

Determinants of Second-Dose HPV Vaccine Uptake among Elementary School Students in the Catchment Area of Genuk Health Center Semarang

Syifa Huraira Algozy¹, Putri Asmita Wigati¹, and Nurhasmadiar Nandini¹

¹Department of Public Health, Faculty of Public Health, Universitas Diponegoro, Central Java, Indonesia

Corresponding author: syifalgzy@gmail.com

Abstract. Cervical cancer is one of the leading causes of mortality among women, primarily caused by persistent infection of oncogenic *Human Papillomavirus* (HPV). The Indonesian government has included HPV vaccination in the national immunization program through the School-Based Immunization Month (BIAS), yet the coverage of the second dose remains below the national target in several areas, including Puskesmas Genuk Semarang. This study aimed to analyze the determinants of HPV second-dose vaccine acceptance among elementary school students. A quantitative analytic study with a cross-sectional design was conducted in August 2025, involving 106 parents or guardians of 6th-grade female students selected using proportional random sampling. Data were collected using a structured questionnaire and analyzed with the Chi-Square test. The results showed that education level, knowledge, trust, attitude, school support, health workers' support, and perceived need for the vaccine were significantly associated with vaccine acceptance ($p < 0.05$), while age, gender, and access to information were not. The majority of respondents (84.9%) accepted the HPV second-dose vaccination. It can be concluded that cognitive and social support factors play a crucial role in determining HPV vaccine completion. Strengthening health education, improving communication strategies, and enhancing collaboration between schools and health workers are essential to increase vaccine coverage and support cervical cancer elimination efforts.

Keywords: HPV, vaccination, vaccine acceptance, second dose, cervical cancer, elementary school

1 Introduction

Cervical cancer is lethal and become significant problem that must be addressed. Cervical cancer is a global concern because it is among the top ten causes of death in women [1]. This cancer is caused by *Human Papillomavirus* (HPV) infection, especially oncogenic types 16 and 18, which cause more than 70% of cervical cancer cases worldwide [2]. The World Health Organization (WHO) reported in 2022 that there were approximately 662,000 new cases of cervical cancer with a mortality rate of 350,000 cases annually [3]. Of these cases, more than 90% occur in developing countries, including Indonesia, which still has limited access to screening and vaccination [4].

Statistics in Indonesia, data from GLOBOCAN in 2022 recorded 36,964 new cases of cervical cancer with a death toll of 20,708. Based on data from Dinas Kesehatan Kota Semarang, the number of cervical cancer cases recorded in 2023 reached 181 cases. Meanwhile, in 2024, there were 282 new cases of cervical cancer [3]. This high number shows that cervical cancer is still a serious threat to the health of Indonesian women.

Primary prevention efforts through HPV vaccination have been proven effective in reducing the risk of cervical cancer. The WHO recommends HPV vaccination as a global strategy for the elimination of cervical cancer, with a target coverage of at least 90% of women receiving the full vaccination before the age of 15 [5]. Following up on this recommendation, since 2023 the Indonesian government has included HPV vaccination in the national immunization program through the School Children Immunization Month (BIAS). Vaccinations is given to 5th grade elementary school students for the first dose and continued to 6th grade elementary school students

for the second dose. This scheme is expected to ensure that all girls receive the full dose as recommended, so that protection against cervical cancer can be optimal [6].

However, the implementation of the HPV vaccination program in Indonesia still faces challenges. One of the obstacles that often arises is the low coverage of the second dose. The second dose is important to ensure the effectiveness of continuous HPV infection prevention, especially against oncogenic types [7]. This situation is not only caused by technical problems in vaccine distribution and logistics, but also by parents' refusal or hesitation towards the vaccine. The reasons for this refusal vary, ranging from a lack of knowledge about HPV and the benefits of the vaccine, concerns about side effects, to the presence of misinformation [8].

Semarang is one of the cities with fairly good HPV vaccination coverage compared to other regions in Indonesia. However, data from Dinas Kesehatan Kota Semarang in 2024 shows variations in achievement between health center working areas. In general, the coverage of the second dose of the HPV vaccine in Semarang reached 96.8%, but the Genuk Health Center recorded the lowest achievement at 82.4%. This figure is below the national target of 95%. The low coverage indicates that there are still barriers to vaccination acceptance, particularly for the second dose [9].

In addition, support from schools and health workers is an important determinant in increasing vaccine acceptance. Schools are strategic locations for BIAS immunization, while health workers play a role as a trusted source of information for parents. Therefore, a thorough understanding of the determinants of second-dose HPV vaccine acceptance is important for designing targeted interventions [10].

Based on the discussion above, this study was conducted to analyze the determinants of acceptance of second-dose HPV vaccine uptake among elementary school students in the catchment area of Genuk Health Center Semarang. The results of this study are expected to provide input for the national immunization program, particularly in designing strategies to increase HPV vaccination coverage so that the target of eliminating cervical cancer can be achieved.

2 Methods

This study used a quantitative method with a *cross-sectional* and descriptive analytical design, which aimed to analyze the determinants of acceptance of the second dose of HPV vaccine among elementary school students in the catchment area of the Genuk Health Center in Semarang. The study was conducted in August 2025.

The population of this study consisted of all parents/guardians of sixth-grade elementary school students in the Genuk Health Center catchment area in Semarang, totaling 255 people. The sampling technique used was *proportional random sampling*. The sample calculation used the Slovin formula and obtained a sample of 106 respondents. The inclusion criteria were parents/guardians who had sixth-grade daughters and were willing to be respondents, while the exclusion criteria were parents/guardians who were not present during data collection or were unwilling to fill out the questionnaire.

The research instrument was a structured questionnaire distributed with the help of the school. The validity test was conducted using *Pearson Product Moment* on 30 respondents, while the reliability test used *Cronbach Alpha*, and the results showed that all variables were valid and reliable. The independent variables in this study included age, gender, education level, knowledge, trust, attitudes, access to information, school support, health worker support, and perceived need for vaccine. The dependent variable was acceptance of the second dose of the HPV vaccine, which was categorized as accepting and not accepting.

Data analysis was performed using statistical software. Univariate analysis was used to describe the characteristics of respondents and the distribution of each variable. Bivariate analysis used the *Chi-Square* test to determine the determinants of acceptance of the second dose of the HPV vaccine based on the *p-value*.

This study received ethical approval from the Health Research Ethics Committee of the Faculty of Public Health, Universitas Diponegoro, and was declared feasible for implementation based on an ethical review approval letter numbered 220/EA/KEPK-FKM/2025, issued on July 24, 2025.

3 Results And Discussion

Table 1. Distribution of Respondent Characteristics

Description	f	%
Age		
Early Adulthood (18–40 years)	39	36.8
Middle Adulthood (41–59 years)	67	63.2
Gender		
Male	33	31.1
Female	73	68.9
Highest level of education		
Elementary School/Equivalent	25	23.6
Junior High School/Equivalent	21	19.8
High School/Equivalent	48	45.3
Higher Education	12	11.3

Based on Table 1, the majority of respondents were in the middle adulthood group (41–59 years old), totaling 67 people (63.2%), while the early adulthood group (18–40 years old) numbered 39 people (36.8%). In the gender variable, most respondents were female, totaling 73 people (68.9), while male respondents numbered 33 people (31.1%). Furthermore, in the variable of highest level of education, the majority of respondents had a high school diploma or equivalent as their highest level of education, totaling 48 people (45.3%). Education levels were categorized into basic education (elementary school/equivalent and junior high school/equivalent) and higher education (high school/equivalent and college). The results showed that the majority of respondents had higher education, totaling 61 people (57.5%), while respondents with basic education numbered 45 people (42.5%).

Table 2. Frequency Distribution of Research Variables

Variable	f	%
Vaccine Acceptance		
Not Accepted	16	15.1
Accepted	90	84.9
Knowledge		
Poor	20	18.9
Good	86	81.1
Trust		
Less Trust	52	49.1
Trust	54	50.9
Attitude		
Poor	35	33.0
Good	71	67.0

Variable	f	%
Access to Information		
Poor	48	45.3
Good	58	54.7
School Support		
Less Supportive	45	42.5
Supportive	61	57.0
Health Worker Support		
Less Supportive	53	50.0
Supportive	53	50.0
Perceived Need for Vaccine		
Less Need	49	46.2
Need	57	53.8

Based on the frequency distribution table, it is known that most respondents received the second dose of the HPV vaccine, namely 90 people (84.9%), while did not receive it numbered 16 people (15.1%). Furthermore, regarding the knowledge variable, the majority of respondents had good knowledge, totaling 86 people (81.1%), while respondents with poor knowledge numbered 20 people (18.9%). On the variable of trust, 54 respondents (50.9%) expressed trust in HPV vaccination, while less confident numbered 52 people (49.1%). Then, on the attitude variable, 71 respondents (67.0%) had a positive attitude towards vaccination, while 35 respondents (33.0%) had a less positive attitude. Next, the access to information variable showed that 58 respondents (54.7%) had good access to information, while 48 respondents (45.3%) had poor access to information. In the school support variable, 61 respondents (57.5%) felt they received support, while 45 respondents (42.5%) felt they received less support. Furthermore, the health worker support variable showed balanced results, with 53 respondents (50.0%) stating that they received support and 53 respondents (50.0%) receiving less support. The variable of perceived need for vaccine, 57 respondents (53.8%) needed the HPV vaccine, while 49 respondents (46.2%) felt less need for it.

Table 3. Cross-tabulation Results of Determinants of Acceptance of the Second Dose of HPV Vaccination

No.	Independent Variable	Category	Acceptance of Second Dose of HPV Vaccination				P-value
			Not Accepted		Accepted		
			f	%	f	%	
1.	Age	Early Adulthood	7	17,9	32	82,1	0,531
		Middle Adulthood	9	13,4	58	86,6	
2.	Gender	Male	4	12,5	28	87,5	0,624
		Female	12	16,2	62	83,8	
3.	Education Level	Basic Education	13	28,9	32	71,1	0,001
		Higher Education	3	4,9	58	95,1	
4.	Knowledge	Poor	13	65,0	7	35,0	0,000
		Good	3	3,5	83	96,5	
5.	Trust	Less Trust	13	25,0	39	75,0	0,005
		Trust	3	5,6	51	94,4	
6.	Attitude	Poor	10	28,6	25	71,4	0,007

No.	Independent Variable	Category	Acceptance of Second Dose of HPV Vaccination				P-value
			Not Accepted		Accepted		
			f	%	f	%	
		Good	6	8,5	65	91,5	
7.	Access to Information	Poor	9	18,8	39	81,3	0,339
		Good	7	12,1	51	87,9	
8.	School Support	Less Supportive	12	26,7	33	73,3	0,004
		Supportive	4	6,6	57	93,4	
9.	Health Worker Support	Less Supportive	12	22,6	41	77,4	0,030
		Supportive	4	7,5	49	92,5	
10.	Perceived Need for Vaccine	Less Need	13	26,5	36	73,5	0,002
		Need	3	5,3	54	94,7	

3.1 The Relationship Between Age with Acceptance of the Second Dose of the HPV Vaccine

Age is a demographic determinant that is often used in health analysis because it is related to behavior patterns and decision making [11]. The results of this study indicate that there is no significant relationship between age and acceptance of the second dose of HPV vaccine (p -value = 0.531). This shows that both younger and older respondents have the same opportunity to support continued HPV vaccination for their children.

The results of this study are in line with Warsini & Septiawan (2019), who found that age is not a dominant variable in vaccine acceptance, but rather knowledge, perception, family role, and health worker support are more influential [12]. Robles et al. (2021) also reinforce these results, showing that age does not have a significant effect, while the more decisive determinants are relationship status, education level, and awareness of HPV [13]. Thus, vaccination program interventions should focus more on improving cognitive and motivational aspects rather than differentiating groups based on age.

3.2 The Relationship Between Gender with Acceptance of the Second Dose of the HPV Vaccine

The gender of parents is often associated with differences in roles in immunization decision-making, where mothers are usually more involved in their children's health aspects [14]. However, this study shows no significant relationship between gender and acceptance of the second dose of HPV vaccine (p -value = 0.624).

This is in line with the findings of Heyde et al. (2024), who found that HPV vaccine acceptance between fathers and mothers did not differ significantly when the information provided was equal [15]. Oka et al. (2024) also stated that although mothers tend to have higher knowledge, differences in acceptance can be overcome if health workers convey information consistently [16]. Therefore, vaccination communication strategies need to target both parents simultaneously.

3.3 The Relationship Between Education Level with Acceptance of the Second Dose of the HPV Vaccine

The level of education affects an individual's ability to understand health information, assess risks, and make preventive decisions. This study shows a significant relationship between education and acceptance of the second dose of the HPV vaccine (p -value = 0.001). Respondents with higher education are more likely to complete vaccination than respondents with lower education.

These findings are in line with Raghupathi & Raghupathi (2020), which shows that education improves access to health services through economic, socio-psychological, and health behavior

channels [17]. Research by Zulfa et al. (2023) also found that highly educated parents tend to have better knowledge and more positive attitudes towards HPV vaccination [18]. In addition, Asimwe et al. (2021) revealed that higher levels of education correlate with good knowledge about HPV, thereby increasing vaccine acceptance [19]. Thus, improving education and health literacy among the community is key to supporting the success of the HPV vaccination program.

3.4 The Relationship Between Knowledge with Acceptance of the Second Dose of the HPV Vaccine

Knowledge is a major determinant of vaccine acceptance because it influences awareness of the benefits, risks, and urgency of vaccination. The results showed a significant relationship between knowledge and acceptance of the second dose of the HPV vaccine ($p\text{-value} = 0.000$). Respondents with good knowledge were more likely to complete the vaccination.

These results are supported by Lopez et al. (2022), who stated that the higher the parents' knowledge, the higher the vaccine acceptance rate [20]. Wong et al. (2016) reported high misconceptions about HPV, which were barriers to vaccine acceptance [21]. Similarly, Chauhan et al. (2025) found that some respondents refused the vaccine because they felt they were not yet sexually active, even though the vaccine is most effective when given before exposure to sexual activity [22]. Thus, targeted and evidence-based knowledge enhancement is essential to reduce misconceptions and increase vaccination coverage.

3.5 The Relationship Between Trust with Acceptance of the Second Dose of the HPV Vaccine

Trust in vaccines, in terms of safety, effectiveness, and health professional recommendations has been shown to be an important determinant of acceptance. The results of the study showed a significant relationship between trust and acceptance of the second dose of the HPV vaccine ($p\text{-value} = 0.005$). Respondents with high levels of trust were more likely to complete the vaccination.

Research by Chen et al. (2024) shows that trust is an important mediator between knowledge and vaccine acceptance [23]. Sartika et al. (2024) in Indonesia also found that low trust increases the risk of vaccine refusal by up to four times. This confirms that even if someone has good knowledge, without trust in the safety and effectiveness of vaccines, acceptance will not be optimal [24]. Therefore, health workers need to play an active role in building trust through clear recommendations, transparent communication, and consistent information.

3.6 The Relationship Between Attitude with Acceptance of the Second Dose of the HPV Vaccine

Attitudes reflect an individual's evaluation of the benefits and obligations of vaccination. Attitudes are a reflection of a person's positive or negative evaluation of vaccination, which can influence behavioral tendencies. The results of this study show a significant relationship between attitudes and acceptance of the second dose of the HPV vaccine ($p\text{-value} = 0.000$). Respondents who had positive attitudes were more likely to complete the vaccination.

This is in line with the findings of Zulfa et al. (2023), which show that parents' attitudes are influenced by their level of knowledge [18]. Research by Saragih et al. (2023) also revealed that economic determinants can shape attitudes towards vaccination, where high costs often make vaccines seen as a government obligation rather than a personal responsibility [25]. Thus, forming a positive attitude requires a combination of education, economic support (e.g., subsidies), and convincing communication from health workers.

3.7 The Relationship Between Access to Information with Acceptance of the Second Dose of the HPV Vaccine

Access to information plays an important role in determining vaccine acceptance because it influences the extent to which parents obtain accurate knowledge about the benefits and safety of

vaccination. This study showed no relationship between access to information and acceptance of the second dose of the HPV vaccine ($p\text{-value} = 0.339$). Respondents who had good access to information, especially through health workers and official media, were more likely to accept the vaccine.

Research by Susanto et al. (2025) in Tegal supports this finding, that media exposure is not significantly related to vaccine acceptance, while knowledge and health promotion determinants play a more important role [26]. Lin et al. (2024) also emphasized that it is not the quantity of information that matters, but the quality and the individual's ability to assess the information [27]. Thus, access to information alone is not enough; what is more important is the credibility of the source and the way the information is conveyed by health workers or official institutions.

3.8 The Relationship Between School Support with Acceptance of the Second Dose of the HPV Vaccine

Schools are strategic locations for vaccination implementation through the School Children Immunization Month (BIAS) program. The results of the study show a significant relationship between school support and acceptance of the second dose of HPV vaccine ($p\text{-value} = 0.000$). Schools that actively provide information, coordinate schedules, and facilitate vaccination implementation have been proven to increase acceptance.

The study by Wijayanti et al. (2023) highlights variations in socialization practices in schools, which have an impact on parental acceptance. Meanwhile, research by Setiyani et al. (2024) shows that 64.9% of students receive education at school, which has an impact on vaccination coverage of $>90\%$.²⁸ This is reinforced by research by Vijayalakshmi (2023) in Singapore, which shows a surge in HPV vaccine coverage after the implementation of a school-based program [29]. Thus, consistent school support can significantly increase vaccine acceptance.

3.9 The Relationship Between Health Worker Support with Acceptance of the Second Dose of the HPV Vaccine

Information from health workers is one of the most trusted sources for the public. This study shows a significant relationship between healthcare worker support and acceptance of the second dose of the HPV vaccine ($p\text{-value} = 0.000$). Respondents who received explanation directly from healthcare were more likely to complete vaccination compared to those who did not receive support.

These findings align with Tsani'ah et al. (2024), who found a strong association between healthcare provider support and interest in HPV vaccination [30], as well as Suraya et al. (2019), who emphasized that interpersonal communication from healthcare providers can enhance trust and positive attitudes toward vaccines [31]. Therefore, the active involvement of healthcare workers through brief counseling and education is key to increasing HPV vaccination coverage.

3.10 The Relationship Between Perceived Need for Vaccine with Acceptance of the Second Dose of the HPV Vaccine

Perceived need reflects the extent to which parents recognize the importance of vaccination as a preventive measure against cervical cancer. The results of this study show a significant relationship between perceived need and acceptance of the second dose of HPV vaccine ($p\text{-value} = 0.000$). Respondents who felt that the vaccine was very necessary tended to be more compliant in completing the doses.

Sitaesmi et al. (2020) found that low perceptions of need prior to education led many parents to consider vaccination unnecessary if their children were asymptomatic, but positive perceptions increased significantly after educational intervention [32]. These findings are in line with Dwi Endarti et al. (2018), who confirmed that a high perception of need increases motivation to take preventive action, including being more likely to accept vaccines and undergo cervical cancer screening [33]. Thus, building awareness of the urgency of vaccination is a strategic step to prevent vaccine hesitancy and refusal.

4 Conclusion

Research shows that the acceptance of the second dose of HPV vaccine among elementary school students in the catchment area of the Genuk Health Center in Semarang is influenced by several determinants, namely education level, knowledge, trust, attitude, school support, health worker support, and perceived need for vaccine. Meanwhile, age, gender of parents, and access to information were not found to be related to vaccine acceptance.

To increase HPV vaccination coverage, it is necessary to disseminate information through official channels such as YohSehat with clear educational content, data transparency through digital dashboards, and massive and sustainable public communication strategies. The role of community health centers and schools is very important as information hubs, through structured socialization, reminder systems, and technical coordination of vaccination implementation. The support of health workers in providing evidence-based education and the active involvement of teachers will strengthen parental trust, shape positive attitudes, and encourage the achievement of cervical cancer elimination targets through the HPV vaccination program.

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