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The Efficacy of the Gingivimil Android Application on the Knowledge, Attitudes, and Dental Health Practices of Expectant Mothers

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Abstract: Background: Pregnancy leads to hormonal changes that can affect oral health, making women more prone to gum disease and tooth decay. Despite this, many pregnant women do not visit the dentist regularly. Using digital apps to provide education could be a new and effective way to address this issue. Objective: To assess how well the Gingivimil Android app improves the knowledge, attitudes, and practices related to dental health among pregnant women. Methods: The research development process included five stages: collecting information, designing the app, getting expert approval, conducting product trials, and creating the final product. A total of fifty pregnant women took part in the study, with twenty-five assigned to the intervention group, who used the Gingivimil app, and twenty-five in the control group, who received information through leaflets. The data was analyzed using the Shapiro-Wilk test, the Mann-Whitney U test, and the independent t-test. Results: Expert validation indicated that the application achieved a feasibility score of 88%, which falls within the very feasible category. The difference test revealed a statistically significant improvement in the intervention group compared to the control group: knowledge scores increased from 64.64 ± 8.67 to 80.40 ± 7.85 ($p < 0.05$). Conclusion: The Gingivimil app is effective in enhancing the knowledge, attitude, and behavior of pregnant women regarding the maintenance of dental and oral health. This app has the potential to be incorporated into antenatal care services.

Keywords*: Android Application, Dental Health, Digital Education, Gingivimil, Pregnant Women.*

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I. INTRODUCTION

Pregnancy causes major changes in hormones, especially a rise in estrogen and progesterone, which affect the mouth.[1]. These changes make individuals more prone to developing gingivitis and plaque buildup. Studies indicate that pregnant women are more likely to experience dental caries and gingivitis than women who are not pregnant.[2]. If dental and oral issues are not treated, they can lead to complications during pregnancy, including early delivery, babies born with low weight, and a condition called preeclampsia. Pregnant women who have serious tooth decay may trigger the release of prostaglandin hormones. These hormones can cause the uterus to contract. If contractions continue, they may result in early birth or miscarriage.[4][5].

Unhealthy teeth and gums can make it difficult to chew and digest food properly. This issue can stop pregnant women from eating healthy and nutritious foods in the best way possible.[6], Poor nutrient absorption can have a significant impact, leading to inadequate nutrient uptake[7] , and potentially causing stunted

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fetal growth, which in turn increases the likelihood of a baby being born with low birth weight[8][9].

Despite this, the use of dental services during pregnancy is still quite low. Surveys indicate that 76% of pregnant women face dental issues, yet only 27% get dental check-ups while they are pregnant.[10]. Commonly mentioned obstacles are the belief that dental treatment can harm the baby, lack of available information, and insufficient advice from healthcare providers.[11]. In the current digital age, mobile health applications (mHealth) have been utilized to improve access to health information due to their practicality, flexibility, and interactive[12]. This research seeks to create and evaluate the Gingivimil Android app to enhance the knowledge, beliefs, and dental care habits of women who are pregnant [13].

II. METHODS

This study is a research and development (R&D) project that consists of five specific phases: (1), collecting information; (2), designing the application; (3), validating it with experts; (4), testing the product; and (5), producing the final version. The study included 50 pregnant women, who were split into two groups: 25 in the intervention group and 25 in the control group. The intervention group used the Gingivimil app for a period of 30 days, whereas the control group received information through printed leaflets. Both groups were also part of a WhatsApp group to serve as a reminder. A normality test was conducted using the Shapiro-Wilk method. For comparing the groups, the Mann-Whitney U test was used when the data was not normally distributed, while the independent t-test was applied when the data followed a normal distribution.

III. RESULTS AND DISCUSSION

This study contributed to several key developments in creating the Gingivimil app as an educational tool for dental health among pregnant women. The first phase of the research included interviews with healthcare professionals, expectant mothers, and community health workers to understand the specific needs and difficulties encountered in providing dental health education during pregnancy. Interviews showed that dental education is seen as important for preventing tooth and gum problems, helping with fetal health, and lowering the chance of early birth. The people interviewed thought the Android app made it easier to get information because it was useful, adaptable, and could include reminders. However, some challenges were faced, such as restricted internet data, lack of familiarity with the application, and limited access to devices.

Based on the information collected, the Gingivimil application was created with several important features. It includes a login page to ensure secure access, an interactive page with a tooth-brushing song to encourage users, and a main menu that has several educational submenus. These submenus provide information on oral changes during pregnancy, the effects of poor dental health, the importance of dental check-ups during pregnancy, safe dental care practices while pregnant, and the role of nutrition in maintaining healthy teeth and gums. The application also includes a tracking card where users can record their daily activities, such as reading educational content, following the tooth-brushing song, and brushing their teeth in the morning and evening.

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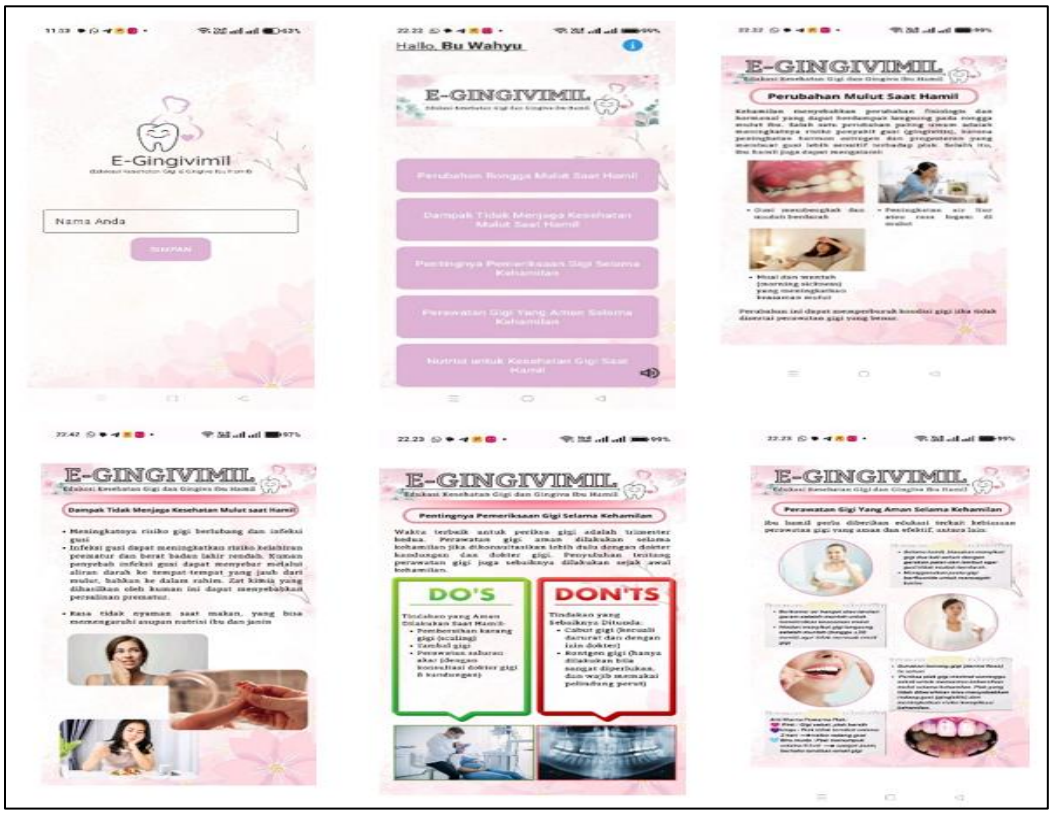

Fig 1 Gingivimil App Display

The developed application was reviewed by three experts: a lecturer, an information technology specialist, and a midwife. The validation process examined the application's content, design, and usability to assess its feasibility. The results indicated a feasibility score of 88%, which falls under the category of very feasible. As a result, the Gingivimil application is considered ready for testing and does not require significant changes.

The Gingivimil app intervention in this study included 25 pregnant women. The process started with explaining the study's goals, the app's advantages, and instructions on how to use it. All participants were then guided through the installation of the Gingivimil app on their phones. Once installed, they were shown the main features of the app, such as a tooth-brushing song designed to encourage brushing habits, and different educational sections. The intervention spanned 30 days, during which participants were required to fill out a daily monitoring card and received reminders through a WhatsApp group.

After the intervention period ended, data analysis was carried out to evaluate how effective the application was in comparison to the control group. The analysis started with a test to check if the data followed a normal distribution.

Table 1 Normality Test

Variabel	Category	P-Value	Explanation
Knowledge	Intervention	0,004	Abnormal
	Kontrol	0,070	Normal
Attitude	Intervention	0,286	Normal
	Kontrol	0,031	Abnormal
Practice	Intervention	0,219	Normal
	Kontrol	0,116	Normal

The normality test indicated that the Knowledge variable in the intervention group did not follow a normal distribution (p = 0.004), whereas in the control group, the variable was normally distributed (p = 0.070). The attitude variable showed a normal distribution in the intervention group (p = 0.286), but it did not follow a normal distribution in the control group (p = 0.031). Both Practice variables showed normal distribution (p = 0.219 and p = 0.116). However, since the Knowledge and Attitude variables had groups that were not normally distributed, the analysis continued using the Mann-Whitney U test. On the other hand, the Practice variable, which was normally distributed in both groups, was analyzed using the independent t-test.

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Table 2 Results of the Difference Test Between the Intervention and Control Groups.

Variable	Intervention Group (n=25)	Control Group (n=25)	p-value
Knowledge	80,40 ± 7,85	64,64 ± 8,67	<0,001
Attitude	79,36 ± 6,11	68,44 ± 7,12	<0,001
Practice	83,28 ± 5,97	72,60 ± 6,11	<0,001

From the table, it is clear that pregnant women in the intervention group who used the Gingivimil application had higher levels of knowledge, positiv attitudes, and better practices compared to those in the control group who received education through leaflet counseling. The statistical analysis showed a significant difference between the two groups in all the measured aspects ($p < 0.001$). This suggests that using the Gingivimil application is more effective in enhancing knowledge, fostering positive attitudes, and encouraging better dental and oral health practices among pregnant women than traditional methods of education.

The improvement in knowledge among the intervention group can be attributed to the Gingivimil application, which offers dental health information tailored for pregnant women. This information is presented in an interactive format, making it easily accessible whenever needed, and includes visual features to enhance understanding.[13]. Repeatedly reading through the material also helps improve participants' ability to remember it.[14]. This aligns with earlier studies that show digital media is better at improving health knowledge compared to print media because it offers a more adaptable, interactive, and engaging experience.[15].

Meanwhile, there were notable differences in how pregnant women viewed dental health. Using the application for education helped increase their understanding of the importance of maintaining dental health during pregnancy, which is crucial for avoiding potential complications.[16], This finding is beneficial for both the mother and the fetus. It aligns with earlier research that has shown mobile health (mHealth) applications can positively shape perceptions and attitudes towards health-related behaviors.[17]. In practice, the study results indicated a notable improvement in the intervention group. The use of the tooth-brushing song and the monitoring card assisted pregnant women in maintaining more consistent tooth-brushing routines.[18]. In addition, reminders through notifications and support via WhatsApp groups also helped improve compliance.[19]. This aligns with existing research which indicates that mHealth applications can lead to greater actual behavior change as they consistently combine educational content, reminders, and tracking features.[20].

Overall, the findings of this study strengthen the evidence that digital applications like Gingivimil can be integrated into maternal health education programs, particularly during antenatal care (ANC) services. This innovation not only increases knowledge but also encourages positive attitudes and concrete behaviors related to maintaining oral health. Therefore, the Gingivimil app has the potential to be an effective intervention model for improving maternal dental health in the digital era.

IV. CONCLUSION

The Gingivimil application has been shown to effectively enhance knowledge, encourage positive attitudes, and promote better oral health habits in pregnant women when compared to traditional education methods like leaflets. A 30-day intervention revealed significant differences between the group using the application and the group receiving standard education in all assessed areas. The Gingivimil app can be used as an innovative digital tool in antenatal care services and has the potential to serve as a sustainable model for improving maternal dental health in the digital age.

➢ *Thank You Note*

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