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Web-based health education utilizing “Sahabat Sehat Serviks” to prevent cervical cancer among adolescent girlsYasmin Nur Muazizah, Tetet Kartilah , Tetik Nurhayati**Author information**

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 tetetkartilah12@gmail.com <https://doi.org/10.31603/nursing.v11i2.11626>**Abstract**

Cervical cancer is the second leading cause of death among women in Indonesia, primarily caused by the Human Papillomavirus (HPV). The progression of this disease takes a long time, and one of the at-risk groups is adolescent girls who engage in risky sexual behavior, neglect proper reproductive organ care, and maintain unhealthy lifestyles. It is essential for adolescents to acquire good knowledge, attitudes, and skills from an early age, as these factors can significantly influence their future behavior, particularly in the early prevention of cervical cancer. Therefore, providing contemporary cervical cancer education through the website "Sahabat Sehat Serviks" is necessary to enhance adolescents' knowledge, which can lead to changes in their attitudes and skills. This study aims to determine the effect of health education delivered through the website on increasing the knowledge, attitudes, and skills of adolescent girls regarding the early prevention of cervical cancer. The research design is a quasi-experiment with a quantitative approach, utilizing a pre-post design with a control group. The study population consisted of 179 adolescent girls aged 11 to 13 years, with a sample of 36 respondents selected through proportional stratified random sampling. The results indicated significant differences in knowledge, attitudes, and skills among respondents who received cervical cancer health education via the "Sahabat Sehat Serviks" e-health website, with p-values of 0.000 for knowledge, 0.014 for attitudes, and 0.001 for skills. The findings suggest that the "Sahabat Sehat Serviks" website is an effective medium for cervical cancer health education for adolescent girls, significantly improving their knowledge, attitudes, and skills related to early cervical cancer prevention. These results underscore the importance of utilizing digital platforms to reach and educate young individuals on critical health issues, thereby empowering them to make informed decisions about their reproductive health.

Keywords: Attitude, cervical cancer, health education, nursing skills, reproductive health**Introduction**

Cervical cancer is a significant health concern that ranks high on both national and international agendas due to its detrimental impact on women's quality of life (Bhatla et al., 2021). Often developing asymptotically over a period of 15 to 20 years, it is commonly referred to as a "silent killer" (Pandey et al., 2015). This type of cancer is a leading cause of death among women which resulting from malignant tumors in the reproductive system (Singh et al., 2023). A study documented that approximately 604.000 new cases of cervical cancer are reported each year, with 342.000 female deaths globally (Ferlay et al., 2019). Projections indicate that by 2025, there will be approximately 720.415 new cases and 394.905 deaths (Global Burden of Cancer Study, 2020). In Asia, particularly in developing countries like Indonesia, the incidence is alarmingly high, with Indonesia ranking fourth in Southeast Asia for cervical cancer cases (Dewi et al., 2021). In 2020 alone, Indonesia reported 36.633 new cases and a mortality rate of 21.003 (Global Burden of Cancer Study, 2020). In Tasikmalaya Regency, the incidence of cervical cancer is notably high, with 0.29 cases per 100.000 women of childbearing age reported in 2022 (Dinas Kesehatan Jawa Barat, 2022). The Singaparna Health Center was selected as the treatment facility due to its accessibility and the presence of qualified health personnel (Susanti et al., 2018). Data from the Singaparna Medikautama General Hospital indicated fluctuations in cervical cancer cases from 2021 to 2023, totaling 119 patients. These statistics highlight that cervical cancer can affect women of various ages and backgrounds (Surbakti et al., 2022). The primary cause of cervical cancer is the Human Papillomavirus (HPV), with types 16 and 18 responsible for 70% of cases (Wahidin & Febrianti, 2021). Risk factors contributing to cervical cancer include early sexual activity, multiple sexual partners, smoking, low economic status, having many children, sexually transmitted infections, and immune system issues (Zhang et al., 2020).

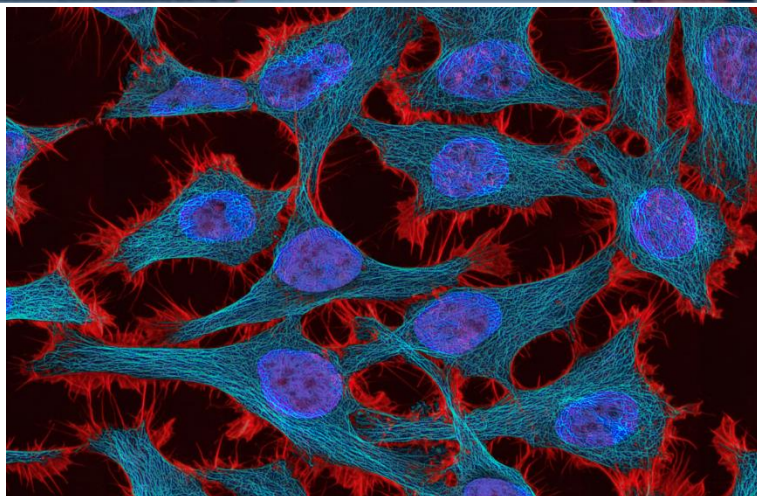


Figure 1. Illustration of cervical cancer using microscopic view (Courtesy of www.unsplash.com).

Adolescents are particularly vulnerable to reproductive health issues stemming from unhealthy sexual behaviors, including promiscuity, out-of-wedlock pregnancies, sexually transmitted infections, and sexual violence (Afritayeni et al., 2018). The prevalence of deviant sexual behaviors among junior high school students is concerning (Theresia et al., 2020), and many adolescents lack adequate knowledge about cervical cancer prevention. A preliminary study at SMPN 1 Singaparna revealed that 7 out of 10 seventh-grade female students had insufficient knowledge about cervical cancer (**Figure 1**). Similar findings at Pondok Pesantren Haramain indicated that many students were unaware of reproductive health issues (Yulastini et al., 2021). This lack of awareness contributes to inadequate preventive measures against cervical cancer. Research has shown that only 1 out of 15

female students interviewed had received the HPV vaccine, with the majority citing ignorance about cervical cancer and its prevention, alongside financial barriers (Dewi et al., 2021). Furthermore, a study indicated that respondents exhibited negative attitudes towards cervical cancer prevention, often possessing knowledge yet displaying negative behaviors (Haryanti & Mariana, 2020). While government facilities, such as general hospitals and obstetric clinics, have initiated HPV vaccination programs, uptake among adolescent girls remains low due to disinterest and perceived costs (Dewi et al., 2021). Additionally, research documented those female students in the tenth grade had never received any information regarding cervical cancer and HPV immunization (Haryanti & Mariana, 2020). Most previous studies have focused on adult women for cervical cancer prevention; however, addressing this issue early in adolescents is crucial. This underscores the need for educational initiatives aimed at improving knowledge, attitudes, and skills related to cervical cancer prevention among adolescent girls.

Despite the increasing awareness of cervical cancer as a significant health issue in Indonesia, there are critical gaps in the current prevention efforts, particularly among adolescent girls. Many young women lack comprehensive knowledge about cervical cancer, its risk factors, and the importance of early detection and vaccination against HPV. Traditional educational methods often fail to engage this demographic effectively, leading to insufficient understanding and low vaccination rates. Furthermore, cultural stigmas and misinformation surrounding reproductive health can deter adolescents from seeking necessary information and healthcare services. The absence of tailored, accessible educational resources specifically designed for young audiences exacerbates these issues, leaving a vulnerable population at risk. Effective cervical cancer prevention can be achieved through early education on reproductive health. This method emphasizes preventive measures such as HPV vaccination and avoidance of risk factors. Moreover, Education via electronic media, particularly the internet, proves to be highly effective due to its accessibility for adolescents (Sari & Suswanto, 2017). Digital platforms, such as dedicated websites, can serve as efficient educational tools, being easily accessible on various devices and appealing to young audiences (Rachmadyansyah & Khairunisa, 2019). Given adolescents' natural curiosity and propensity for risk-taking, it is essential to provide them with accurate information to prevent future reproductive health issues (Nita & Novi, 2020). The initiative to use websites specifically designed for adolescent girls to promote early cervical cancer prevention represents a novel approach which shifting the focus from older women to younger populations. In nursing practice, delivering cervical cancer education through websites enables nurses to provide clear, understandable, and sustainable information about the disease. This structured approach helps enhance public understanding of risk factors, symptoms, and the importance of HPV vaccination, positioning nurses as vital health educators capable of disseminating evidence-based health information to the community. The study focusing on web-based health education through platforms like "Sahabat Sehat Serviks" is crucial for addressing these gaps in cervical cancer prevention. Utilizing an online platform can reach a broader audience and overcome geographical and social barriers that often limit access to health information in Indonesia. The interactive nature of web-based education allows for engaging content that resonates with adolescents. This approach enhances knowledge and encourages positive behavioral changes, such as seeking vaccination and participating in regular screenings. Furthermore, the convenience of online resources can empower young women to explore sensitive topics

related to reproductive health without fear of judgment. Additionally, the success of this study can serve as a model for similar health education initiatives targeting other pressing health issues in Indonesia.

Method

This study employed a quantitative quasi-experimental design, specifically a pre-posttest with a control group design. This design is a research method that evaluates the effects of an intervention by comparing outcomes before and after the treatment while including a control group that does not receive the intervention (Handley et al., 2018). This design involves assessing participants' knowledge, attitudes, or skills through a pre-test to establish a baseline and a post-test to measure changes post-intervention (**Figure 2**). Unlike true experimental designs, participants are not randomly assigned to groups, which can introduce potential biases and confounding variables (Schweizer et al., 2016). However, this approach is practical and ethical in real-world settings as it allows researchers to assess the effectiveness of interventions and maintain relevance to everyday situations (Andrade, 2021). Despite its limitations in establishing causality, it provides valuable insights into the impact of educational or health-related programs. In this study, the population consisted of 179 seventh-grade female students aged 11 to 13 years at SMPN 1 Singaparna. To select participants, the researchers utilized a probability sampling technique, specifically proportional stratified random sampling, ensuring a representative sample from the population. The inclusion criteria for the study were female students at SMPN 1 Singaparna who understood the concept of cervical cancer and were able to interact with web-based educational materials. Conversely, the exclusion criteria included female students who were unwilling to participate in the study or who had specific diseases that would prevent them from taking part. A total of 36 respondents were selected, comprising 18 individuals in the intervention group and 18 in the control group. It is important to note that some participants withdrew during the study process, which could affect the overall results. The research was conducted from March 25 to April 1, 2024. Measurements were taken on the first and seventh days using a validated questionnaire that assessed knowledge, attitudes, and skills related to cervical cancer prevention. The data collection instrument underwent validation through Pearson correlation, and reliability was tested using Cronbach's Alpha, yielding results indicating that the reliability coefficient exceeded the r table value of 0.444.

The final structure of the questionnaire included 22 questions for the knowledge variable, 14 questions for the attitude variable, and 16 questions for the skills variable. Data collection began with a pre-test questionnaire administered to all participants. Following this, respondents in the intervention group received education on cervical cancer through the "Sahabat Sehat Serviks" website. Meanwhile, the control group received information via leaflets and conventional educational approaches. After the intervention, all subjects completed a post-test questionnaire administered through Google Forms to measure any changes in knowledge, attitudes, and skills. Data analysis was conducted using T-tests, including both univariate and bivariate analyses, with the data processed using SPSS software to ensure accurate statistical evaluation. This study received ethical approval from the Health Research Ethics Committee of Universitas Jendral Achmad Yani (No.06/Kepk/FITKes-Unjani/III/2024). The rigorous methodology and ethical considerations underscore the study's commitment to producing reliable and valid findings that can contribute to the understanding of cervical cancer education among adolescents.

Results

This study involved two groups, each consisting of 18 respondents, with diverse characteristics. The first group was the intervention group, while the second served as the control group. The data presented in the following table reveals that nearly all respondents are 13 years old and that almost all have never received the HPV vaccine. Additionally, the majority occasionally discuss reproductive health with their families, with most respondents identifying their mothers as the



Figure 2. Illustration of health education among adolescents (Courtesy of www.npr.org).

primary source for these discussions. Furthermore, many also engage in occasional conversations about reproductive health with friends. Alarmingly, almost all respondents reported never having received information about cervical cancer, and nearly all do not have family members with a history of the disease (**Table 1**). The second table illustrates the average levels of knowledge, attitudes, and skills before and after the cervical cancer education. In the intervention group, prior to the intervention, the average knowledge score was 60.78, the average attitude score was 75.17, and the average skill level was 69.50. Following the intervention, these scores rose significantly, with average knowledge increasing to 87.22, attitudes to 84.06, and skills to 80.72. In contrast, the control group exhibited lower scores before the intervention, with average knowledge at 60.28, attitudes at 73.33, and skills at 63.33. After the intervention, the control group showed some improvement, with average knowledge rising to 74.00, attitudes to 78.94, and skills to 69.44 (**Table 2**). These results indicate a marked difference in the effectiveness of the educational methods employed in each group.

Table 1. Respondent characteristics.

Variables	Intervention group		Control group	
	<i>n</i>	Percentage (%)	<i>n</i>	Percentage (%)
Age				
12 Years Old	2	11.1%	4	22.2%
13 Years Old	16	88.9%	14	77.8%
HPV vaccination				
Once	1	5.6%	0	0%
Never	17	94.4%	18	100%
Discussion in reproductive health				
Once	6	33.3%	4	22.2%
Sometimes	10	55.6%	12	66.7%
Never	2	11.1%	2	11.1%
Partner in discussion				
Father	2	11.1%	0	0%
Mother	15	83.3%	14	77.8%
Siblings	1	5.6%	4	22.2%
Discussing reproductive health with friends				
Once	1	5.6%	4	22.2%
Sometimes	11	61.1%	10	55.6%
Never	6	33.3%	4	22.2%
Get information about cervical cancer				
Once	3	16.7%	3	16.7%
Never	15	83.3%	15	83.3%
Family affected by cervical cancer				
Presence	2	11.1%	0	0%
Absence	16	88.9%	18	100%

The table highlights the changes observed in the intervention group, where knowledge increased by 24.44 points, attitudes by 8.89 points, and skills by 11.22 points following the educational intervention. Statistical analysis revealed significant differences in all three variables, with p-values of 0.000 for knowledge, 0.001 for attitudes, and 0.001 for skills, all of which are less than the alpha level of 0.05. This indicates that the cervical cancer education provided through the e-health website “Sahabat Sehat Serviks” had a significant impact on the participants. In comparison, the control group experienced increases of 13.72 in knowledge, 6.51 in attitudes, and 6.11 in skills after receiving education through leaflets. Their statistical analysis also showed significant differences, with p-values of 0.000 for knowledge, 0.008 for attitudes, and 0.026 for skills, further emphasizing the effectiveness of educational interventions (**Table 3**). The final table summarizes the comparative analysis between the two educational media. It indicates that the p-value for knowledge is 0.05, for attitudes is 0.014, and for skills is 0.001, all of which are below the alpha level of 0.05. This suggests significant differences in knowledge, attitudes, and skills after cervical cancer education when comparing the e-health website to the leaflet media (**Table 4**). These findings underscore the potential of web-based educational platforms to enhance understanding and awareness of cervical cancer among adolescents.

Table 2. Mean score of knowledge, attitudes, and skills among groups.

Variables	Groups	
	Pretest	Posttest
Intervention group (n = 18)		
Knowledge		
Mean	60.78	87.22
Elementary School	16.791	8.829
Attitude		
Mean	75.17	84.06
Elementary School	6.913	6.539
Skills		
Mean	69.50	80.72
Elementary School	7.470	8.195
Control group (n = 18)		
Knowledge		
Mean	60.28	74
Elementary School	10.380	7.203
Attitude		
Mean	73.33	78.94
Elementary School	6.782	5.218
Skills		
Mean	63.33	69.44
Elementary School	7.639	9.775

Table 3. Mean difference among variables.

Variables		Average difference	<i>p value</i>
Intervention group (<i>n</i> = 18)			
Knowledge	Pretest	26.44	0.000
	Posttest		
Attitude	Pretest	8.89	0.001
	Posttest		
Skills	Pretest	11.22	0.001
	Posttest		
Control group (<i>n</i> = 18)			
Knowledge	Pretest	13.72	0.000
	Posttest		
Attitude	Pretest	6.51	0.008
	Posttest		
Skills	Pretest	6.11	0.026
	Posttest		

Discussion

The study highlighted that early adolescence represents an ideal period for introducing cervical cancer education. This proactive approach empowers adolescents to take preventive measures regarding their reproductive health, particularly in avoiding exposure to cervical cancer (Amorha et al., 2024). Unfortunately, many adolescents do not receive the HPV vaccination due to a lack of information and barriers to accessibility. This leads to a general unawareness of the vaccine's importance among both adolescent girls and their parents (Cheng et al., 2020). Factors contributing to adolescent girls' reluctance to discuss reproductive health with their families include feelings of anxiety or fear, a lack of family openness, differing values, and inadequate communication skills. Open communication, emotional support, and education provided by mothers are crucial in helping adolescents understand the importance of reproductive health care and encouraging them to take protective actions (Singh et al., 2023). Additionally, advancing a supportive environment through peer engagement can stimulate proactive discussions about reproductive health among adolescent girls (Kumar



Figure 3. Illustration of educational process in a classroom (Courtesy of www.usnews.com).

et al., 2019). Several factors contribute to the lack of information about cervical cancer among adolescents, including a reluctance to seek out information, limited access, and low health literacy levels. This study indicated that the average levels of knowledge, attitudes, and skills significantly increased in both the intervention and control groups (**Figure 3**). Notably, nearly all respondents in both groups had previously never received information about cervical cancer. A study highlights that individuals with higher education levels are more likely to receive information; thus, increased knowledge enables better processing of information (Surinati et al., 2023).

Moreover, a solid foundation of knowledge positively influences receptive attitudes. This means that individuals are more inclined to engage with presented stimuli, respond to inquiries, and complete tasks (Surinati et al., 2023). As noted by a study that the ability to apply knowledge and experience to

complete tasks is defined as skill (Marsiami, 2021). However, it is essential to recognize that changing an individual's skills requires a prolonged and continuous process. Each learning activity related to motor skills positively impacts skill development, as frequent practice enhances proficiency. In this study, the intervention group demonstrated a higher increase in knowledge, attitudes, and skills compared to the control group. This disparity can be attributed to the intervention group's greater engagement during the research implementation by the interactive "Sahabat Sehat Serviks" website. The researchers posit that changes in knowledge are accompanied by corresponding changes in attitudes and skills. Developing good knowledge, attitudes, and skills in reproductive health management among adolescent girls necessitates significant time and diverse training programs. Therefore, it is essential to prioritize the reproductive health needs of adolescent girls. As shown in the table, significant differences in average levels of knowledge, attitudes, and skills were observed between pre- and post-intervention scores in both groups, with a p value ≤ 0.05 (**Tables 3**). This aligns with the findings of study that indicated that health education significantly impacts adolescent girls' ability to care for their reproductive health (Sandriani et al., 2023). Cervical cancer education aims to enhance individual knowledge and abilities through structured learning practices and healthier behaviors (Surinati et al., 2023). The researchers assert that cervical cancer health education improved understanding of reproductive health and early cervical cancer prevention. This knowledge empowers them to make informed choices and develop practical skills for daily life in the prevention of cervical cancer. A study demonstrated the effectiveness of the "Sayang Wanita" educational website on the behavior of Women of Reproductive Age (WRA) regarding the Visual Inspection with Acetic Acid (VIA) test (Fuadah et al., 2021).

Table 4. Mean difference among variables after intervention.

Variables	Groups	Mean	p value
Knowledge	Control	8.829	0.000
	Intervention	7.203	
Attitude	Control	6.539	0.014
	Intervention	5.218	
Skills	Control	8.195	0.001
	Intervention	9.775	

Health education is notably more effective when utilizing media to enhance information dissemination. Health information can be shared quickly through various media to allow individuals access knowledge on health issues like cervical cancer prevention without relying on traditional sources. The e-health platform "Sahabat Sehat Serviks" excels in presenting health information in an engaging and easily digestible format. Utilizing videos, images, and audio allows for the effective communication of complex material related to cervical cancer and its prevention. In contrast, leaflets often present simpler and more static information, limiting the depth of content that can be conveyed. The advantages of the

“Sahabat Sehat Serviks” website include affordability, flexibility, and interactivity. For those with internet access, platforms like Google and various websites have become primary sources for seeking information due to their low cost, ease of access, and extensive range of available information (Ayumaruti & Anshari, 2023). Furthermore, the ability to consistently convey health messages strengthens knowledge retention and promotes positive health attitudes, enhancing adolescent girls' skills in caring for their reproductive health, particularly in the early prevention of cervical cancer.

As the evaluation regarding the method of this present study, the quasi-experimental design of this study offers several strengths in its application of web-based health education through the “Sahabat Sehat Serviks” platform to prevent cervical cancer among adolescent girls in Indonesia. One of the primary strengths is the innovative use of digital technology to reach a demographic that is increasingly engaged with online content. Utilizing a web-based platform allows for a more engaging learning experience. This approach also accommodates the varying schedules of adolescents, and encourage them to access educational materials at their convenience. Furthermore, the sample size of 18 respondents in both the intervention and control groups allows for a focused analysis of the educational impact. Meanwhile, the pre- and post-intervention assessments of knowledge, attitudes, and skills provide clear evidence of the effectiveness of the intervention. The significant improvements observed in the intervention group further validate the potential of web-based education in enhancing health literacy and promoting preventive behaviors among adolescents. Despite its strengths, this study has several limitations that must be acknowledged. One significant limitation is the relatively small sample size of 18 respondents in each group, which may limit the generalizability of the findings to a broader population. Therefore, a larger sample size would provide more robust data and enhance the statistical power of the analysis. This approach also allows for more definitive conclusions about the effectiveness of the intervention across diverse demographic groups. Additionally, the quasi-experimental design lacks randomization, which could introduce selection bias and affect the validity of the results. The reliance on self-reported data for measuring knowledge, attitudes, and skills may also lead to response bias, as participants might provide socially desirable answers rather than accurate reflections of their understanding and behaviors. Lastly, the study's duration may not be sufficient to assess the long-term retention of knowledge and sustained behavioral changes. This limitation highlighted the need for follow-up studies to evaluate the lasting impact of web-based health education initiatives on cervical cancer prevention among adolescent girls in Indonesia.

Conclusion

Health education using the e-health media platform “Sahabat Sehat Serviks” significantly improved the knowledge, attitudes, and skills among adolescents in early prevention of cervical cancer. Future research is expected to explore the early introduction of cervical cancer prevention vaccination for parents with daughters in elementary school. Additionally, developing educational initiatives using digital media, such as websites or applications, would be beneficial in enhancing knowledge related to cervical cancer prevention among adolescents and Women of Reproductive Age (WRA). Recommendations for future research include enhancing cervical cancer prevention education among peers through youth communities. Conducting further studies on adolescents' decision-making abilities in preventing HPV transmission in their social interactions. Furthermore, there is potential for broader development of web-based educational media targeting a larger audience, such as mothers with daughters in elementary school, to promote early HPV vaccination. Expanding these educational efforts can empower both adolescents and their families to take proactive steps in cervical cancer prevention.

Author's declaration

All authors contributed to the manuscript writing process.

AI statement

When composing the manuscript, the author didn't employ any generative text artificial intelligence techniques.

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Availability of data and materials

All data are available from the authors.

Competing interests

The authors declare no competing interest.

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Authors' insight

Key points

- The web-based education is important to prevent morbidity and mortality of a particular chronic condition.
- The education platform emphasizes improving knowledge, attitudes, and practical skills.
- Leveraging e-health solutions adapts to modern technological trends for a vulnerable population.

Emerging nursing avenues

- How does the "Sahabat Sehat Serviks" web-based platform improve adolescent girls' knowledge, attitudes, and skills in preventing cervical cancer?
- What specific features of the "Sahabat Sehat Serviks" website make it an effective tool for cervical cancer education among adolescent girls?
- What are the measurable outcomes of utilizing the "Sahabat Sehat Serviks" web-based education program in reducing cervical cancer risk in the target population?

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