# Original Article

# Comparison of Self-Efficacy and Knowledge of Human Papillomavirus Vaccination among Various Types of Decision Makers in Indonesia: A Cross-Sectional Study

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## Abstract

**Background:** Self-efficacy and knowledge of various types of decision-makers concerning the Human Papillomavirus (HPV) vaccine can play an essential role in the acceptance of the vaccine in women. This study sought to investigate the self-efficacy and knowledge regarding the HPV vaccine among different decision-makers, encompassing self-decision makers (SDM), assisted-decision makers (ADM), and helping-decision makers (HDM).

**Methods:** This cross-sectional survey was conducted in Jakarta, Indonesia, from May 13th to June 15th, 2023, involving 441 females distributed among three decision-making groups, each comprising 147 participants. Inclusion criteria were not receiving an HPV vaccination and being proficient in Bahasa Indonesia. Specific criteria were women aged 18-26 for SDM, sexually inexperienced female adolescents aged 9-17 for ADM, and mothers of eligible female adolescents for HDM. Participants completed questionnaires on self-efficacy and knowledge of HPV and cervical cancer. The Kruskal-Wallis test and Dunn's post hoc test ($P<0.05$) were used to analyze the data performed in SPSS 26 software.

**Results:** Most respondents were employed (224, 50.8%), were of low socioeconomic status (271, 61.5%), and had medium knowledge (278, 63%) and medium self-efficacy (190, 43.1%). The HDM and SDM groups demonstrated the lowest and highest knowledge scores, respectively, across all domains compared to the other groups, encompassing knowledge about HPV infection, cervical cancer, and HPV vaccination. The median score for self-efficacy in the SDM and HDM groups was the highest and lowest among the different types, respectively. The median of self-efficacy and knowledge showed statistically significant differences among decision-making groups ($P<0.001$).

**Conclusion:** This study revealed a significant difference between diverse decision-making groups and knowledge and self-efficacy. Educational interventions focusing on various types of decision-maker groups are recommended.

**Keywords:** Decision-making, Human papillomavirus vaccine, Knowledge, Self-efficacy, Women

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## Introduction

Administration of The Human Papillomavirus (HPV) vaccine has demonstrated efficacy in diminishing the likelihood of cervical cancer development in women.[1] HPV vaccination coverage is intricately linked to such factors as self-efficacy, knowledge, and the individual in charge of the decision-making process regarding vaccine acceptance.[2] Self-efficacy and knowledge about the HPV vaccine have been linked as factors that contribute to achieving vaccination coverage targets.[3, 4] Self-efficacy is the belief of a person, whether a teenager, a young adult woman, or a parent of a teenage girl, to receive three doses of the HPV vaccine for six months.[5] Self-efficacy is a crucial determinant of an individual's ability to execute specific actions and plays a pivotal role in the decision to receive the HPV vaccine.[6] Individuals with a strong sense of self-efficacy are more inclined to opt for vaccinations and surmount the hurdles that arise during decision-making.[7, 8]

The influence of knowledge of HPV vaccination extends to individuals' decision-making processes. A comprehensive understanding of the HPV vaccine can facilitate a clear understanding of its advantages and help to address any uncertainties or misconceptions. Nevertheless, the decision to receive immunization has a significant weight in achieving this objective, and it affects an individual's self-efficacy and awareness of cervical cancer, as well as the HPV vaccine.[9, 10]

However, two prior studies—one quantitative and one qualitative— revealed that the decision for adolescents or young individuals to complete the three-dose HPV vaccination series over six months remains significantly influenced by adults, particularly parents.[5, 11] This finding underscores the need for further investigation, particularly from the perspective of adolescent girls, within the context of three distinct decision-making frameworks. Additionally, it is imperative to expand the analysis to include the role of decision-making variables.[5, 11] This indicates that self-efficacy, serving as a mediator in the interaction between social-cognitive characteristics and intention, exerts both indirect and direct effects on knowledge-behavior intentions related to cervical cancer prevention.[1, 2] This implies that self-efficacy and knowledge were influenced by different types of decision-making.[12]

Decision-making processes can be categorized into two primary types: rational decision-making, which is guided by objective information and comprehensive risk assessment, and emotional decision-making, which is influenced by psychological and social factors.[13] Various decision-making scenarios involve different individuals, including self-decision makers (SDM), who are young adult women making decisions for themselves; helping-decision makers (HDM), who are parents assisting in decisions regarding vaccine acceptance or rejection for their children; and assisted-decision makers (ADM), who are teenagers who require the assistance of their parents to make decisions about vaccine acceptance or rejection.[7, 14-16]

Independent decision-making by the individual (SDM) and decisions involving other people can influence the decision to receive the HPV vaccine and are believed to have distinct implications for self-efficacy and knowledge about the HPV vaccine.[17, 18] SDM reflects independent decision-making by individuals who have complete control over these decisions. However, decisions involving other people, such as parents helping to decide for their child (HDM), can impact both parties' self-efficacy and knowledge of the HPV vaccine. Decisions assisted by other people, such as minors who are helped to decide regarding vaccines by their parents (ADM), can also have implications for an individual's self-efficacy and knowledge regarding the HPV vaccine.[10, 19]

Several previous studies have explored the decision-making process to receive the HPV vaccine, whether in the population of children, adolescents, young adults, or parents, but each group of subjects has been studied separately.[9, 10, 20, 21] A gap exists in the literature

regarding vaccine decisions for children and adolescents under 17 years old as parental consent is still required. Variations in consent preferences for vaccination contingent on the decision-making approach will impact the recommended design of targeted intervention programs. This novel insight regarding decision-makers serves as a valuable input for tailoring vaccination programs according to the specific demographics of vaccine recipients. The relationship between decision-making type, HPV vaccine-related self-efficacy, and knowledge of HPV vaccination is not fully understood. Moreover, there is a paucity of research that correlates knowledge and self-efficacy by comparing decision-making parties concurrently from the perspective of teenagers, young adults, and their parents, especially in the urban areas of Indonesia. Therefore, this study aimed to compare self-efficacy and knowledge of human papillomavirus vaccination among various types of decision-makers categorized as SDM, HDM, and ADM in Indonesia.

## Materials and Methods

This cross-sectional survey was conducted on women residing in Jakarta City, Indonesia, from May 13 to June 15, 2023. Jakarta is a densely populated metropolitan city in Indonesia. In 2021, Jakarta was the first city to pilot the free HPV vaccination program for girls in elementary schools; this elicited a wide range of reactions from parents and the broader community. Over time, this program has garnered interest from various groups. The varied responses from Jakarta's populace present a rich potential for inclusion in this research.

The general inclusion criteria mandated the participants to possess proficiency in reading and writing Bahasa Indonesia, be willing to complete the informed consent form, and have never received an HPV vaccination. Furthermore, distinct inclusion criteria were defined for each group: young adult women aged 18-26 years old for the SDM group, sexually inexperienced female adolescents aged 9-17 years old for the ADM group, and mothers of eligible adolescents for vaccination for the HDM group. Exclusion criteria across all groups included a self-reported history of cervical cancer.

The sample size for this study was determined based on a confidence interval of 95%, a power of 80%, a test value, an anticipated population mean based on a previous study,[1] the average of the sample groups of 19.28,a standard deviation of 1.66, and the use of the following formula[22]

$$n = \frac{2\sigma^2\left[Z_{1-\alpha/2} + Z_{1-\beta}\right]^2}{(\mu_1 - \mu_2)^2}$$

$$n = \frac{2(1{,}66)^2[1{,}96 + 0{,}84]^2}{(14.7 - 14.8)^2}$$

Thus, the minimum sample size for the study was 432. Nevertheless, there were 441 participants in the field who met the criteria and joined this study. To ensure fairness and equal representation, the researchers allocated 147 participants to each SDM, HDM, and ADM group, resulting in a total of 441 individuals.

The sampling method in this study was consecutive sampling. Respondents were chosen sequentially until the predetermined sample size was reached.[23] The research team members collected data simultaneously across all research locations, ensuring that data that met the specified criteria were sorted sequentially until the desired sample size was attained under the principles of consecutive sampling.

In this study, a sociodemographic questionnaire was employed to delineate respondents' characteristics, encompassing age, educational background, employment status, family income, and decision-making type. The decision-making role of respondents, categorized as SDM, HDM, or ADM, was documented in the demographic questionnaire based on their age and inclusion criteria, obviating the necessity for validity and reliability tests.

The Self-Efficacy Scale for HPV vaccination,

developed by Christy, was used to measure self-efficacy variables.[1] The self-efficacy questionnaire was translated into Bahasa Indonesia. The validity and reliability of the questionnaire were established using expert review and pilot testing. The questionnaire was evaluated for face and content validity by 12 experts from faculty members, researchers, nurse practitioners, and pharmacists in hospitals. The content validity ratio (CVR) and content validity index (CVI) were calculated for each item. Items with a CVR value of 0.56 or higher were retained, as per Lawshe's table for determining minimum values. A CVR value of 1 for the self-efficacy for HPV vaccination was deemed acceptable.[24] Next, CVI, both I-CVI and S-CVI (S-CVI/Ave and S-CVI/UA) were assessed. For all items, the I-CVI was greater than 0.91. The S-CVI/Ave and S-CVI/UA for the HPV vaccine self-efficacy questionnaire had values of 1 and 1, respectively.

Furthermore, the questionnaire underwent reliability testing with 30 respondents. The results indicated satisfactory reliability, with Cronbach's alpha coefficients of 0.801 for self-efficacy, indicating a reliable instrument. The self-efficacy questionnaire comprised three positive statements. Participants were asked to rate their confidence in their ability to receive the HPV vaccine, even in scenarios where (1) it was expensive, (2) they received the shot with some pain, and (3) arrangement for three doctor visits was necessary. The rating scores were selected by respondents using a 7-point Likert scale, with options ranging from 1 = "strongly disagree" to 7 = "strongly agree," including intermediate choices of 2 = "somewhat disagree," 3 = "slightly disagree," 4 = "neutral," 5 = "slightly agree," and 6 = "somewhat agree". The total self-efficacy scores ranged from 7 to 21. To improve univariate analysis results, we categorized the self-efficacy based on certain scores. Specifically, a total score of 1-7 indicates low self-efficacy, 8-14 represents medium self-efficacy, and 15-21 denotes high self-efficacy.

The knowledge level was evaluated using a questionnaire on the knowledge of HPV, cervical cancer, and HPV vaccines developed by Winarto.[25] This questionnaire was originally designed in Bahasa, Indonesia, and administered in Jakarta, Indonesia. However, to recheck its validity and reliability, we subjected this instrument to thorough testing involving 12 expert reviews and pilot testing as the CVR and CVI were not available in the previous study. Items with a CVR value of 0.56 or higher were retained according to Lawshe's table for determining minimum values.[24] A CVR value of 0.98 for the knowledge questionnaire was considered acceptable. Moreover, all items exhibited an I-CVI greater than 0.91. The S-CVI/Ave and S-CVI/UA for the knowledge questionnaire were calculated as 0.98 and 0.85, respectively.

The questionnaire was distributed among 30 respondents to assess its reliability. The results indicated a Cronbach's alpha coefficient of 0.864 for the knowledge questionnaires, confirming its reliability. The questionnaire on the knowledge of HPV, cervical cancer, and HPV vaccines consisted of 21 questions divided into two sections: nine questions on HPV infection and cervical cancer knowledge, and 12 questions on HPV vaccine knowledge. Response options were limited to "yes," "no," or "do not know." Correct answers were given a score of 2, while incorrect or unanswered items received a score of 0. The favorable items on the questionnaire were 1, 2, 4, 6, 8-17, while the unfavorable items were 3, 5, 7, 18, 19, 20, and 21. The total score on the questionnaire ranged from 0-42. To enhance the results of the univariate analysis, knowledge was categorized into specific score ranges. A total score of 0-14 is classified as low knowledge, 15-28 as medium knowledge, and 29-42 as high knowledge.

Before data collection commenced, potential participants were provided with a concise overview of the research design, and they willingly agreed to participate by signing an informed consent form. The respondents then filled out the questionnaire for approximately 20 minutes. All the data filled in by the respondents were confidential.

Data were collected during individual home visits. Moreover, participants were allowed to withdraw from the study at any time. This research protocol was approved by the Health Research Ethics Committee of the Universitas Pembangunan Nasional "Veteran" Jakarta, Indonesia, under approval number of 205/V/2023/KEPK.

The present investigation used univariate analysis to classify respondents based on age, family income, education level, employment type, and vaccination uptake decision-making approach. Given the skewed distribution of the data, the Kruskal-Wallis test was employed, followed by a post hoc test using Dunn's test. Statistical analysis was conducted using SPSS 26 software, and the significance was set at $P<0.05$.

## Results

None of the respondents in this study had received the HPV vaccine. Respondents ranged from 12 to 49 years old, with a mean age of 24.95±11.84. Education in the sequence was as follows: elementary school, one person (0.2%); junior high school, 64 people (14.6%); high school, 196 people (44.4%); and college, 180 people (40.8%). More than half of the respondents (50.8%, 224 people) had jobs, and the rest (49.2%, 217 people) did not work. However, the prevalence of respondents with low economic status was higher (61.5%, 271 people) than that of respondents from high socioeconomic status (38.5%, 170 people) (Table 1).

Table 2 displays the distribution of knowledge questionnaire responses across three respondent groups. It was shown that a significant number of respondents in the SDM category exhibited a strong grasp of both HPV infection and cervical cancer, as well as knowledge regarding the HPV vaccine. Conversely, the HDM group demonstrated the lowest knowledge scores across all domains compared to the other groups, encompassing knowledge pertaining to HPV infection, cervical cancer, and HPV vaccination.

According to the results shown in Table 3, the median score for self-efficacy in SDM was the highest (15 points) among the different types. In contrast, the lowest median score for self-efficacy was found 11 for the HDM type. Regarding knowledge, SDM had the highest median among women (34 points), while HDM had the lowest median at 24. The Kruskal-Wallis test was conducted to compare the self-efficacy and knowledge about cervical cancer and HPV vaccine among the types of decision-making (Table 3).

The Kruskal-Wallis test results shown in Table 3 indicate a significant difference in the median self-efficacy scores between the three types of decision-makers ($P<0.001$). In other words, the kind of decision-maker had a significant correlation with self-efficacy regarding the HPV vaccine. In line with this result, knowledge shows similar results for the self-efficacy variable. The types of decision-makers, SDM, HDM, and ADM, had significant differences in median scores ($P<0.001$) on the knowledge variable.

**Table 1:** Characteristics of the respondents (n=441)

| Variables | N (%) | Variables | N (%) |
|---|---|---|---|
| Educational background | | Age | |
| Elementary school | 1 (0.2) | 9-17 years old (ADM) | 147 (33.4) |
| Junior high school | 64 (14.6) | 18-26 years old (SDM) | 147 (33.3) |
| Senior high school | 196 (44.4) | 29-49 years old (HDM) | 147 (33.3) |
| College | 180 (40.8) | | |
| Working Status | | Self-efficacy | |
| Unemployed | 217 (49.2) | Low | 118 (26.8) |
| Working | 224 (50.8) | Medium | 190 (43.1) |
| | | High | 133 (30.1) |
| Socioeconomic status | | Knowledge | |
| Low | 271 (61.5) | Low | 91 (20.6) |
| High | 170 (38.5) | Medium | 278 (63.0) |
| | | High | 72 (16.3) |

**Table 2:** The breakdown of knowledge questionnaire results for each decision-makers type

| Domain | Item | SDM[a] (N=147) | | HDM[b] (N=147) | | ADM[c] (N=147) | |
|---|---|---|---|---|---|---|---|
| Knowledge about HPV infection and Cervical Cancer | Mean±SD | 12.69±4.025 | | 10.00±4.693 | | 12.07±3.170 | |
| | Minimum-Maximum | 0-18 | | 0-18 | | 0-18 | |
| | Number of respondents who answered "Yes" or "No" for each questionnaire item | | | | | | |
| | **Statements** | **Yes** | **No** | **Yes** | **No** | **Yes** | **No** |
| | | **N (%)** | **N (%)** | **N (%)** | **N (%)** | **N (%)** | **N (%)** |
| | Did you know that cervical cancer is a disease caused by a viral infection? | 132 (29.9) | 15 (3.4) | 118 (26.8) | 29 (6.6) | 143 (32.4) | 4 (0.9) |
| | Do you know what HPV[d] is and its presence in humans? | 98 (22.2) | 49 (11.1) | 76 (17.2) | 71 (16.1) | 126 (28.6) | 21 (4.8) |
| | Does HPV virus infection cause cancer? | 51 (11.6) | 96 (21.8) | 32 (7.3) | 115 (26.1) | 104 (23.6) | 43 (9.8) |
| | Men can transmit the HPV virus | 106 (240 | 41 (9.3) | 91 (20.6) | 56 (12.7) | 122 (27.7) | 25 (5.7) |
| | Men are not at risk of contracting the HPV virus infection | 92 (20.9) | 55 (12.5) | 59 (13.4) | 88 (20) | 115 (26.1) | 32 (7.3) |
| | The HPV virus can be transmitted through sexual contact | 125 (28.3) | 22 (5) | 113 (25.6) | 34 (7.7) | 58 (13.2) | 89 (20.2) |
| | HPV virus infection is very rare (sporadic) | 97 (22) | 50 (11.3) | 74 (16.8) | 73 (16.6) | 40 (9.1) | 107 (24.3) |
| | The HPV virus can cause cervical cancer | 126 (28.6) | 21 (4.8) | 103 (23.4) | 44 (10) | 60 (13.6) | 87 (19.7) |
| | Cigarettes are a risk factor for HPV virus infection | 106 (24) | 41 (9.3) | 69 (15.6) | 78 (17.7) | 119 (27) | 28 (6.3) |
| **Domain** | **Item** | **SDM (N=147)** | | **HDM (N=147)** | | **ADM (N=147)** | |
| Knowledge about HPV Vaccine | Mean±SD | 16.91±5.501 | | 12.08±5.781 | | 12.78±4.518 | |
| | Minimum-Maximum | 0-24 | | 0-24 | | 0-24 | |
| | Number of Respondents Who Answered "Yes" or "No" for Each Questionnaire Item | | | | | | |
| | **Statements** | **Yes** | **No** | **Yes** | **No** | **Yes** | **No** |
| | | **N (%)** | **N (%)** | **N (%)** | **N (%)** | **N (%)** | **N (%)** |
| | Do you know what the HPV vaccine is? | 112 (25.4) | 35 (7.9) | 84 (19) | 63 (14.3) | 48 (10.9) | 99 (22.4) |
| | Have you ever heard that vaccination could prevent cervical cancer? | 117 (26.5) | 30 (6.8) | 88 (20) | 59 (13.4) | 117 (26.5) | 30 (6.8) |
| | Did you know that the cervical cancer vaccine (HPV vaccine) is already available in Indonesia? | 116 (26.3) | 31 (7) | 88 (20) | 59 (13.4) | 120 (27.2) | 27 (6.1) |
| | Do you know who you should contact if you want to get a cervical cancer vaccination (HPV vaccine)? | 103 (23.4) | 44 (10) | 65 (14.7) | 82 (18.6) | 97 (22) | 50 (11.3) |
| | Do you think that the cervical cancer vaccine (HPV vaccine) has side effects? | 97 (22) | 50 (11.3) | 56 (12.7) | 91 (20.6) | 39 (8.8) | 108 (24.5) |
| | Do you think someone can still be infected by the HPV virus if they have been vaccinated? | 101 (22.9) | 46 (10.4) | 77 (17.5) | 70 (15.9) | 42 (9.5) | 105 (23.8) |
| | Do you think that if someone has been infected with HPV, they still need to be vaccinated against HPV? | 103 (23.4) | 44 (10) | 71 (16.1) | 76 (17.2) | 43 (9.8) | 104 (23.6) |
| | Women who have been vaccinated need to undergo periodic early detection (screening) examinations (Pap's Smear / VIA[e]) in the future | 115 (26.1) | 32 (7.3) | 76 (17.2) | 71 (16.1) | 43 (9.8) | 104 (23.6) |
| | Vaccination can provide 100% protection against cervical cancer | 83 (18.8) | 64 (14.5) | 50 (11.3) | 97 (22) | 28 (6.3) | 119 (27) |
| | The HPV vaccine only needs to be done in the adult population (over 30 years old) | 102 (23.1) | 45 (10.2) | 78 (17.7) | 69 (15.6) | 116 (26.3) | 31 (7) |
| | With just 1 dose of vaccination, I will get full protection against cervical cancer | 84 (19) | 63 (14.3) | 63 (14.3) | 84 (19) | 110 (24.9) | 37 (8.4) |
| | After receiving the full dose of the HPV vaccine, sexual relations with multiple partners are permitted | 110 (24.9) | 37 (8.4) | 92 (20.9) | 55 (12.5) | 136 (30.8) | 11 (2.5) |

[a]SDM: Self-decision makers; [b]HDM: Helping-decision makers; [c]ADM: Assisted-decision makers; [d]HPV: Human Papillomavirus; [e]VIA: Visual inspection with acetic acid

**Table 3:** Comparison of self-efficacy and knowledge among decision-makers

| Dependent Variable | Type of Decision-Making | Median | Inter-quartile Range | Minimum-Maximum | SD | 95% Confidence interval | P value* |
|---|---|---|---|---|---|---|---|
| Self-efficacy (n=441) | SDM[a] (n=147) | 15 | 5 | 3-22 | 3.604 | 14.11 to 15.29 | <0.001 |
| | HDM[b] (n=147) | 11 | 4 | 3-20 | 3.506 | 10.35 to 11.50 | |
| | ADM[c] (n=147) | 12 | 4 | 3-21 | 3.130 | 11.68 to 12.70 | |
| Knowledge (n=441) | SDM (n=147) | 34 | 4 | 20-40 | 3.120 | 33.25 to 34.26 | <0.001 |
| | HDM (n=147) | 24 | 4 | 20-38 | 3.818 | 24.15 to 25.39 | |
| | ADM (n=147) | 32 | 4 | 20-36 | 3.276 | 31.09 to 32.15 | |

[a]SDM: Self-decision makers; [b]HDM: Helping-decision makers; [c]ADM: Assisted-decision makers
*Kruskal-Wallis test

**Table 4:** Comparison details of self-efficacy and knowledge among decision-makers type using Post Hoc Dunn's test (n=441)

| Dependent Variable | Pairwise | Standard Error | 95% Confidence interval | P value* |
|---|---|---|---|---|
| Self-Efficacy | HDM[a] - ADM[b] | 14.780 | -2.20 to -0.33 | <0.001 |
| | HDM - SDM[c] | 14.780 | -4.71 to -2.84 | <0.001 |
| | ADM - SDM | 14.780 | -3.45 to -1.57 | 0.001 |
| Knowledge | HDM - ADM | 14.748 | -7.79 to -5.91 | 0.005 |
| | HDM - SDM | 14.748 | -9.92 to -8.05 | <0.001 |
| | ADM - SDM | 14.748 | -3.07 to -1.20 | <0.001 |

[a]HDM: Helping-decision makers; [b]ADM: Assisted-decision makers; [c]SDM: Self-decision makers; *Dunn's test

In other words, the type of decision-maker has a considerable relationship with women's knowledge of the HPV vaccine. As to the results of the Kruskal-Wallis test showing a P<0.05, the test was continued with a Post Hoc test, namely Dunn's test, to see the comparison between three groups of decision-making in more detail. The test results are listed in Table 4.

According to Table 4, all pairwise comparisons of scores were statistically significant, indicating a significant difference in the median scores of self-efficacy and knowledge among the different types of decision-makers.

## Discussion

This study examined the roles of different decision-making as SDM, HDM, and ADM; also, we investigated their self-efficacy and knowledge concerning the HPV vaccine. Significant differences were observed among SDM, HDM, and ADM groups, which were associated with the age of respondents ranging from teenagers to late adults. Respondents' ages varied according to the inclusion criteria for each decision-maker type, reflecting diverse educational backgrounds, employment statuses, and family socio-economic statuses. These attributes likely influenced self-efficacy and knowledge regarding cervical cancer and the HPV vaccine, with respondents' age and educational backgrounds being particularly associated with their understanding of cervical cancer and HPV vaccination as a primary preventive measure.[13]

The median knowledge scores were lowest in the HDM group, followed by the ADM and SDM groups, indicating a potential association between age and knowledge levels. This finding is contrary to the common perception. Typically, older individuals, such as parents, may have more excellent knowledge due to their exposure to information over time and their educational background. A study in Ethiopia showed that parents had good knowledge, and two-thirds were willing to receive HPV vaccination.[26] However, contrary to expectations, the present study

found that parents had the lowest knowledge scores, particularly in the HDM group. This issue suggests that age alone may not always correlate with higher knowledge levels compared to younger age groups.

Generally, most parents rely solely on secondary prevention measures such as Pap Smear or Visual Inspection with Acetic Acid (VIA) for cervical cancer prevention in adults.[27] They tend to overlook the importance of the HPV vaccine, which serves as a primary preventive measure that can be administered to their adolescent children. Despite the availability of government-funded HPV vaccination programs, some parents still question the necessity of their daughters and perceive them as an expensive option.[11] Additionally, the lack of awareness regarding Pap Smear or VIA is evident from the fact that the number of this secondary preventive measure has not yet reached the national target.[28, 29] This fact aligns with the current study findings, which reveal that respondents with high knowledge about HPV infection, cervical cancer, and the HPV vaccine constituted the smallest percentage compared to those with moderate and low knowledge. This underscores the necessity for enhanced education and awareness regarding these crucial preventive measures.

The findings of the current study are not in the same line with those of a prior study in Ethiopia, where most parents acquired knowledge about cervical cancer severity through health promotion by health providers and observing relatives with the disease.[30] Health workers attributed increased awareness to community instances of cervical cancer illness and deaths, motivating parents to vaccinate their daughters. Additionally, girls demonstrated good knowledge about cervical cancer and the HPV vaccine, learned through disease explanations.[30] One key takeaway is the need to enhance the role of health workers in Indonesia in providing comprehensive education on cervical cancer and its prevention within the community.

The self-efficacy score for the HDM group was similar to their knowledge score, the lowest among the groups. However, one study explained contrasting results that over half of the parents (59%) who had teenagers had good self-efficacy regarding the HPV vaccine.[31] On the other hand, the digital literacy of the HDM, as a digital technology generation migrant, is allegedly less than that of the other two groups.[32, 33] Digital literacy among HDMs is reportedly lower compared to other groups. Due to potential misinformation, targeted health education on HPV vaccine efficacy and safety is crucial for the HDM group. This measure can enhance their knowledge and self-efficacy.

The ADM group exhibited higher mean scores for self-efficacy and knowledge regarding cervical cancer and the HPV vaccine than the HDM group. This value is attributed to their role as vaccine recipients, leading to heightened interest in understanding the vaccine.[12] Their elevated digital literacy enables them to access relevant information online.[33, 34] This study aligns with previous research that reported positive perceptions and self-efficacy regarding HPV vaccination among girls.[30] However, their young age and dependence on parents for vaccine decisions may limit independent decision-making. Education is needed to improve their critical thinking skills and ability to discern information validity.[34] These factors contribute to the intermediate scores of the ADM group for self-efficacy and knowledge.

These findings are consistent with previous research that has reported higher levels of self-efficacy and knowledge in young adult women regarding cervical cancer and HPV vaccines.[21] This group, classified as the SDM type, had high self-efficacy and knowledge and was the most concerned about undergoing medical treatment themselves. They have also been found to have better critical thinking skills and decision-making abilities than younger individuals.[21, 35] However, a study conducted in Japan reported different results. Between 2013 and 2021, the participation rate in HPV vaccination among young adults

was low because of the suspension of active recommendations for the vaccine due to high reports of post-vaccination side effects.[36] The self-efficacy and knowledge of this group regarding morbidity, mortality, transmission, and prevention of cervical cancer through HPV vaccination was very low until the suspension of vaccination recommendations ended in 2021, posing a challenge for stakeholders to restore vaccine coverage.[36]

In the present study, the level of knowledge and self-efficacy among individuals in the SDM group was already high, which rendered the provision of general information about cervical cancer and the HPV vaccine less pertinent. Hence, to increase the demand for the HPV vaccine, health promotion campaigns should prioritize raising awareness specifically about the vaccine. Rather than focusing on general knowledge of cervical cancer, these campaigns should aim to provide targeted information that encourages individuals to seek out the HPV vaccine independently. Additionally, offering technical content that facilitates easier access to the vaccine can further support this objective.[37] Accessibility of the HPV vaccine should be made more convenient to encourage individuals to receive it as the current accessibility is not as extensive as that provided for schoolchildren who receive the free vaccine from the government.

Furthermore, it is crucial to raise awareness about the cost-effectiveness of preventing cervical cancer through vaccination as the cost of treatment for this disease is much higher than that of the vaccine.[38] This will encourage individuals to view the cost of the three-dose vaccine as a worthwhile investment and motivate them to budget for it. Increased awareness will also lead to increased psychomotor behavior as individuals are more likely to take action to receive the HPV vaccine. Providing triggers for awareness will empower this social marketing group to self-vaccinate themselves.

The government can also boost the demand for HPV vaccines by offering incentives to healthcare facilities to promote vaccination against HPV. Additionally, a financing mechanism for HPV vaccination with a cross-distribution system can be proposed to make the vaccine accessible to all community groups, including those with a lower socioeconomic status. Therefore, all women can benefit from HPV vaccination.[39]

The present study established significant value for all pairwise types of decision-maker groups. This finding provides compelling evidence for recommending the specification of the decision-maker type in promoting self-efficacy and knowledge about the HPV vaccine. It is anticipated that respondents' self-efficacy and knowledge will be enhanced by tailoring educational and health promotion interventions to specific decision-making groups.[39, 40]

This study targeted respondents from a single city using non-probability sampling, necessitating careful generalization. Another limitation is the exclusive focus on mothers as parents, potentially overlooking the fathers' perspectives. Despite these limitations, this study is the first investigation in Indonesia to explore self-efficacy and knowledge related to the HPV vaccine from the viewpoints of adolescent girls, young adult women, and parents concurrently. These findings serve as a foundation for future research, particularly in developing intervention programs that consider decision-making factors to enhance HPV vaccination acceptance and reduce resistance among women, including SDM, HDM, and ADM. It is recommended that tailored communication strategies should be devised to increase awareness of the benefits of the HPV vaccine across various decision contexts, involving both personal and collective considerations.

## Conclusion

The study established a significant difference between the type of decision-maker and women's self-efficacy and knowledge regarding cervical cancer and HPV vaccines. Based on these findings, interventions such as health

campaigns or promotions should be tailored to the characteristics of each decision-maker group. Moreover, the government should encourage health service facilities to promote HPV vaccination through incentives and a cross-distribution cost-assistance system to increase vaccination demand.

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**Authors' Contribution**

DS, EBT, CS, and II developed conceptualization and methodology. DS and II performed data collection, study supervision, data processing and interpretation. DS wrote the first draft of the manuscript. EBT, CS, and II conduct critical revisions for important intellectual content. All authors thoroughly reviewed and revised the manuscript and approved the final version for publication. The corresponding author confirms that all individuals listed have met the authorship criteria, and that no eligible contributors have been excluded.

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**Declaration on the use of AI**

The authors of this manuscript declare that in the writing process of this work, no artificial intelligence (AI) or AI-assisted technologies were used.

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