 or 18. In addition, the crude incidence rates of HPV-related cancers in female in Indonesia for cervical, anal, vulva, vaginal, oropharyngeal, oral cavity, and laryngeal cancers were 27, 0.2, 0.98, 0.35, 0.32, 1.64, and 0.18, respectively. Meanwhile, the crude incidence rates of HPV-related cancers in male in Indonesia for anal, penile, oropharyngeal, oral cavity, and laryngeal cancers were, 0.36, 0.74, 0.76, 2.58, and 2.48,

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respectively [5].

HPV-related cancers left health and economic burden to the patients and societal. It was estimated that in 2019, there were 465,740 potentially vaccine-preventable cancer deaths due to Human papillomavirus (HPV) and hepatitis B virus (HBV) and 14,171,397 YLL across all WHO regions, with estimated economic impact due to this mortality was \$106.3 billion globally. Among all these cancers, HPV-related cervical cancer resulted in the highest burden with 251,846 deaths, productivity loss valued at \$71.9 billion and a value of years of life lost (VYLL) of \$71.9 billion [6]. HPV-related cancers also decreased health related quality of life (HRQOL) of the patients as was found in Indonesian patients, in which the average of HRQOL measured in health utility was 0.69 ± 0.10 [7].

Several studies have demonstrated that the HPV vaccine is cost-effective in preventing both cervical and non-cervical cancers [8]. By 2022, the HPV vaccine has been incorporated into national routine vaccination schedules of 127 countries (representing > 60% of World Health Organization (WHO) Member States and roughly one-third of the worldwide target population) [9]. The introduction of HPV immunization in Indonesia has been carried out in 2016 and became mandatory implementations for all districts/cities in Indonesia in 2023 [10].

The national immunization program of HPV in Indonesia targets girls in the 5th and 6th grades of elementary school [10]. The primary target of vaccination is girls aged 9-14, prior to the start of sexual activity. Meanwhile, the vaccination of secondary targets such as boys and older females is recommended where feasible and affordable. The benefit of HPV vaccination would increase if the target were expanded to adolescent adult women aged 15-20 years, women aged over 21 years but not more than 26 years old, and boys aged 11 to 12 years old [11, 12]. HPV vaccination for adolescent, adult women, and boys has been included in the national immunization schedules in several countries [13-15].

Vaccine hesitancy is a challenge that important to be eliminated in order not to be barrier for country immunization programmes [15]. Study on determinant factors of HPV vaccination uptake emphasizes the need for community education, school-based immunization, and education programs that promote the uptake of the vaccine to increase coverage [16]. Studies to explore aspects of knowledge, acceptance, willingness to pay toward HPV vaccine have been conducted in Indonesia that mostly specified the vaccination target toward girls or adolescent girls [17-19]. None of study focus on HPV vaccine targeted for boys. This study aimed to measure knowledge, acceptance, and willingness to pay towards HPV vaccination for boys among parents in Yogyakarta Province, Indonesia.

Materials and Methods

Study design and setting

The cross-sectional, descriptive study was conducted from September to November 2023 through electronic

self-reported questionnaires survey to assess knowledge, acceptance, and willingness to pay of parents in Special Region of Yogyakarta Province, Indonesia toward HPV vaccination for boys. Yogyakarta Province was selected as study location due to high coverage of routine immunization, as well as the first area in which HPV vaccination was introduced. The study respondents were recruited through school-based approach involving 12 elementary schools and 15 junior high schools that distributed in 3 districts of Yogyakarta Province namely Districts of Sleman, Yogyakarta, and Bantul. Convenience sampling was applied to select the schools and recruited study participants.

Participants

The parents of boys aged 11 to 15 years of age and had never had an HPV vaccination for their son before were recruited as survey respondents. Before the survey was administered, participants were properly informed about the study's goals and confidentiality measures. Conscientious consent was given by all legitimate respondents. Respondents not completing to answer the important questions in the questionnaire were excluded.

Sample size was calculated using Lemeshow Formula as follow [20]:

$$n = \frac{Z_a^2 p Q}{d^2}$$

Where:

n= minimum sample size

Za = a measure of confidence level

P= proportion of categories targeted for sampling

Q= (1-P) or proportion not targeted for sampling

d= acceptable tolerance for sampling error (deviation)

Assuming the proportion of the study is unknown, the value of P was 0.50, the value of Za following confidence level 95% was 1.96, with the desired degree of deviation was 5%, the formula resulted minimum sample size of 385 respondents.

Instruments

The self-administrated questionnaires in Indonesian language were modified from the related literature mostly were previous similar studies [21-27]. The survey examined demographic details, knowledge about HPV and its vaccine, understanding of HPV-related issues, willingness to receive the HPV vaccination, and readiness to pay for the vaccine which divided into 6 sections.

Section 1 was designed to gather information on sociodemographic factors, such as age, area of residence, religion, marital status, education level, income level, distance to Health Facilities, health Insurance and pre-existing conditions of respondents. Section 2 examined factors related to individuals' experience with HPV-related illness and its vaccine, their favored sources of information, and the most influential person in their decision-making process regarding vaccination.

Section 3 was for knowledge-related questions to assess participants' knowledge of HPV and its associated

illnesses. The knowledge domain consists of 15 questions covering the aspects of etiology and transmission of HPV infection, risk factor for HPV infection, benefit and safety of HPV vaccination, and existing program related to HPV. The responses for knowledge using “Yes”, “No”, and “Do not know” answers. Knowledge level of each respondent was scored by calculating the correct answer for each question, in which correct answer was scored as 1 (one) and incorrect or do not know answer were scored as 0 (zero). In Section 4, the respondents were asked to indicate if they would be willing to receive HPV vaccine for their sons. The acceptance domain consisted of 1 main question to ask if the respondent willing to vaccinate their child and 3 additional questions including if the respondents willing to recommend others to get vaccination, and safety/effectivity of vaccine. “Yes” or “No” answers were used to response acceptance questions. The acceptance was reported as frequency (number and percentage) of respondents who respond to “Yes” or “No” answer.

Section-5 aimed to assess the respondents’ WTP toward HPV vaccine in two alternative scenarios: out-of-pocket and co-payment. WTP amounts under an out-of-pocket scenario were calculated using the contingent valuation approach [28]. With a conversion rate of USD 1 = IDR 15,500, at first bidding rates of IDR 800,000/shot (USD 51.6) for the bivalent vaccination and IDR 1,200,000/shot (USD 77.4) for the quadrivalent vaccine, two varieties of HPV vaccines that were available in the Indonesian market were offered. Prior to contingent valuation, the respondents were advised that, depending on age, the HPV vaccine takes two to three doses. An open-ended inquiry regarding their willingness to pay was part of this valuation, which used the average cost of HPV vaccinations in Indonesia to reflect market realities. They noted additional factors that affected their payment choices. In the second scenario, the respondents were asked their WTP if government subsidies were combined with a co-payment that began at 25% and increased to 50% and 75%.

Statistical analysis

Content validity involving experts with relevant experience was conducted to ensure the contents met the objectives of survey. Face validity was tested on about 15 respondents to ensure that the questionnaire understood by the respondents. Descriptive analysis was applied to analyse and present the respondents’ characteristics, knowledge response and level, acceptance response, and WTP amount along with additional response related to WTP. Respondents’ characteristics, knowledge, acceptance, and WTP responses were presented as frequency (number and percentage). Meanwhile mean, median, standard of deviation, range of minimum and maximum were presented in the knowledge level and WTP amount. Chi Square tests were performed to analyse the relationship between knowledge level versus acceptance and WTP, as well as between acceptance versus WTP. Non-parametric Mann-Whitney U test determined any significant differences in WTP amount among sociodemographic groups. Statistical significance was considered at a p-value below 0.05 with a confidence

interval of 95%. A minor missing data such as not complete in fulfilling respondent’s characteristics was allow as this could be accommodated when analysing and presenting the data in terms of frequency and percentage.

Study bias

There were several sources of potential bias in this study that the researchers efforted to avoid. Sampling bias might occur as the study used non-random sampling, resulting in non-representative sample from the whole population. Even though the study applied convenience sampling, the sample selection considered to include respondents from several schools from 3 districts out of 5 districts in Yogyakarta Province. To reduce non-response bias, this study targeted parents of students in schools which age match with the target, coordinated with the teachers to ensure delivery of the questionnaire, provided a short and easy-answer form of questionnaire to avoid the respondents not finishing the survey. Agreement bias could lead to a tendency to negative or positive responses, thus the questionnaire was designed containing combination of favorable and unfavorable questions, nonleading questions, and anonymous option.

Results

Socio-demographic characteristics of the participants

A total of 410 respondents were included in the final study analysis. As mentioned in Table 1, among all the parents that coincidentally were all women, almost half of the children were junior high student or aged 13-15 years old (62%.0) with most parents identified as Muslim (92.4%) and married (89.8%). Half of the participants had higher education (54.9%) and a slight majority (58%) reported moderate-high income levels. In term of access to healthcare, most participants lived near health facilities (81.2%) and had insurance (85.6%) with primarily public insurance (83.2%).

Parental experiences and awareness of HPV and HPV vaccine

Table 1 also reveals that 81.7% of parents reported previous vaccination experience. A majority (64.4%) were unaware of penile cancer, and less than half (47.8%) had even heard of the HPV vaccine. This lack of awareness may stem from the fact that only 16.3% personally knew someone with HPV-related cancers and only 26.1% of participants knew someone who had been vaccinated against HPV.

Parental knowledge about HPV and its related diseases

As shown in Table 2, more than a half of all the parents (62.2%) had some knowledge about the main transmission of HPV is through sexual activity, whereas 66.6% parents don’t know whether the government has implemented an HPV vaccination for boys. Over half (53.2%) understood that HPV can lead to penile cancer in men and 68.3% correctly acknowledged that vaccinated boys have a lower risk of genital infections. About 72.0% of respondents correctly identified that HPV is caused by a virus, and a significant majority (77.3%) acknowledged

Table 1. Sociodemographic Characteristics of Respondents

Characteristics	Category	Frequency (N=410)	Percent
Child's age (years)	11 - 12 (elementary school)	156	38
	13 – 15 (junior high school)	254	62
Parent's age (years)	≤ 40	189	46.3
	> 40	219	53.7
Religion	Islam	379	92.4
	Non-Islam	31	7.6
Marital status	Not Married (Single/widowed/divorced)	42	10.2
	Married	368	89.8
Education level	Primary (elementary & high school)	185	45.1
	Higher (university)	225	54.9
Monthly income	Low (<Regional Minimum Wage: USD 122)	172	42
	Moderate-high (≥ RMW)	238	58
Distance to health facilities	Near (<5km)	333	81.2
	Far (≥5km)	77	18.8
Having Insurance	Yes	351	85.6
	No	59	14.4
Type of insurance	Public (government)	341	83.2
	Private	10	2.4
	Don't have	59	14.4
History of illness	Have chronic disease	46	11.2
	No chronic disease	331	80.7
	Don't know, never been checked up	33	8.1
Ever been vaccinated (any type of vaccine)	Yes	335	81.7
	No	73	17.8
Ever heard of penile cancer	Yes	164	35.6
	No	264	64.4
Ever heard of HPV	Yes	219	53.4
	No	191	46.6
Ever heard of the HPV vaccine	Yes	196	47.8
	No	214	52.2
Known of anyone with penile/anal/pharyngeal cancer (whether knowing them directly or only knowing them from the news)	Yes	67	16.3
	No	343	83.7
Known of anyone who had been vaccinated against	Yes	107	26.1
	No	303	73.9

that people who have several sexual partners are more likely to become infected with the virus. However, just 43.4% were aware that HPV may be spread orally, and 43.6% had no idea that HPV can even afflict those who are not sexually active. The HPV vaccine clearly lacked knowledge; 57.3% of respondents were unaware that it can prevent certain malignancies, and 74.4% did not know it needs at least two doses. Only 32.7% realized that asymptomatic individuals can still transmit HPV. A large proportion (55.1%) recognized the need for men to be vaccinated, but misconceptions persisted, with only 29.7% knowing the optimal vaccination age for boys and 62.7% aware that men can contract HPV. Additionally, 12.2% mistakenly believed that the HPV vaccine could reduce male fertility.

The average knowledge score was 6.58 (43.9%), indicating that overall knowledge about HPV is moderate among the respondents. In the meantime, the values for the median and mean of knowledge score were 7.00 and 6.58 (\pm 4.06) out of the total score of 15, respectively. Due to not normally distributed data, the cut-off point used median score, with 47.8% parents scored high knowledge (valued 8-15 points) and 52.2% parents scored low knowledge (valued 0-7 points).

Parental acceptance towards HPV vaccine

A total of 346 parents (84.4%) from 410 respondents expressed their willingness to vaccinate their son and recommended the vaccine to another child. Most of parents also believe that the vaccine is safe (84.9%) and

Table 2. Cognitive List and Knowledge Level

Questions	Correct		Incorrect			
	N (%)	Wrong N (%)	Don't know N (%)			
1. Main transmission of HPV is through sexual contact	255 (62.2)	13 (3.2)	142 (34.6)			
2. The government has implemented an HPV vaccination program for boys.	108 (26.3)	29 (7.1)	273 (66.6)			
3. HPV can lead to penile cancer in men.	218 (53.2)	6 (1.5)	186 (45.4)			
4. Vaccinated boys have a lower risk of genital infections.	280 (68.3)	8 (1.9)	122 (29.8)			
5. The risk of HPV infection is higher for individuals with multiple sexual partners.	317 (77.3)	6 (1.5)	87 (21.2)			
6. HPV infection is caused by a virus.	295 (72.0)	4 (1.0)	111 (27.0)			
7. Oral sex can lead to the transmission of HPV infection	178 (43.4)	25 (6.1)	207 (50.5)			
8. HPV infection only affects sexually active individuals.	127 (31.0)	104 (25.4)	179 (43.6)			
9. HPV vaccine requires at least 2 doses.	95 (23.2)	10 (2.4)	305 (74.4)			
10. HPV vaccination in boys can 100% prevent the occurrence of penile, anal, and pharyngeal cancer.	109 (26.6)	66 (16.1)	235 (57.3)			
11. A person can transmit HPV infection even without showing symptoms.	134 (32.7)	35 (8.5)	241 (58.8)			
12. Men do not need to be vaccinated against HPV *	14 (3.4)	226 (55.1)	170 (41.5)			
13. HPV vaccine is most effective when given to boys aged 11-12 years.	122 (29.7)	20 (4.9)	268 (65.4)			
14. Men cannot contract HPV infection *	7 (1.7)	257 (62.7)	146 (35.6)			
15. HPV vaccine can reduce male fertility.	50 (12.2)	123 (30.0)	237 (57.8)			
Mean	SD	Min Score	Max Score	Median	Knowledge Level	
					Low ** N (%)	High *** N (%)
6.58	4.06	0	15	7	214	196
43.9%	27.1%	0%	100%	46.7%	52.2%	47.8%

*, unfavorable question which is supposed to be answered as "false"; **Low score = 0 – 7.00 points (0% – 46.7%);***High score = 8.00 – 15.00 points (53.3% - 100%)

Table 3. Acceptance toward HPV Vaccination

Variable	Frequency	Percent
I agree to vaccinate my son with the HPV vaccine		
Yes	346	84.4
No	64	15.6
I would recommend the HPV vaccine for children and adolescents (ages 11-15)		
Yes	346	84.4
No	64	15.6
I believe the HPV vaccine is safe for my son.		
Yes	348	84.9
No	62	15.1
I believe the HPV vaccine is effective in preventing HPV infection		
Yes	356	86.8
No	54	13.3

effective (86.8%). The detail of information is available in Table 3. The most frequent reasons for acceptance of HPV vaccination were for the benefit of vaccination to prevent diseases and for general health of their children. Meanwhile the most frequent reasons for refusing HPV vaccination were doubt about the safety of vaccination and perception that their lifestyle was not at risk for HPV-related diseases.

Respondents' WTP for HPV vaccination

The willingness to pay for quadrivalent and bivalent vaccines under various payment scenarios is summarised in Table 4. In the first offer, 13.9% and 11.0% of participants expressed willingness to pay for the bivalent and quadrivalent vaccines, respectively. When the price was increased by 1.5 times, the willingness to pay grew dramatically to 34.4% for the bivalent vaccine but just 5.4% for the quadrivalent. On the other hand, a 0.5-fold decrease in price led to a WTP of 25.1% for the bivalent and 18.8% for the quadrivalent. The bivalent had mean of an out-of-pocket WTP of 172,279 IDR (USD 11.11) and the quadrivalent of 223,144 IDR (USD 14.39), with a median WTP of 100,000 IDR (USD 6.4) for both. About 16.8% of respondents were willing to pay the copayment when the government paid for 25% of the total cost, rose to 22.4% when the government paid for 50% of the cost and increased to 55.1% when it paid for 75% of the cost.

Among the respondents' reasons of willingness to pay for HPV vaccination were belief about benefit of vaccination and afraid of the serious impact of the diseases, for the general health of their children, and reasonable cost. Meanwhile the reasons for not willing to pay for HPV vaccination were because cannot afford the cost of vaccination, afraid of the side effect of vaccination, doubt the benefit of vaccination, and desire that HPV vaccination for boys should also provided free by the government.

Table 4. Respondents' WTP under 2 Payment Scenarios

Scenario	WTP response	N (%)			
Copayment scenario					
WTP to copayment (25% Government)	Yes	69 (16.8)			
	No	341 (83.2)			
WTP to copayment (50% Government)	Yes	92 (22.4)			
	No	318 (77.6)			
WTP to copayment (75% Government)	Yes	226 (55.1)			
	No	184 (44.9)			
Out of pocket scenario					
		Bivalent	Quadrivalent		
WTP to Initial bid price	Yes	57 (13.9)	45 (11.0)		
	No	353 (86.1)	365 (89.0)		
WTP to Second bid price (1.5 times than initial bid)	Yes	141 (34.4)	22 (5.4)		
	No	269 (65.6)	388 (94.6)		
WTP Third bid price (0.5 times than initial bid)	Yes	103 (25.1)	77 (18.8)		
	No	307 (74.9)	333 (81.2)		
		WTP Bivalent			
		IDR	USD*		
		WTP Quadrivalent			
		IDR	USD*		
WTP amount	Mean (SD)	172,279 (±309,706)	11.11 (±20.0)	223,144 (±358,265)	14.39 (±23.1)
	Median	100,000	6.4	100,000	6.4
	Range**	0 -2,500,000	0 - 161.3	0 - 2,500,000	0 - 161.3

*Exchange rate 1 USD= IDR 15,500 (<https://www.cnbcindonesia.com/market-data/currencies>, 14 December 2023); ** Some respondents answer 0 WTP which were 198 (48.3%) and 189 (46.1%) for bivalent and quadrivalent vaccines, respectively.

Difference of WTP amount within sociodemographic groups

Table 5 presents the willingness to pay (WTP) for bivalent and quadrivalent vaccines among different sociodemographic groups. For the bivalent vaccine,

Table 5. Group Difference in Bivalent and Quadrivalent Vaccine's WTP Amount

Sociodemographic characteristic	Mean (IDR/USD)	SD (IDR/USD)	P-value	Mean (IDR/USD)	SD (IDR/USD)	P-value
Child's age						
Elementary School	275,714 (17.8)	362,240 (23.4)	0.45	302,359 (19.5)	390,634 (25.2)	0.726
Junior High School	241,959 (15.6)	297,433 (19.2)		295,590 (19.1)	385,954 (24.9)	
Marital status						
Not Married	148,750 (9.8)	246,881 (15.9)	0.004*	169,583 (10.9)	306,643 (19.8)	0.002*
Married	266,346 (17.2)	327,907 (21.2)		311,637 (20.1)	392,508 (25.3)	
Education level						
Primary	176,575 (11.4)	235,106 (15.2)	0.000*	171,818 (11.1)	251,205 (16.2)	0.000*
Higher	311,511 (21.4)	355,229 (22.9)		366,543 (23.6)	428,868 (27.7)	
Monthly income						
Low	128,734 (8.3)	176,545 (11.4)	0.000*	166,250 (10.7)	318,419 (20.5)	0.000*
Moderate-high	318,954 (20.6)	359,463 (23.2)		369,567 (23.8)	402,526 (26.0)	
Distance to health facilities						
Near	255,894 (16.5)	330,387 (21.3)	0.732	293,000 (18.9)	370,332 (23.9)	0.998
Far	246,428 (15.9)	284,699 (18.4)		318,000 (20.5)	450,567 (29.1)	
Having Insurance						
Don't Have	322,187 (20.8)	394,246 (25.4)	0.75	346,000 (22.3)	450,491 (29.1)	0.931
Have	243,300 (15.7)	308,723 (19.9)		290,186 (18.7)	376,102 (24.3)	
History of illness						
Don't Have	254,895 (16.4)	330,455 (21.3)	0.881	304,436 (19.6)	393,294 (25.4)	0.155
Have	250,853 (16.2)	283,200 (18.3)		269,456 (17.4)	359,586 (23.2)	

*, indicates a significant mean difference based on Mann-Whitney U test.

Table 6. Relationship between Knowledge - Acceptance - WTP

Knowledge	Acceptance		p-value			
	No	Yes				
	n	n				
Low	43	153	0.001*			
High	22	192				
Knowledge	WTP Bivalent vaccine		p-value	WTP Quadrivalent vaccine		p-value
	No	Yes		No	Yes	
	n	n		n	n	
Low	111	85	0.001*	109	87	0.000*
High	87	127		80	134	
Acceptance	No	Yes	p-value	No	Yes	p-value
	n	n		n	n	
No	50	15	0.000*	50	15	0.000*
Yes	148	197		139	206	

*, indicates a significant relationship based on Chi-Square test.

married respondents were willing to pay significantly less compared to unmarried respondents and those with higher education were willing to pay almost twice as much than those with only primary education. Higher monthly income was also associated with a significantly higher WTP. For the quadrivalent vaccine, similar trends were observed; married respondents and those with lower education had lower WTP, while those with higher income and education were willing to pay more. Mann-Whitney U tests indicated significant differences in WTP for variables such as marital status, education, income, and knowledge level, but no significant difference for other factors like distance to health facilities or insurance status.

Relationship between Knowledge – Acceptance – WTP

As described in Table 6, there were significant relationships between knowledge, acceptance, and WTP of bivalent and quadrivalent HPV vaccine ($p < 0.001$). Respondents with high knowledge tended to accept vaccination for their son and inline respondents with high knowledge and willingness to accept HPV vaccine tended to have willingness to pay toward the vaccination.

Discussion

This research highlights a parent's knowledge gap about HPV vaccination in boys despite a generally positive attitude towards vaccination. While most of participants reported prior vaccination experience, indicating a positive attitude towards vaccines in general, their understanding of HPV transmission, associated risks, and the protective benefits of vaccination was considered low. This finding aligns with similar research conducted in other countries where despite limited knowledge of cervical cancer, men displayed a good awareness of HPV and its implications for their health [29–31]. Other research, however, points to little knowledge about HPV and the HPV vaccine as a significant deterrent to vaccination. It has been discovered that knowledge is a reliable indicator of vaccination acceptance [32, 33]. Although examining different

genders, several previous studies related to HPV in women in several countries also showed similar results. A study in Yogyakarta showed that over half of the participants exhibited a low level of knowledge. This outcome was supported by several systematic review studies that noted a lack of information of HPV and HPV vaccine existed in several of ASEAN, African, European, Indian, Australian, and Latin American nations [34–36]. Numerous nations have shown a lack of knowledge about the importance of getting vaccinated against HPV at a young age before making one's first sexual experience, as well as the disease's causation and effects [23, 34, 37, 38].

Our study revealed that a considerable portion of participants lacked awareness of male-specific cancers like penile, anal, and throat cancers and their connection to HPV. Programs for HPV vaccination exclusively for women have several shortcomings, including the assumption that cervical cancer is the only result of HPV transmission [39]. The finding of this research aligns with study from Malaysia which emphasized the need for gender-specific educational campaigns that directly address men's health concerns related to HPV [40]. Vaccinating against HPV in a gender-neutral approach will improve the health of both male and female populations [41].

To overcome the various obstacles to HPV vaccine adoption, information alone might not be enough. Research exploring barriers to HPV vaccination among adolescents in the United States underscores the importance of considering cultural sensitivities and engaging community stakeholders, such as religious leaders and influencers, to promote vaccine acceptance within existing social norms [42]. Similarly, in the context of Yogyakarta, where religious and cultural values hold significant weight, integrating HPV vaccination messaging within these frameworks is crucial. Collaborating with religious leaders and community organizations to disseminate accurate information and address concerns within a culturally sensitive manner can significantly enhance the effectiveness of public health interventions [43].

The findings in this research shows that the WTP amount of the quadrivalent and bivalent vaccines was found to be significantly less than the current price in Indonesia. This may have to do with the fact that Yogyakarta Province is the lowest Regional Minimum Wages among the Indonesian provinces. To obtain additional information for decision-making recommendations on the HPV vaccination program's plan, this research analyzed participants' willingness-to-pay for the vaccine under different cost-sharing scenarios. The introduction of co-payment scenarios with varying levels of government subsidy significantly increased the proportion of respondents willing to vaccinate. This finding aligns with broader research on healthcare utilization, which consistently demonstrates that cost is a significant barrier to accessing healthcare services, particularly in low- and middle-income [44, 45].

Married individuals and those with higher education levels demonstrated a significantly higher WTP for both types of HPV vaccines compared to their counterparts. This finding aligns with broader research on healthcare utilization, which consistently demonstrates that individuals with higher socioeconomic status tend to have greater access to healthcare services and are more likely to utilize preventive healthcare measures. This disparity can be attributed to a complex interplay of factors, including increased awareness, greater perceived susceptibility to health risks, and higher disposable income. Finally, our findings emphasize the importance of addressing factors that might influence vaccine uptake from the aspects of knowledge and acceptance since these variables significantly related to WTP of HPV vaccination.

In conclusion, despite the high acceptance towards HPV vaccination, knowledge and WTP were still considered low. Such strategies are required to increase awareness regarding the impact of HPV on men's and women's health. In addition, at current situation voluntary HPV vaccination for boys was not favorable program. Sociodemographic characteristics that significantly influenced WTP value should be considered when such a program was implemented. Future research should be developed to expand coverage of survey to other area to gather the same information from the wider population of Indonesia including subpopulation in area with high and low vaccination coverages.

Study Limitation

While this study offers valuable insights into HPV vaccine acceptability, it's crucial to acknowledge its limitations. The sample size of 410 may not fully represent the population of parents that have a boy in Yogyakarta Province, potentially limiting the generalizability of the findings. Furthermore, the study's focus on only bivalent and quadrivalent vaccines, excluding the available 9-valent option, limits the comprehensiveness of the analysis. Finally, the convenience sampling method and online distribution introduce potential selection and response biases, requiring cautious interpretation of the findings when applying them to other contexts.

Author Contribution Statement

All authors contributed to this study. The first author was the lead of the research project.

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Ethical Declaration

The study was approved by the Medical and Health Research Ethics Committee (MHREC) of the Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada Yogyakarta with reference number: KE/FK/0873/EC/2023. The survey was an electronic, anonymous questionnaire that adhered to the confidentiality, informed consent, and anonymity criteria.

Conflict of Interest

There are no conflicts of interest concerning the research.

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