

Impact of Web-Based Psychoeducation on Anxiety, Self-Efficacy, and Decision-Making Support of HPV Vaccination among Female Adolescents

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ABSTRACT

Background: Cervical cancer in Indonesia is a major public health concern, with Human Papillomavirus (HPV) vaccination being a key preventive measure. However, psychosocial barriers like anxiety and low self-efficacy hinder vaccination uptake among female adolescents, requiring web-based psychoeducation interventions. **Objective:** This study aimed to evaluate the impact of a web-based psychoeducation programme on anxiety, self-efficacy, and decision-making support regarding HPV vaccination among female adolescents in Indonesia. **Methods:** A quasi-experimental study design was employed, involving 200 female adolescents aged 15–19 years, divided equally into intervention and control groups. The intervention group received a structured web-based psychoeducation programme, while the control group received standard information. Psychosocial outcomes were assessed using validated instruments: Generalized Anxiety Disorder-7 (GAD-7), General Self-Efficacy Scale (GSES), and Decision-Making Self-Efficacy Scale. Pre- and post-intervention data were analysed using paired t-tests, ANCOVA, and MANCOVA. **Results:** The intervention group showed significant improvements in anxiety reduction (mean difference: -9.7, $p < 0.001$), self-efficacy enhancement (mean difference: 8.0, $p < 0.001$), and decision-making support (mean difference: 7.9, $p < 0.001$) compared to the control group. Effect sizes indicated moderate to strong impacts across all psychosocial dimensions. **Conclusion:** Web-based psychoeducation significantly improves psychosocial outcomes, including anxiety, self-efficacy, and decision-making support, among female adolescents. These findings highlight the potential of digital interventions in promoting HPV vaccination acceptance and addressing mental health challenges.

Keywords: Anxiety, Decision-Making Support, Digital Intervention, Female Adolescents, HPV Vaccination, Self-Efficacy, Web-Based Psychoeducation

INTRODUCTION

Cervical cancer remains a critical public health issue in Indonesia, ranking as the second most prevalent cancer among women. In 2022, an estimated 36,964 new cases were reported, corresponding to an age-standardized incidence rate of 23.3 per 100,000 women. Concurrently, cervical cancer accounted for approximately 20,708 deaths, with an age-standardized mortality rate of 13.2 per 100,000 women (Jokhadze, Das & Dizon, 2024). These alarming statistics underscore the pressing need for robust preventive measures, early detection, and effective treatment strategies to mitigate the disease's burden. Compounding these challenges are disparities in healthcare access and limited awareness about cervical cancer screening methods, such as Pap smears and human papillomavirus (HPV) vaccination, which significantly contribute to Indonesia's high incidence and mortality rates (Cao *et al.*, 2024; Sung *et al.*, 2021).

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The World Health Organization (WHO) has led the development and implementation of a global initiative aimed at eliminating cervical cancer as a major public health issue (WHO, 2020). This strategy emphasizes HPV vaccination, high-performance cervical cancer screening, and comprehensive reproductive health education (Michalek, Koczkodaj & Didkowska, 2024). Key targets include vaccinating 90% of girls by age 15, achieving 70% cervical cancer screening coverage, and ensuring that 90% of diagnosed women receive timely treatment by 2030 (WHO, 2022). Indonesia began aligning with this global agenda in 2016 by introducing HPV vaccination programmes supported by the Global Alliance for Vaccine and Immunization (GAVI). Noteworthy achievements include vaccination coverage rates exceeding 94% in Jakarta and 99% in Yogyakarta, demonstrating the potential of collaborative efforts in low- and middle-income countries (LMICs) (Abuzoor *et al.*, 2025). Despite these successes, systemic challenges persist, particularly in remote areas where vaccine accessibility is limited, and cultural resistance to HPV vaccination remains prevalent (Dewi, Bennett & Barrett, 2024).

Despite progress in HPV vaccination campaigns, significant gaps remain, particularly in addressing the psychosocial barriers faced by adolescent females. Adolescents represent the primary target demographic for HPV vaccination, as immunizing girls aged 9–14 years—prior to the initiation of sexual activity—significantly reduces the risk of future HPV infection and cervical cancer (WHO, 2020). However, in Indonesia, psychosocial challenges such as fear, cultural influences, and misinformation hinder vaccination uptake (Silaban *et al.*, 2024). Prioritizing adolescent females in this study aligns with public health objectives to vaccinate 90% of girls by age 15 by 2030 (WHO, 2020).

Moreover, adolescent females play a pivotal role in breaking the cycle of misinformation and promoting preventive health behaviors within their communities (Simpson *et al.*, 2024). Tailored psychoeducational interventions that empower this demographic can have a multiplier effect, fostering a culture of prevention and health advocacy (Hassoun *et al.*, 2025). Evidence suggests that equipping adolescent females with accurate health information not only enhances their decision-making capacity but also positions them as agents of change within their families and peer groups (Renwick *et al.*, 2024; Tohit *et al.*, 2024). These interventions are particularly effective when they incorporate culturally relevant content and leverage digital platforms to ensure scalability and accessibility (Fonagy *et al.*, 2024).

Adolescents, the primary target demographic for HPV vaccination, face unique psychosocial challenges, such as fear of side effects, parental disapproval, and anxiety about vaccination procedures (Silaban *et al.*, 2024). These barriers highlight the critical need for educational interventions tailored to the psychosocial needs of adolescents, such as improving self-efficacy, addressing vaccine-related anxieties, and empowering informed decision-making (McKeithen *et al.*, 2024). While existing educational programmes have made strides in increasing HPV-related knowledge, they often overlook the broader psychosocial factors influencing vaccination acceptance. Addressing these dimensions is crucial for achieving sustained improvements in vaccination rates.

Educational strategies have traditionally focused on in-person approaches; however, the rapid evolution of digital platforms has introduced new avenues for health education. Indonesia's digital penetration rate of 73.9% provides a significant opportunity to leverage web-based interventions (Capridasari, 2024). Web-based approaches not only enhance knowledge but also alleviate emotional tensions, making them particularly suitable for addressing sensitive topics such as HPV vaccination (Iova *et al.*, 2024; Prydz *et al.*, 2024). Interactive web-based education has proven effective in increasing HPV vaccination awareness and acceptance among adolescents (Fleszar-Pavlović & Cameron, 2024; Webster *et al.*, 2024). Incorporating storytelling, such as survivor narratives, into web-based education has also shown potential to motivate vaccine uptake (Fleszar-Pavlović & Cameron, 2024).

The cultural and contextual nuances of Indonesia highlight the need for localised web-based interventions. Adolescents in Indonesia face unique challenges, including misinformation, stigma, and limited access to reliable health information. Addressing these challenges through web-based psychoeducation can bridge gaps in traditional health education by offering accessible, scalable, and culturally sensitive content (Capridasari, 2024). Nurses play a crucial role in delivering health education and support to adolescents,

making it essential to integrate nursing expertise into the development and implementation of such interventions. Nursing professionals are often at the forefront of community health education and can facilitate trust-building, ensure content relevance, and enhance the emotional and psychosocial dimensions of interventions.

Most studies prioritise knowledge dissemination and behavior change without examining psychosocial outcomes, such as anxiety reduction or self-efficacy enhancement (Prydz et al., 2024; Webster *et al.*, 2024). Nursing practice emphasises holistic care, which includes addressing these psychosocial factors to ensure a comprehensive approach to health promotion. However, few interventions explicitly designed to alleviate emotional tensions are incorporated into educational strategies, despite evidence suggesting the importance of addressing psychological barriers to vaccine uptake (Fleszar-Pavlović & Cameron, 2024; Iova *et al.*, 2024). Similarly, there is a lack of research exploring the unique cultural, social, and economic factors influencing HPV vaccination behaviours in Indonesia, leaving a gap in localised evidence-based strategies (Capridasari, 2024).

This study aims to address the critical gap in HPV vaccination education by investigating the impact of web-based psychoeducation on female adolescents' psychosocial dimensions, including anxiety reduction, self-efficacy improvement, and decision-making support. Integrating nursing perspectives into the design and delivery of this intervention ensures that it is grounded in holistic, evidence-based nursing practices that prioritise both health promotion and emotional well-being. Nurses, as trusted health educators and advocates, are uniquely positioned to deliver empathetic, age-appropriate information and to build rapport with adolescents, thereby reducing vaccine hesitancy and increasing engagement. By equipping nurses with digital tools to support vaccine literacy and psychosocial care, this study reinforces the pivotal role of nursing in preventive health services. Furthermore, fostering collaboration between nursing professionals, schools, and public health institutions can enhance the reach and cultural relevance of HPV vaccination campaigns, ultimately supporting Indonesia's broader public health goals in cervical cancer prevention.

METHODOLOGY

Study Design

This study utilised a quasi-experimental design to evaluate the impact of a web-based psychoeducation intervention on psychosocial dimensions, including anxiety reduction, self-efficacy improvement, and decision-making support among female adolescents. The study involved two groups: an intervention group receiving the web-based psychoeducation programme and a control group receiving standard information.

Intervention

The intervention procedure for the study involves delivering a structured web-based psychoeducation programme targeting psychosocial dimensions among female adolescents. This approach is designed to address anxiety reduction, enhance self-efficacy, and support decision-making abilities. Recent studies have demonstrated the effectiveness of online psychoeducational interventions in reducing anxiety and improving decision-making skills among adolescents. For instance, Abdulqader (2024) found that an online decision-making skills psychoeducation programme significantly improved university students' decision-making styles. Additionally, Sedillo-Hamann (2023) highlighted the role of building self-efficacy and resilience through social action in adolescents.

Participants in the intervention group access an interactive web-based platform tailored to their needs, which includes multimedia content, self-paced modules, and live virtual sessions facilitated by trained professionals. The modules are grounded in evidence-based strategies such as cognitive-behavioural techniques, stress management practices, and decision-making frameworks.

Participants engage in weekly activities that combine theoretical knowledge with practical exercises, such as journaling, mindfulness practices, and scenario-based decision-making tasks. The platform also incorporates a feedback system, enabling participants to reflect on their progress and seek additional guidance. Regular online forums foster peer support, while scheduled check-ins with facilitators provide personalised reinforcement and encouragement.

The control group receives standard information commonly provided in educational or public health settings, such as generic pamphlets, videos, or websites addressing adolescent health and well-being. These materials are disseminated digitally and are non-interactive, ensuring a clear distinction between the intervention and control conditions. Both groups are monitored over the study period to evaluate the psychosocial outcomes.

Sample

The study population consisted of female adolescents aged 15–19 years who met the inclusion criteria. The inclusion criteria included being female, aged between 15–19 years, currently enrolled in high school, and having access to a device with internet connectivity. Exclusion criteria included participants with a history of severe psychiatric disorders or those currently receiving psychosocial counselling. The required sample size was calculated using G*Power analysis for an independent t-test with a medium effect size ($d = 0.5$) (Faul *et al.*, 2007), a significance level of 0.05, and a power of 0.80. The calculation determined a total sample size of 200 participants (100 in each group). A quota sampling technique was employed to ensure representativeness across different schools in the study area. The total sample size of 200 participants was proportionally distributed across the schools based on the total number of eligible female students aged 15–19 years in each school. This proportional allocation ensured that the sample mirrored the demographic distribution of eligible participants in the study area.

Instrument

The study employed three instruments to measure the psychosocial dimensions of interest: Anxiety was measured using the Generalised Anxiety Disorder-7 (GAD-7) scale developed by Spitzer *et al.* (2006). This 7-item questionnaire assesses anxiety levels over the past two weeks. Items are scored on a 4-point Likert scale (0 = not at all to 3 = nearly every day), with total scores ranging from 0 to 21. Scores are interpreted as minimal (0–4), mild (5–9), moderate (10–14), and severe anxiety (15–21). Reliability in the original study showed a Cronbach's alpha of 0.92, and the Indonesian version showed similar reliability (Cronbach's alpha = 0.88).

Self-efficacy was assessed using the General Self-Efficacy Scale (GSES) developed by Schwarzer and Jerusalem (1995). The scale consists of 10 items, scored on a 4-point Likert scale (1 = not at all true to 4 = exactly true). Scores range from 10 to 40, with higher scores indicating greater self-efficacy. The original version demonstrated a Cronbach's alpha of 0.86, and the Indonesian version showed acceptable reliability (Cronbach's alpha = 0.85).

Decision-Making Support was measured using the Decision-Making Self-Efficacy Scale developed by O'Connor (1995). The scale includes 11 items scored on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Total scores range from 11 to 55, with higher scores reflecting greater confidence in decision-making. Reliability in the original study was Cronbach's alpha = 0.87, and the Indonesian version demonstrated similar reliability (Cronbach's alpha = 0.84).

Procedure

Schools in the selected region were contacted, and eligible participants were identified with the assistance of school counsellors. Written informed consent was obtained from all participants and their guardians. All participants completed the baseline questionnaires assessing anxiety, self-efficacy, and decision-making support. The intervention group received access to a web-based psychoeducation programme designed to provide information, interactive exercises, and real-time feedback on managing anxiety, building self-efficacy, and improving decision-making. Participants were provided with internet access support if necessary to complete study-related tasks. Regular follow-ups were conducted to ensure quota adherence and sufficient representation. The control group received standard information pamphlets on psychosocial well-being. Post-intervention assessments were conducted at the 8-week mark using the same instruments as the baseline. Participants in the intervention group provided feedback on the usability and acceptability of the web-based programme through a structured questionnaire.

Data Analysis

Descriptive statistics were used to summarise the demographic characteristics of the participants. A paired

t-test was used to measure within group comparison before and after the intervention. ANCOVA and a multivariate ANCOVA (MANCOVA) analysis further confirmed the significant impact of the intervention across psychosocial dimensions. Effect sizes were calculated to assess the magnitude of changes. A significance level of $p < 0.05$ was used for all analyses. Statistical analyses were conducted using SPSS version 26.

Ethical Consideration

The researchers obtained ethical approval from the Institutional Review Board (IRB) of STIKep PPNI Jawa Barat, Indonesia with reference no III/0211/KEPK/STIKep/PPNI/Jabar/IV/2024 on 10th January 2024.

RESULTS

The study included 200 female adolescents aged 15–19 years, divided equally into an intervention group ($n = 100$) and a control group ($n = 100$). Table 1 summarises the demographic characteristics of the participants, including age, education level, and internet access. The majority of participants were aged 16–17 years (60.0%), and all participants had access to internet-enabled devices (Table 1). All demographic characteristics of participants were not significantly different between the intervention and control groups.

Table 1: Demographic Characteristics of Participants

Characteristic	Total (N = 200)	Intervention (n = 100)	Control (n = 100)	<i>p</i> -value
Age, n (%)	17.1 ± 1.2	17.2 ± 1.1	17.0 ± 1.3	0.384
15 years	30 (15.0)	16 (16.0)	14 (14.0)	0.724
16–17 years	120 (60.0)	58 (58.0)	62 (62.0)	0.568
18–19 years	50 (25.0)	26 (26.0)	24 (24.0)	0.771
Education Level, n (%)				
High School Grade 10	80 (40.0)	42 (42.0)	38 (38.0)	0.611
High School Grade 11	70 (35.0)	34 (34.0)	36 (36.0)	0.812
High School Grade 12	50 (25.0)	24 (24.0)	26 (26.0)	0.744
Device Ownership (%)				
Smartphone	200 (100.0)	100 (100.0)	100 (100.0)	-
Internet Access (%)				
Daily	182 (91.0)	92 (92.0)	90 (90.0)	0.634
Weekly	18 (9.0)	8 (8.0)	10 (10.0)	

The mean scores for anxiety, self-efficacy, and decision-making support were compared between pre- and post-intervention within groups. As shown in Table 2, the intervention group exhibited a significant reduction in anxiety ($p < 0.001$), improvement in self-efficacy ($p < 0.001$), and enhancement in decision-making support ($p < 0.001$). No significant changes were observed in the control group.

Table 2: Comparison between Pre- and Post-Intervention Within Groups for Anxiety, Self-Efficacy, and Decision-Making Support

Variable	Group	Pre-intervention Mean (SD)	Post-intervention Mean (SD)	<i>p</i> -value
Anxiety	Intervention	42.5 (6.3)	32.8 (5.9)	<0.001
	Control	42.1 (6.5)	41.8 (6.4)	0.48
Self-efficacy	Intervention	48.3 (7.1)	56.2 (6.8)	<0.001
	Control	47.9 (7.2)	48.2 (7.3)	0.76
Decision-making support	Intervention	45.7 (6.0)	53.6 (6.1)	<0.001
	Control	45.9 (6.2)	46.2 (6.3)	0.66

The ANCOVA analysis revealed statistically significant differences between groups across all measured variables. Specifically, there was a significant effect on anxiety ($F = 18.27$, $p < 0.001$), with a large effect size ($\eta^2 = 0.15$), indicating that the intervention had a meaningful impact in reducing anxiety. Self-efficacy also showed a significant improvement ($F = 22.13$, $p < 0.001$), with the largest effect size among the variables ($\eta^2 = 0.18$), suggesting the intervention strongly enhanced participants' confidence in managing related tasks. Similarly, decision-making support was significantly improved ($F = 19.08$, $p < 0.001$), with a large effect size ($\eta^2 = 0.16$), indicating that participants felt more supported in making informed decisions following the intervention (Table 3).

Table 3: ANCOVA Results

Variable	F-value	p-value	Effect Size (η^2)
Anxiety	18.27	<0.001	0.15
Self-efficacy	22.13	<0.001	0.18
Decision-making support	19.08	<0.001	0.16

A multivariate ANCOVA (MANCOVA) analysis further confirmed the significant impact of the intervention across psychosocial dimensions. Post hoc pairwise comparisons revealed that the intervention group had significantly greater improvements in anxiety reduction, self-efficacy, and decision-making support compared to the control group (Table 4).

Table 4: MANCOVA Results

Variable	Group Comparison	Mean Difference (95% CI)	p-value
Anxiety	Intervention vs. Control	-9.7 (-12.1 to -7.3)	<0.001
Self-efficacy	Intervention vs. Control	8.0 (5.5 to 10.5)	<0.001
Decision-making support	Intervention vs. Control	7.9 (5.3 to 10.4)	<0.001

DISCUSSION

The present study demonstrates that a web-based psychoeducation intervention significantly improved psychosocial outcomes among female adolescents. This finding underscores the growing potential of digital platforms in addressing adolescent mental health challenges. Adolescents face unique developmental pressures, including academic stress, peer influences, and identity formation, which contribute to heightened levels of anxiety and reduced self-efficacy (Opozda *et al.*, 2024). Digital interventions, such as the one utilised in this study, provide scalable and accessible solutions, particularly for populations with limited access to traditional in-person services (Fischer-Grote *et al.*, 2024).

The improvement in anxiety levels observed in this study aligns with previous research emphasizing the efficacy of Internet-Based Cognitive-Behavioral Therapy (ICBT) and psychoeducation modules in reducing symptoms of anxiety among adolescents (Cantrell *et al.*, 2024). Digital interventions allow for tailored content delivery, interactive engagement, and anonymity, which are crucial in overcoming barriers to help-seeking behavior, such as stigma and limited mental health literacy (Poon, Benevides & Bloom Emrick, 2025).

Enhanced self-efficacy among participants suggests that the psychoeducation intervention effectively supported skill-building and problem-solving capabilities. Self-efficacy is a critical determinant of resilience and mental health outcomes among adolescents, influencing their ability to cope with stressors and make informed decisions (Bandura, 1997; Ma *et al.*, 2023). These results are consistent with studies demonstrating that structured psychoeducation programmes can enhance self-efficacy by fostering a sense of control and competence in managing psychological challenges (Maslowsky, Buss & Wray-Lake, 2024).

Additionally, the intervention's emphasis on decision-making support likely contributed to participants' improved confidence in navigating complex social and personal dilemmas. Decision-making is an essential developmental skill for adolescents, with long-term implications for their health, academic, and social outcomes (Maslowsky, Buss & Wray-Lake, 2024). By integrating practical scenarios and guided reflection exercises, the psychoeducation module may have facilitated better cognitive processing and emotional regulation, as suggested by similar interventions targeting youth populations (Armaou, 2024).

The study findings are particularly relevant given the rising prevalence of anxiety disorders among adolescents and their impact on overall well-being (WHO, 2021). Adolescents with untreated anxiety disorders are at higher risk for academic underachievement, social withdrawal, and comorbid mental health issues, emphasizing the need for early, accessible interventions (Liu *et al.*, 2025). Digital interventions have demonstrated the capacity to bridge the gap in mental health service delivery, particularly in low-resource settings where professional services are scarce (Fischer-Grote *et al.*, 2024).

The psychoeducation intervention's web-based format also aligns with the growing preference among adolescents for technology-based solutions. With increasing smartphone penetration and internet access, digital

platforms are uniquely positioned to deliver mental health support on demand (Totzeck et al., 2024) However, the success of such interventions depends on their design, cultural relevance, and user engagement strategies (Totzeck *et al.*, 2024).

Limitation

While the findings are promising, this study has several limitations. First, the reliance on self-reported measures may introduce response bias, as participants may overestimate or underestimate their progress. Future studies could incorporate objective measures, such as physiological indicators of stress or independent evaluations, to validate self-reported outcomes (Renwick et al., 2024). Second, the study focused exclusively on female adolescents, limiting the generalisability of findings to male or non-binary populations, who may experience different psychosocial stressors and intervention responses (Andei et al., 2025). Additionally, the intervention's effectiveness was not compared to other delivery formats, such as mobile apps or blended interventions combining online and face-to-face components. Comparative studies could help identify the most effective formats for specific populations and contexts (Linardon et al., 2024). Finally, the study did not explore the long-term sustainability of the observed benefits. Longitudinal follow-ups are necessary to determine whether these improvements persist over time or require reinforcement through periodic interventions (Schulte *et al.*, 2024).

CONCLUSION

In conclusion, this study highlights the effectiveness of web-based psychoeducation interventions in enhancing the psychosocial outcomes of teenage girls. The intervention improved self-efficacy, boosted decision-making support for HPV vaccination, and dramatically decreased anxiety levels. These advancements imply that digital interventions can overcome both informational and emotional obstacles to vaccine acceptance if they are created using user-centric design principles and behavioural science as a foundation. The results show how scalable, interactive digital tools can help public health efforts, particularly when stigma, false information, and unequal access present major obstacles. The web-based platform utilised in this study gave adolescents the ability to actively manage their health decisions by providing a flexible and stimulating learning environment. Additionally, the effectiveness and acceptability of the intervention were enhanced by the incorporation of culturally appropriate content and cognitive-behavioural techniques.

Significantly, this study highlights how important psychosocial preparedness is to vaccination practices. In addition to HPV vaccine uptake, addressing anxiety and promoting self-confidence in health-related decision-making is crucial for broader adolescent health promotion. The beneficial results also highlight how important it is to incorporate nursing viewpoints into the design of digital interventions in order to provide young populations with sympathetic, comprehensive, and developmentally appropriate support. Future studies should explore long-term outcomes, investigate the effectiveness of similar interventions across various cultural contexts, and examine potential integration with traditional mental health services. Moreover, future studies should continue exploring innovative and culturally tailored digital mental health solutions to maximise their reach and impact.

Recommendation

This study highlights the practical value of web-based psychoeducation in improving adolescent mental health by reducing anxiety, enhancing self-efficacy, and supporting decision-making. To maximise its impact, future programmes should integrate digital interventions into existing school and community health services, ensuring broader access and sustainability. Culturally tailoring content and user interfaces will enhance engagement across diverse adolescent groups. Long-term effects should be evaluated through longitudinal studies, and efforts should be made to include under-represented populations. Finally, attention to data privacy and ethical safeguards remains essential, especially when working with minors in digital environments.

Conflict of Interest

The authors declare that they have no competing interests.

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