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Visual Inspection with Acetic Acid Screening Participation among Women of Childbearing Age in Tulungagung, East Java, Indonesia: A Health Belief Model Approach

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ABSTRACT

Background: Visual inspection with acetic acid (VIA) is a screening test that aims to detect precancerous cervical lesions and early cervical cancer in women who appear normal and asymptomatic. However, VIA coverage in various regions in Indonesia is very low and far from the national target. This study aims to analyze the application of the Health Belief Model on the participation of women of childbearing age in VIA examinations.
Subjects and Method: A quantitative cross-sectional study design was used. The subjects were married women of childbearing age in Tulungagung Regency, selected using a multistage random sampling method, totaling 210 individuals. The instrument used was a research questionnaire that had undergone validity and reliability testing. Data analysis used multivariate path analysis to examine the direct and indirect effects between variables.
Results: There was a direct and significant effect of cues to action (OR= 5.26; CI 95% 1.58 to 17.48; p=0.007) and self-efficacy (OR= 4.01; 95% CI 1.19 to 13.39; p=0.025) towards participation in VIA screening among women of childbearing age. Perceived susceptibility (OR= 4.11; 95% CI 1.61 to 10.49; p=0.003), perceived severity (OR= 0.11; 95% CI 0.02 to 0.51; p=0.005), perceived barriers (OR= 0.08; 95% CI 0.03 to 0.21; p<0.001), perceived benefits (OR= 17.55; 95% CI 4.58 to 67.19; p<0.001), and cues to action (OR= 8.02; 95% CI 3.16 to 20.31; p<0.001) had an indirect effect on the participation of women of childbearing age in VIA screening through self-efficacy.
Conclusion: There is a direct effect of cues to action and self-efficacy on the participation of women of childbearing age in VIA screening. There is an indirect effect of perceived vulnerability, perceived seriousness, perceived barriers, perceived benefits, and cues to action on the participation of women of childbearing age in VIA screening through self-efficacy.

Keywords: Health Belief Model, visual inspection with acetic acid, women of reproductive age

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BACKGROUND

The International Agency for Research on Cancer (IARC) defines Visual Inspection with Acetic Acid (VIA) as a test designed to detect precancerous cervical lesions and early cervical cancer in women who appear normal and asymptomatic. VIA is a visual examination that involves examining the uterine cervix with the unaided eye under appropriate lighting after applying freshly prepared 3%–5% acetic acid. Interpretation of the test is based on the identification of well-defined acetowhite areas in the cervical transformation zone one minute after the application of acetic acid. (Mittal et al., 2020). VIA is a simple, affordable, and rapid screening test for detecting precancerous lesions and early cervical cancer in asymptomatic women, with a 94% sensitivity and 95% specificity (Nuranna, 2022; Utami et al., 2024). The target of VIA screening is all women of childbearing age (15-49 years) who are married or sexually active. It is highly recommended that they undergo cervical cancer screening (Nuranna, 2022). Early detection of cervical cancer is in line with Target 3 of the Sustainable Development Goals (SDGs), which is to ensure healthy lives and promote well-being, particularly through reducing premature mortality from noncommunicable diseases, increasing universal access to sexual and reproductive health services, and achieving universal health coverage by 2030 (WHO, 2020).

Globally, cervical cancer is the fourth most common cancer in women (Bhatla et al., 2021). In low- and middle-income countries, the incidence of cervical cancer is about twice as high, and the mortality rate is three times higher than in high-income countries (WHO, 2020). In Indonesia, cervical cancer is the most common cancer among women after breast cancer, and cervical cancer mortality ranks fourth among all cancer deaths. According to Globocan data in 2022 in Indonesia, the incidence of cervical cancer in women reached 23.3 per 100,000 population, with a mortality rate of 13.2 per 100,000 population (Global Cancer Observatory, 2024). Most deaths caused by cervical cancer occur due to late diagnosis, and around 70% of patients are only detected at an advanced stage, even though this disease can be preventable and curable if detected early (Kementerian Kesehatan, 2024; WHO, 2020). Cervical cancer generally does not show symptoms in its early stages. The appearance of symptoms usually indicates that the disease has reached the precancerous stage or even cancer (Tjokroprawiro et al., 2024).

The National Cancer Plan 2024–2034 is targeting 70% coverage of VIA screening for women aged 30–50 (Kementerian Kesehatan, 2024). WHO recommends routine screening every 5–10 years, including for those who have been vaccinated against HPV (WHO, 2024). VIA screening is generally conducted at primary health care facilities, especially community health centers as the first line of early detection of cervical cancer (Simarmata et al., 2025). Based on the Indonesian Minister of Health Regulation No. 29 of 2017, VIA screening is recommended every 3–5 years for healthy women, while those with positive VIA results undergo cryotherapy and re-screening after 6 months. VIA services are regulated by each health center's policies and are generally available on specific days each week. Their costs are covered by the Indonesian Health Insurance Agency (BPJS Kesehatan) in accordance with Indonesian Ministry of Health Regulation No. 3 of 2023. However, VIA screening coverage in various regions remains low and has not yet reached the national target. The challenge is that awareness of cervical cancer screening and

prevention remains low among women (Tjokroprawiro et al., 2024).

According to the 2024 Indonesian Health Profile, the achievement of VIA screening in the 2022–2024 period was 23.59% nationally, and East Java achieved a VIA screening coverage of 15.47%, which is still far from the national target (Kementerian Kesehatan, 2025). According to the 2024 East Java Provincial Health Profile, VIA screening coverage in Tulungagung Regency was only 2.9%, ranking fourth lowest, yet positive VIA cases were recorded at a high rate of 4.9% (Dinas Kesehatan Provinsi Jawa Timur, 2025). This indicates a relatively high risk of cervical cancer despite low screening coverage. The low screening coverage is due to several factors, including education, perception, and culture, illness paradigms, fear or shame, access to healthcare, limited healthcare providers, and local government commitment (Kementerian Kesehatan, 2024).

Based on a preliminary study conducted on the coordinator of the Integrated Non-Communicable Disease Control Program in February 2025 at the Kalidawir Community Health Center, the low coverage of VIA screening was mainly due to feelings of shame and fear among women of childbearing age, as well as a tendency to undergo screening only after symptoms appeared. These findings are relevant to the Health Belief Model (HBM), which is widely used to explain the factors that influence health screening behavior, particularly in the context of chronic diseases and health promotion (DeDonno et al., 2022). The Health Belief Model theory provides insight regarding screening behavior, which includes perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Green et al., 2021).

Prior research in Malang was conducted by Putri et al. (2022) found that VIA screening behavior in women of childbearing age is positively correlated with perceived severity, perceived susceptibility, perceived barriers, perceived benefits, and cues to action. These findings provide a reference for researchers to conduct similar research by adding the Expanded Health Belief Model construct to assess self-efficacy. This study aims to determine the effect of HBM application on the participation of childbearing-age women in VIA screening in Tulungagung Regency.

SUBJECTS AND METHOD

1. Study Design

This study is an analytical observational study using a cross-sectional design. The study was conducted in three health centers, including Bandung Health Center, Kauman Health Center, and Pagerwojo Health Center, located in Tulungagung Regency, from September to October 2025.

2. Population and Sample

The target population of this study was married women of childbearing age in Tulungagung Regency. A total of 210 respondents were included in the sample. The sampling technique uses multistage random sampling.

3. Study Variables

The independent variables in this study were perceived susceptibility, perceived severity, perceived barriers, perceived benefits, cues to action, and self-efficacy. The dependent variable in this study is VIA screening participation.

4. Operational Definition of Variables

VIA screening participation is the actual actions of women of childbearing age who have or have not undergone VIA screening.

Perceived susceptibility is an individual's subjective perception of the risk of contracting a disease.
Perceived severity is the perception of the seriousness of the disease and its impact.
Perceived barriers are the obstacles or hindrances that individuals perceive in practicing healthy behaviors.
Perceived benefits are an individual's perception of the effectiveness of strategies designed to reduce the threat of a disease.
Cues to action are the stimuli needed to trigger the decision-making process for health behavior.
Self-efficacy is the belief in one's own ability to do or achieve something.
Participation in VIA screening is the actual action of women of childbearing age who have or have not undergone VIA screening.

5. Study Instruments

The research instrument used was a research questionnaire consisting of 59 questions, including 10 questions on vulnerability perception, 8 questions on seriousness perception, 9 questions on barrier perception, 10 questions on perceived benefits, 10 questions on cues to action, 10 questions on self-efficacy, and 1 question on participation in VIA screening.

6. Data Analysis

Univariate analysis was used to describe the results of each variable studied. Bivariate analysis with simple logistic regression was used to determine the relationship between the dependent and independent variables. Multivariate analysis with path analysis was used to determine the direct and indirect effects of one variable on another. This analysis was conducted using STATA 13 software.

7. Research Ethics

Research ethics issues, including consent, anonymity, and confidentiality, were carefully addressed throughout the research process. Ethical approval for the study was obtained from the Research Ethics Committee of Dr. Moewardi General Hospital, Surakarta, Indonesia, with reference number 1.900/VIII/HREC/2025 on August 29, 2025.

RESULTS

1. Sample Characteristic

Univariate analysis was used to describe the characteristics of the research participants (Table 1).

Table 1. Demographic characteristics of the sample data

Characteristics	Category	Frequency	Percentage
Age	<30 years old	65	30.95%
	≥30 years old	145	69.05%
Education	Elementary school	3	1.43%
	Junior high school	23	10.95%
	Senior high school	81	38.57%
	College	103	49.05%
Employment status	Unemployed	97	46.19%
	Employed	113	53.81%
Income	Low (< Rp. 2,470,800)	140	66.67%
	High (≥Rp 2,470,800)	70	33.33%
Family history of cervical cancer	No	196	93.33%
	Yes	14	6.67%

Table 2 shows that the mean score for perceived susceptibility was 20.08 with a standard deviation of 5.56, perceived severity was 21.82 with a standard deviation

of 5.19, perceived barriers was 21.47 with a standard deviation of 5.71, perceived benefits was 30.27 with a standard deviation of 5.31, signals to act at 25.25 with a standard deviation of 8.07, and self-efficacy at 26.97 with a standard deviation of 5.69.

Table 2. Results of univariate analysis of continuous data

Variables	Mean	SD	Min.	Max.
Perceived susceptibility	20.08	5.56	11	34
Perceived severity	21.82	5.19	8	31
Perceived barriers	21.47	5.71	9	32
Perceived benefits	30.27	5.31	15	40
Cues to action	25.25	8.07	10	40
Self-efficacy	26.97	5.69	11	40

2. Bivariate Analysis

Bivariate analysis was used to analyze the relationship between dependent and independent variables affecting the VIA participation of childbearing-age women. Table 4 shows that there is a relationship between perceived susceptibility and participation in VIA screening (OR = 8.36; 95% CI = 3.11 to 22.49; p<0.001). These results show that a 1-unit increase in perceived susceptibility score will be followed by an 8.36-fold increase in the log odds score for participation in VIA screening among women.

There is a relationship between perceived severity and VIA screening participation (OR = 20.34; 95% CI = 4.74 to 87.24; p<0.001). These results show that a 1-unit increase in perceived severity score is followed by a 20.34-fold increase in the log odds score for VIA screening participation among women. There is a relationship between perceived barriers and participation in VIA screening (OR = 0.13; 95% CI= 0.05 to 0.33; p<0.001).

These results show that a 1-unit increase in the perceived barriers score is associated with a 0.13-fold increase in the log odds of participation in VIA screening among women. There is a relationship between perceived benefits and participation in VIA screening (OR = 4.33; CI 95%= 1.80 to 10.40; p=0.001).

These results show that a 1-unit increase in perceived benefits score is followed by a 4.33-fold increase in the log odds score for participation in VIA screening among women. There is a relationship between cues to action and participation in VIA screening (OR = 10.78; CI 95% = 3.66 to 31.75; p<0.001).

These results show that a 1-unit increase in the cue to action score is followed by a 10.78-fold increase in the log odds score for participation in VIA screening among women. There is a relationship between self-efficacy and participation in VIA screening (OR= 9.59; 95% CI = 3.25 to 28.23; p <0.001). These results show that a 1-unit increase in self-efficacy score is followed by a 9.59-fold increase in the log odds score for participation in VIA screening among women.

Table 4. Results of simple logistic regression analysis of variables affecting VIA participation among childbearing-age women in Tulungagung Regency

Variables	OR	95% CI		p
		Lower limit	Upper limit	
Perceived susceptibility	8.36	3.11	22.49	<0.001
Perceived severity	20.34	4.74	87.24	<0.001

Variables	OR	95% CI		p
		Lower limit	Upper limit	
Perceived barriers	0.13	0.05	0.33	<0.001
Perceived benefits	4.33	1.80	10.40	0.001
Cues to action	10.78	3.66	31.75	<0.001
Self-efficacy	9.59	3.25	28.23	<0.001

3. Multivariate Analysis

This study uses path analysis to determine the direct and indirect effects of the variables analyzed. Figure 1 shows the model specifications that connect the research variables. This theory describes that participation in VIA screening among women of childbearing age is directly influenced by cues to action and self-efficacy. Self-efficacy is influenced by perceived susceptibility, perceived severity, perceived barriers, perceived benefits, and cues to action.

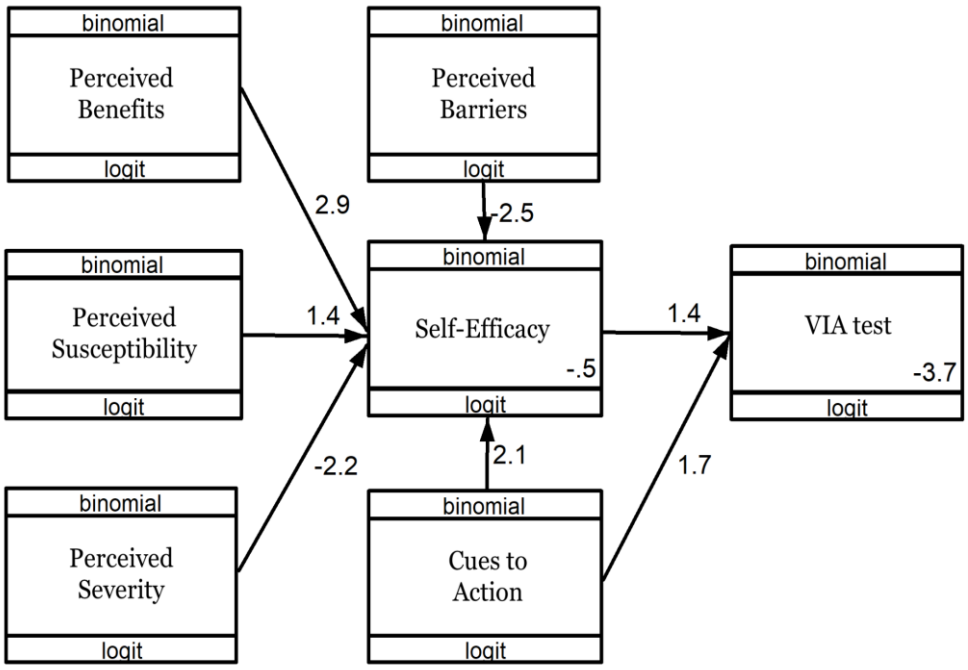

Figure 1. Health Belief Model (HBM) pathway diagram with VIA screening participation among women of childbearing age

This study employed a path analysis model involving seven measurable variables, consisting of five exogenous variables and two endogenous variables, with a total of seven estimated parameters. The calculated degree of freedom (df) was 14, indicating that the model was overidentified and therefore appropriate for path analysis. The model fit assessment, as presented in Table 5 of the multivariate analysis, demonstrated a good level of goodness of fit, as reflected by the Akaike Information Criterion (AIC = 319.8102) and Bayesian Information Criterion (BIC = 349.9342).

The parameter estimation results revealed several significant relationships among the variables. Cues to action were found to have a significant positive effect on VIA screening participation, where women with high cues to action were 5.26 times more likely to undergo VIA screening compared to those with low cues to action

(OR = 5.26; 95% CI 1.58 to 17.48; p = 0.007). Similarly, self-efficacy showed a significant positive association with VIA screening participation, with women who had high self-efficacy being 4.01 times more likely to participate in VIA screening than those with low self-efficacy (OR = 4.01; 95% CI 1.19 to 13.39; p = 0.025).

In addition, perceived susceptibility was significantly associated with self-efficacy, as women with high perceived susceptibility were 4.11 times more likely to have high self-efficacy compared to those with low perceived susceptibility (OR = 4.11; 95% CI 1.61 to 10.49; p = 0.003). Perceived severity, however, showed a negative relationship with self-efficacy, where women with high perceived severity were 0.11 times more likely to have high self-efficacy than those with low perceived severity (OR = 0.11; 95% CI 0.02 to 0.51; p = 0.005). Likewise, perceived barriers were negatively associated with self-efficacy, with women experiencing strong perceived barriers being 0.08 times more likely to have high self-efficacy compared to those with weak perceived barriers (OR = 0.08; 95% CI 0.03 to 0.21; p < 0.001).

Conversely, perceived benefits demonstrated a strong positive association with self-efficacy, as women with high perceived benefits were 17.55 times more likely to have high self-efficacy than those with low perceived benefits (OR = 17.55; 95% CI 4.58 to 67.19; p < 0.001). Furthermore, cues to action also significantly influenced self-efficacy, where women who received high cues to action were 8.02 times more likely to have high self-efficacy compared to those who received low cues to action (OR = 8.02; 95% CI 3.16 to 20.31; p < 0.001). Overall, these findings indicate that both cognitive and perceptual factors play important roles in influencing self-efficacy and participation in VIA screening.

DISCUSSION

Perceived susceptibility on VIA screening participation

The results of the path analysis show that perceived susceptibility is indirectly related to VIA screening participation among women of childbearing age through self-efficacy and is statistically significant. In line with the findings of Tshuma et al. (2017) in South Africa, self-efficacy functions as a total mediator between perceived susceptibility and preventive behavior for non-communicable diseases. The indirect effect of perceived susceptibility was found at 0.099 on health behavior through self-efficacy and statistically significant. These findings indicate that perceptions of individual vulnerability do not directly motivate individuals to adopt health behaviors without a high level of self-efficacy.

Another study also mentions that efficacy has been proven as a mediating variable between perceived susceptibility and health behaviors through a total mediation model (Mufiedah et al., 2023). Carter-Harris et al. (2020) found that a family history of cancer does not directly increase screening acceptance, but it strengthens self-efficacy, allowing individuals to have more confidence in themselves to participate in screening programs, with moderate but significant mediating effects (b = 0.02; p < 0.05). Low perceived risk factors, such as no family history of cervical cancer and the “healthy means risk-free” paradigm, particularly among respondents with lower education levels, are likely to reduce perceived vulnerability. Thus, VIA screening depends on the level of self-efficacy (Aldohaian et al., 2019; Yirsaw et al., 2024).

Perceived severity on VIA screening participation

The results of the path analysis show that the perceived severity of cancer has an indirect relationship with VIA screening participation among women of childbearing age through self-efficacy, and it is statistically significant. In line with research by Carter-Harris et al. (2020), which shows that the perception of fatality towards cancer does not have a direct effect on individual acceptance of cancer screening. However, fatality has an indirect effect through a mediating mechanism involving a decrease in self-efficacy (b=-0.03; p<0.05). Research by Tshuma et al. (2017) in South Africa found that self-efficacy functions as a partial mediator of perceptions of seriousness and preventive behavior for non-communicable diseases.

A randomized controlled trial (RCT) study showed that self-efficacy and cancer fatalism have a negative correlation. This means that the stronger a person's self-efficacy, the lower their perception of cancer fatalism. This condition indicates that an overly high perceived severity can lead to fatalism or helplessness, which weakens self-efficacy (Hay et al., 2024). Demographic factors such as education level can influence the perceived severity of cervical cancer. Higher education promotes rational understanding and participation in VIA screening, while lower education can lead to excessive fear that reduces self-efficacy and inhibits screening behavior (Mili *et al.*, 2025).

Perceived barriers on VIA screening participation

The results of the path analysis show that the perception of barriers is indirectly related to VIA screening participation among women of childbearing age through self-efficacy in a statistically significant manner. Consistent with the study by Corrales et al. (2024) in Chile, positive beliefs about screening barriers, such as fear, embarrassment, or concerns about revealing sexual history, can increase the self-efficacy of women of childbearing age and encourage participation in cervical cancer screening. Research in Ghana shows that Islamic modesty values and the need for spousal consent decrease Muslim women's self-efficacy in cervical cancer screening, mainly due to concerns about being examined by male doctors (Enyan et al., 2022).

On the other hand, women with high self-efficacy are more likely to be able to overcome any barriers that may arise. As found in a qualitative study conducted on low-income and uneducated immigrant women in France, high self-efficacy values, such as independence in seeking healthcare services, can suppress and overcome the socio-cultural barriers felt by women in undergoing cancer screening in general (De Jesus et al., 2021). Demographic factors related to employment status and income level, due to time constraints, risk of loss of income, and direct and indirect costs, can reinforce perceived barriers, thus reducing self-efficacy and screening participation (Biddell et al., 2021).

Perceived benefits on VIA screening participation

The results of the path analysis show that perceived benefits are indirectly related to VIA screening participation among women of childbearing age through self-efficacy and are statistically significant. In line with the study by Tshuma et al. (2017), which found that perceived benefits were fully mediated by self-efficacy with a significant indirect effect of 0.102 on health behavior. Research in China reported similar findings that self-efficacy acts as a bridge or mediator between perceived benefits and adherence to health behaviors (Yu et al., 2022).

Another study by Corrales et al (2024) found a direct positive relationship between

self-efficacy and perceived benefits of cervical cancer screening. Better self-confidence about the benefits of screening was identified as a factor contributing to high self-efficacy among women of child-bearing age. In addition, the perceived benefits of VIA examinations are related to educational factors. Respondents with higher education levels are likely to have better health literacy, enabling them to understand the benefits of early detection of cervical cancer, which can strengthen their self-efficacy and motivate them to undergo screening (Yirsaw et al., 2024).

Cues to action on VIA screening participation

The results of the path analysis indicate that cues to action have a direct effect on the VIA screening participation among women of reproductive age and are statistically significant. In line with the study by Destaw et al. (2021), found that women who receive high cues to action are 4.5 times more likely to undergo cervical cancer screening than women who receive low cues to action. A qualitative study by Asl et al. (2020) among women in Iran showed that, despite women receiving low cues from their environment due to negative stigma in their communities, direct (face-to-face) recommendations by healthcare providers prompted women of childbearing age to undergo cervical cancer screening.

Secondary research using Demographic and Health Surveys (DHS) data in sub-Saharan African countries found that women exposed to mass media (in terms of television, radio, and newspapers/ magazines) were more likely to undergo cervical cancer screening (Bawuah et al., 2025). In addition, a systematic review also mentioned that support from husbands can significantly encourage women of child-bearing age to undergo VIA screening (Ayu & Hadi, 2024). Family medical history can also serve as a strong internal cue that increases risk awareness, perception of the urgency of early detection, and sensitivity to external cues, thus encouraging the decision to undergo VIA screening (Agrawal et al., 2025).

Cues to action on self-efficacy

Cues to action can indirectly influence participation in VIA screening through self-efficacy and are statistically significant. In line with the research by Tu et al. (2024) in China found that self-efficacy mediates the relationship between social support and cervical cancer screening behavior. Thus, social support not only provides external encouragement but also increases women's confidence in their ability to undergo screening.

Another study in Iran showed that education and motivation play a role in encouraging cervical cancer screening behavior in women of childbearing age indirectly through self-efficacy. The study reported that various factors strengthen women's internal motivation to undergo screening, including recommendations from health workers, support from husbands, and advice from friends and family (Ghasemi et al., 2025). Another study also shows that spousal support is positively correlated with self-efficacy and participation in VIA screening, in terms of self-efficacy acting as a mediator between spousal support and the use of VIA tests (Juwitasari et al., 2021).

Self-efficacy on VIA screening participation

The path analysis results show that self-efficacy has a direct effect on participation in VIA screening among women of childbearing age, and this relationship is statistically significant. The higher the self-efficacy of women of childbearing age, the more likely they are to undergo VIA screening compared to women who have low self-efficacy. In line with the study by Destaw et al. (2021), one

in four respondents had high self-efficacy related to cervical cancer screening, which significantly increased their likelihood of participating in screening compared to women with low self-efficacy. A study by Corrales et al. (2024) found that women of childbearing age who had high self-efficacy in undergoing early screening tended to show better compliance with cervical cancer programs.

A meta-analysis study also showed that women of childbearing age with high self-efficacy were 4.7 times more likely to undergo cervical cancer screening than women with low self-efficacy (Yirsaw et al., 2024). Based on the Health Belief Model framework by Rosenstock et al. (1974), it is explained that self-efficacy is an important driver that directly influences a person's decision to engage in preventive behaviors, including regular VIA screening. In addition, the respondents' level of education can also influence the strength of their self-efficacy. Higher education increases health literacy and access to health information, confidence in interacting with health workers, and understanding of procedures, thus strengthening women's confidence to undergo screening (Ghasemi et al., 2025).

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AUTHOR CONTRIBUTION

SMS contributed to the conception and design of the study, data collection, data analysis, interpretation of results, and drafted the initial manuscript. RGHN contributed to the conception and design of the study, interpretation of results, critical manuscript review, and served as the corresponding author. SM contributed to the conception and design of the study, interpretation of results, and critical manuscript review. EBC and ISS contributed to the conception and design of the study, interpretation of results, critical manuscript review, and strengthening of intellectual content. All authors approved the final version of the manuscript to be published and agreed to be accountable for all aspects of the work, ensuring that any questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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CONFLICT OF INTEREST

There are no conflicts of interest

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