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Original Research

The Effect of Mobile Application "Pergiene Care" On Improving Perineal Hygiene Among Adolescent Girls

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ABSTRACT

Background: *Perineal hygiene is a way to treat and maintain cleanliness of the genital area to preserve the health of reproductive organs. Knowledge and attitudes can improve perineal hygiene. This study aimed to determine the effect of a mobile application on knowledge and attitudes among adolescents about perineal hygiene for preventing vaginal discharge.*

Methods: *This study used a quasi-experimental pretest and posttest with a control group. The sampling technique used was consecutive sampling, with 84 respondents divided into two groups of 42 each. The instrument used was the Perineal Hygiene Knowledge and Attitude Questionnaire. The data were analysed using the T-test and the Mann-Whitney U.*

Results: *The study showed differences in the pre- and post-intervention knowledge and attitudes scores in the intervention group (p=0.001;<0.05). In the control group, there was no difference in the pre- and post-test scores of knowledge (p=0.884; p>0.05) and attitudes (p=0.343; p>0.05). The results of the knowledge and attitude post-test scores between the intervention and control groups were significantly different (p=0.001; p <0.05).*

Conclusion: *The results of the study indicate that there was an increase in knowledge and attitudes towards perineal hygiene after providing health education through the "Pergiene Care" application. The Pergiene Care application can be used as an educational medium for adolescents to improve perineal hygiene.*

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INTRODUCTION

Adolescence is a period of rapid growth and development, both physically, psychologically, and intellectually (The Ministry of Health Republic Indonesia, 2015). At this time, adolescent girls experience reproductive organ maturity marked by menarche and an increase in the hormone estrogen, which can trigger vaginal discharge (Hapsari, 2019). Vaginal discharge is a non-blood secretion from the birth canal with

characteristics that have an odor, or are odorless, colorless, thick, or watery, and are accompanied by itching or not (Yulfitria et al., 2022).

Vaginal discharge is a common reproductive health concern, with up to 75% of Indonesian women experiencing it at least once, and 31.8% of adolescents aged 15–24 years reporting frequent vaginal discharge (Armini & Lestari, 2022; Suminar et al., 2022). Poor perineal hygiene can lead to pathological discharge and increase the risk of infections, such as vulvovaginitis, bacterial vaginosis, urinary tract infections, and pelvic inflammatory disease, which may result in infertility or long-term reproductive complications if untreated (Occhipinti et al., 2025). Despite its high prevalence, many adolescents lack adequate knowledge and positive attitudes toward perineal hygiene due to cultural taboos and limited access to reproductive health education (Nimbhorkar et al., 2023; Titisari et al., 2025).

The need for effective health education is particularly evident in addressing perineal hygiene among Indonesian adolescent girls. Health education has evolved from conventional methods, such as lectures (Yogesh et al., 2024), leaflets, posters (Hasanica et al., 2020), and videos (Agustina et al., 2021) to interactive digital platforms (Yarger et al., 2024). One of the most effective innovations is the use of mobile health applications (mHealth apps), which provide high accessibility and interactive multimedia content, such as videos, quizzes, and personalized reminders, enhancing knowledge retention and engagement among adolescents (Noordiati et al., 2020). Studies have shown that mobile applications are more effective than traditional educational media in improving adolescents' knowledge, attitudes, and health behaviors (Petrovic et al., 2023).

Mobile applications offer a strategic solution by providing accessible, interactive, and engaging health education, improving adolescents' knowledge and attitudes, and promoting proper hygiene practices (Mancone et al., 2024). This approach can prevent improper perineal hygiene from developing into serious reproductive health problems. Recently, the use of mobile health applications has been growing rapidly, including their impact on knowledge and attitude. Many studies have developed mobile applications for knowledge, attitudes, and practices regarding anemia in female students (Sari et al., 2022), prediabetes prevention (Novianto et al., 2019), mental health (Reni Nurhidayah et al., 2025), and stunting (Follona et al., 2025).

Although several studies have investigated the effects of mobile health applications on knowledge, attitudes, and practice in adolescents, to our knowledge, no prior study has investigated the effects of mobile applications on knowledge and attitudes regarding perineal hygiene. This study utilized a technology-based intervention through the Pergiene Care application, which provides educational content on perineal hygiene using engaging visual illustrations. The application aims to inform and raise awareness among adolescents about proper perineal hygiene to prevent genital health issues.

Knowledge is a key determinant of attitudes and behaviors, and adolescents who receive accurate health education are more likely to develop positive hygiene practices (Ghimire et al., 2024). Furthermore, app-based interventions have been shown to improve preventive behaviors and health literacy more effectively than printed materials, such as booklets (Ardenny et al., 2024). These characteristics make mobile applications an innovative and practical medium for health education. This study aimed to improve adolescent girls' knowledge and attitudes regarding perineal hygiene and

reduce the risk of vaginal discharge and related genital issues through the Pergiene Care application.

MATERIALS AND METHOD

A quasi-experimental research design with a control group pretest and posttest design was conducted in the Sokaraja and Kembaran Districts, Banyumas Regency, in January 2023. Eligible participants were approached in their classes using a list of names provided by the school, and consecutive sampling was used to recruit them. The population in this study was students from MTs Ma'arif NU 1 Sokaraja and MTs Ma'arif NU 1 Kembaran.

The sample size was calculated using a formula for unpaired numerical comparison of the two groups, and a consecutive sampling method was used for the sample selection (Dahlan, 2016). This study comprised a total sample of 84 respondents, consisting of 42 in the intervention group and 42 in the control group, with the inclusion criteria of female adolescent students, aged 12-14 years old, who experienced vaginal discharge, had an Android smartphone, and were willing to participate in the study. The exclusion criteria included students who refused to respond and those who were unable to attend due to illness.

The instrument used in this research was an adapted questionnaire from Istiqamah, (2018) for the knowledge section and an attitude questionnaire from (Pertiwi, 2018). There were two types of questionnaires that the researchers used: a questionnaire containing questions about the socio-demographic characteristics consisting of age and class, and a knowledge questionnaire consisting of 15 questions with answer choices using answer choices (true or false) with correct answer criteria getting 1 point and the wrong answer getting 0 points and attitudes questionnaire consisting of 20 statements with answer choices strongly disagree, disagree, hesitant, agree, and strongly agree. The scoring criteria for the attitude questionnaire for negative statements, with strongly disagree assigned the highest value (5) and strongly agree the lowest (1).

Conversely, in positive statements, strongly agree is assigned the highest value and strongly disagree the lowest. The validity and reliability of the knowledge questionnaire were tested by (Istiqamah, 2018). The results of the validity test of the perineal hygiene knowledge questionnaire showed that r count > r table (0.413), and the results of the reliability test of the Cronbach's alpha value of perineal hygiene knowledge were 0.963 (>0.60). The validity and reliability of the perineal hygiene attitude questionnaire were tested by Pertiwi (2018), with the results of the validity test of the perineal hygiene attitude showing that r count > r table (0.444), and the results of the reliability test of the Cronbach's alpha value of perineal hygiene attitude were 0.976 (>0.60).

The “Pergiene Care” application was developed for this study. The content of the application included information about the concept of vaginal discharge (including the definition, causes, and effects of vaginal discharge), the definition of perineal hygiene, how to perform perineal care, and tips on maintaining the health of the perineal area. The application was validated by two experts.

The researcher conducted visits to MTs Ma'arif NU 1 Sokaraja and MTs Ma'arif NU 1 Kembaran to gather information on the enrollment numbers of female students. These locations were chosen because the age of the respondents matched the study's criteria, and preliminary surveys indicated a lack of awareness about perineal hygiene and the absence of health education initiatives in both the schools and local health

services. Furthermore, the sites were selected because of poor environmental sanitation and inadequate health facilities.

The female students were then assessed to determine whether they met the inclusion and exclusion criteria to participate as respondents. Once eligibility was confirmed and consent was obtained, the respondents were assembled in a classroom for data collection. The researcher initiated the data collection process by administering a pre-test questionnaire via Google Forms to both groups. After completing the pretest, the intervention group was instructed to download the "Pergiene Care" app on their smartphones, while the control group did not receive any intervention during the study period.

The intervention lasted for seven days, followed by a seven-day follow-up period (Erlina, 2017). For a week, students were directed to use the Pergiene Care app. On the 3rd, 5th, and 7th days, the researcher visited the location to gather the intervention group for a joint review. A WhatsApp group was set up to remind students to interact with the Pergiene Care app. On the seventh day, a post-test questionnaire was distributed to all participants in both groups, followed by a question-and-answer evaluation session.

The control group underwent the same process as the intervention group, but they engaged with the "Pergiene Care" app only after completing the post-test activity. To prevent contamination between groups, intervention groups and control groups were recruited from geographically separated locations so that the likelihood of interaction between participants during the study was very small. In addition, data collection in the control group was carried out first before the implementation of the intervention in the intervention group.

Data were analyzed univariately and bivariately. The frequency distribution of the variables from the univariate analysis was determined. The Paired t-test and Wilcoxon test were used in the bivariate analysis to compare the difference in variable scores of the intervention and control groups before and after treatment. The Independent t-test and Mann-Whitney U test were employed in the bivariate analysis to investigate the differences in variable scores between the intervention and control groups.

Bivariate analysis was conducted to identify the knowledge and attitude scores before and after the intervention. The paired t-test was used to analyse pre and post-test in the control group since the data were normally distributed, while the Wilcoxon was used to analyse pre and post-test in the intervention group since the data were not normally distributed. The Mann-Whitney U test was used to analyze the difference between the intervention and control groups in knowledge and attitude before intervention, and the knowledge after intervention, since the data were not normally distributed. The independent t-test was used to analyze the differences in posttest attitude scores between both groups because the data were normally distributed.

The Research Ethics Committee, Faculty of Health Sciences, Universitas Jenderal Soedirman, Indonesia, approved ethical clearance with the number: 969/EC/KEPK/XII/2022. Informed consent is obtained through the consent of the teacher as the guardian of the respondent at school. Respondents expressed their consent to participate in the research and signed an informed assent.

RESULTS

Respondent characteristics (Table 1) showed that median age of participants in intervention group was 13 years (range 12–14 years), while in control group it was 13.5

years (range 12–14 years). There was no age difference between the two groups (p = 0.589), suggesting that the age distribution was relatively balanced. Based on grade level, most respondents were in grade VII, both in intervention group (45.2%) and control group (42.9%), with an overall proportion of 44.0%.

Class VIII respondents accounted for 35.7% in the intervention group and 33.3% in the control group, respectively, while class IX accounted for the smallest proportion of both groups. The statistical test showed that there was no difference in grade level between the intervention and control groups (p = 0.868), so it can be concluded that the characteristics of the respondents based on the grade level were relatively homogeneous in both groups.

Table 1. The demographic characteristics

Characteristics	Intervention group (n=42)	Control group(n=42)	Total	%	*p*
Age, median(min-max)	13 (12-14)	13.50(12-14)			0.589*
Grade level, n(%)					
VII	19(45.2)	18(42.9)	37	44.0	0.868**
VIII	15(35.7)	14(33.3)	29	34.5	
IX	8(19.0)	10(23.8)	18	21.4	

*homogeneity test, **Chi-square

Table 2 shows that there was a significant difference in the intervention group's pretest and posttest scores. The median score in the intervention group increased from 8 (range 3–13) on the pretest to 12 (range 10–15) on the posttest, and the Wilcoxon test showed a significant difference (p = 0.001). These findings indicate that the interventions provided are effective in improving the measured outcome scores.

On the other hand, in control group, no significant difference was found in the pretest and posttest scores. The average score in control group was relatively stable, 9.50 ± 2.330 in the pretest and 9.52 ± 1.824 in the posttest. The results of the Paired T-test showed no difference (p = 0.884), which suggests that without intervention, the outcome score was less likely to experience significant changes.

Table 2. Knowledge scores before and after intervention

Group		n	Median (Minimum-Maximum)	Mean±SD	*p*
Intervention	Pretest	42	8 (3-13)		0,001*
	Posttest	42	12 (10-15)		
Control	Pretest	42		9,50±2,330	0,884**
	Posttest	42		9,52±1,824	

* Wilcoxon test, ** Paired T-test

Table 3 shows a significant increase in scores in the intervention group between pretest and posttest measurements. The median score in the intervention group increased from 69 (range 54–83) on the pretest to 83.5 (range 77–89) on the posttest. The Wilcoxon test showed that the improvement was significant (p = 0.001), which

indicated that the intervention given was effective in improving the scores of the variables measured.

In contrast, no difference was found between pretest and posttest scores in the control group. The average score in the control group was relatively stable, 69.52 ± 4.805 in the pretest and 69.14 ± 4.740 in the posttest. The results of the Paired T-test showed no difference (p = 0.343). It can be concluded that without intervention, the variable score is less likely to experience significant changes.

Table 3. Attitude scores before and after intervention

Group		n	Median (Minimum-Maximum)	Mean±SD	*p*
Intervention	Pretest	42	69 (54-83)		0,001*
	Posttest	42	83,5 (77-89)		
Control	Pretest	42		69,52±4,805	0,343**
	Posttest	42		69,14±4,740	

* Wilcoxon Test, ** Paired T-test

Table 4 illustrates the differences observed between the two groups.

Table 4. The differences in knowledge and attitude scores between the intervention group and the control group

Variable		Group	n	Median (minimum-maximum)	Mean±SD	*p*
Pretest	Knowledge	Intervention	42	8 (3-13)		0,116*
		Control	42	9 (4-14)		
	Attitude	Intervention	42	69 (54-83)		0,446*
		Control	42	70 (58-80)		
Posttest	Knowledge	Intervention	42	12 (10-15)		0,001*
		Control	42	9,5 (5-14)		
	Attitude	Intervention	42		83,57±3,021	0,001*
		Control	42		69,14±4,740	*

* Mann-Whitney U Test, ** Independent T-test

Table 4 shows that there were no significant differences in the pretest knowledge scores between groups (p = 0,116; p>0,05), nor in the pretest attitude scores between groups (p = 0,446; p>0,05). The table also shows that there were differences in the post-test knowledge scores between groups (p = 0.001; p <0,05), and the post-test attitude scores between groups (p=0,001; p<0,05). Based on that, H_0 was rejected, and H_a was accepted, which means there was a significant effect of perineal care application on the knowledge and attitude of adolescent girls about perineal hygiene.

DISCUSSION

This study demonstrated an increase in knowledge scores among adolescents in the intervention group following the use of the Pergiene Care mobile application, while no change was observed in control group. These findings indicate that mobile-based health education effectively improves adolescents' knowledge of perineal hygiene. The

contrasting outcomes between the groups highlight the importance of structured and accessible digital educational media in facilitating health knowledge acquisition.

The observed improvement in knowledge can be explained using Orem's Self-Care Deficit Nursing Theory (Alligood, 2004), which posits that individuals enhance their self-care capacity when provided with adequate knowledge and supportive resources. The Pergiene Care application functions as an educational support system, enabling adolescents to independently access accurate and relevant information regarding perineal hygiene. This increased understanding may strengthen adolescents' cognitive readiness to adopt appropriate self-care behavior.

These findings are in line with other studies that reported the effectiveness of digital health interventions in improving adolescent health knowledge. Macharia et al., (2022) reported a significant increase in knowledge following the use of a USSD-based health application, while Hatini, (2021) demonstrated improved reproductive health knowledge among adolescents using the Rumah BidanKu application. The consistency across studies reinforces the potential of mobile health (mHealth) interventions as effective educational tools for adolescents.

Additionally, increased knowledge was reflected in the participants' active engagement during post-intervention discussions, where they were able to accurately respond to questions and seek further clarification on related health topics. This behavior suggests heightened curiosity and cognitive engagement, aligning with findings of Muslimin et al., 2022), who emphasized that adolescents' high curiosity encourages active information-seeking behavior when stimulated by appropriate educational interventions. The absence of significant knowledge improvement in the control group suggests the limitations of conventional education methods that lack interactive and technology-based components. This finding underscores the need for innovative, adolescent-friendly educational strategies to enhance reproductive health education.

The research results also showed a significant improvement in attitudes toward perineal hygiene in the intervention group after using the Pergiene Care app, while the control group showed no change in their attitudes. These findings indicate that the mobile app-based educational intervention not only improves cognitive aspects but also influences adolescents' affective perceptions of the importance of perineal hygiene. Pender's Health Promotion Model can explain the change in attitudes in the intervention group (Joseph, 2016), which states that positive attitudes toward health behaviors are formed through increased perceptions of benefits, self-efficacy, and environmental support. The visual, structured, and interactive information presented in the Pergiene Care app is thought to increase adolescents' perceptions of the benefits of maintaining perineal hygiene and strengthen their confidence in implementing these behaviors in their daily lives.

These findings align with previous studies that reported the effectiveness of mHealth interventions in improving adolescent reproductive health attitudes. Ardenny et al., (2024); Petrovic et al., (2023) showed that the use of interactive digital media significantly increased adolescents' positive attitudes toward reproductive health practices. The increase in positive attitudes was also reflected in the adolescents' openness in post-intervention discussions, including their willingness to share their views and experiences related to personal hygiene.

This indicates that the Pergiene Care app serves not only as a source of information but also as a stimulus for self-reflection, encouraging the internalization of

healthy values. Conversely, lack of significant changes in attitudes in control group suggests that conventional educational approaches tend to be less effective in influencing adolescents' affective aspects, particularly on sensitive topics such as reproductive health. This indicates the need for educational approaches that are more contextual, private, and tailored to adolescents' developmental characteristics.

The Pergiene Care app offers numerous advantages as a health education tool. According to (Petrovic et al., 2023), Android-based applications targeting adolescent well-being are effective in enhancing insight and understanding, providing visually attractive and non-monotonous content, facilitating memory retention, increasing motivation to learn, and delivering material relevant to adolescent needs. Similarly, the Pergiene Care application presents comprehensive information on vaginal discharge, including definitions, types, causes, and effects, as well as guidance on perineal hygiene, including definitions, benefits, and step-by-step instructions.

The application's design, theme, and visual illustrations are tailored to appeal to adolescent girls and maintain user engagement, preventing disinterest in interacting with the content. Features of the Pergiene Care application, such as visual aids, interactive navigation, and structured content, may have facilitated both knowledge acquisition and attitudinal shifts. However, this study did not systematically evaluate which elements were the most effective. Future studies should explore the contribution of specific app features, potentially using a mixed-methods design to capture nuanced engagement patterns.

This study was limited to evaluating respondents' knowledge and attitudes without assessing their actual behavior. Control over the use of the Pergiene Care app was partial, as engagement reminders were provided only through a WhatsApp group and three face-to-face visits. Potential external influences during the intervention were not examined, which may have introduced biases. Future research should consider incorporating audio-visual educational features into the app to enhance engagement and systematically evaluate the methods used to implement the intervention.

However, this study provides valuable insights into the potential role of digital interventions in adolescent health promotion. Integrating mobile health applications within broader nurse-led health education programs, complemented by objective monitoring, feature evaluation, and contextual adaptation, may optimize outcomes in adolescent reproductive health.

CONCLUSION

Health education on perineal hygiene delivered through the Pergiene Care application significantly enhanced adolescent girls' knowledge and attitudes, fostering greater awareness and promoting the prevention of genital conditions, such as vaginal discharge. The Pergiene Care app is expected to serve as a sustainable tool for adolescent health education.

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