



The Improvement of Oral Hygiene and Knowledge Through Dental Health E-Book Program for Elementary School Students

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Abstract

Riskesdas 2018 shows that the highest percentage of dental problems in Indonesia is dental caries (45.3%). The provision of dental health services in school is UKGS. Counseling methods and tooth-brushing demonstrations to promote dental health are routinely carried out for elementary school students. This method is used to change the behavior of maintaining dental health by brushing teeth properly and correctly. With current technological developments, Android use become common in learning activities. Android applications can be media favored by children. The educational program named “e-book dental and oral health maintain” with an android application is an innovative way to increase the behavior of maintaining dental and oral hygiene in children. The research objective was to determine the effect of e-book program with an android application on the maintenance of dental health in children, so do the role of parents. The sample consisted of 100 students of 5th grade elementary school. The increase of knowledge and the role of parents in improving dental health was significantly different between before and after the intervention, where p-value = 0.001. The research concluded that the knowledge and parent role, is vital in improving children's dental health.

Introduction

The Ministry of Health reports that the prevalence of cavities in early childhood is very high, reaching 93%, which means that only 7% of Indonesian children are free of cavities. This number is still far from the World Health Organization (WHO) target, which targets that 93% of children aged 5-6 years are caries free. The average number of cavities in children aged 5-6 years is 8 teeth or more. According to the 2018 Basic Health Survey (Riskesdas), the highest proportion of dental problems is damaged/cavities/sick teeth (45.3%). Most of the Indonesian population experience dental and oral health problems due to swelling of the gums and/or abscesses (14%). In Indonesia,

the prevalence of cavities is 88.8%, and the incidence of cavities at the roots of the teeth is 56.6%.

96.5% of the Indonesian population aged 10-14 years have brushed their teeth every day, but only 2.1% brush their teeth twice a day at the right time, in the morning and at night before going to bed. From the data on the proportion of dental and oral health problems and treatment by dental medical personnel based on the age group in Indonesia, it is known that 55.6% of the population aged 10-14 years experiences dental and oral problems and only 9.4% receive treatment from dental medical personnel. The 2018 Riskesdas showed that the DMF-T in children aged 12 years was 1.9, an increase compared to the 2013 Riskesdas results which stated the DMF-T was 1.4. This means that

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there was an increase in the DMF-T index of 0.5 from 2013 to 2018. It does not follow the DMF-T target stated by WHO in the Global Goals for Oral Health 2020, which is < 1 . Caries incidence in the 12-year-old group in Indonesia is also still high at 72%.

Dental and oral health in children is a factor considered as early as possible because tooth decay in childhood can affect the growth of teeth in the future. Dental and oral health services are vital for maintaining and improving the health status of the community, in the form of improving dental health, preventing and treating dental disease, and restoring dental health in an integrated and sustainable manner (Ramos-Jorge et al., 2014). Cavities and toothache are the biggest problems in Indonesia, occurring in 45.3% of the population. Another oral health problem experienced by Indonesians is swollen gums and/or abscesses, amounting to 14% (Kemenkes RI, 2020). Riskesdas mentioned the representation of the population providing dental and oral health care increased from 23.2% to 25.9% in 2007 and 2013. 93.8% of children aged ≥ 10 years brush their teeth every day. The problem is that most residents (79.7%) still brush their teeth in the morning and evening while bathing. Data released by the Ministry of Health shows that 94.7% of Indonesians brush their teeth every day, but only 2.8% brush their teeth at the right time, after breakfast and before going to bed (Riskesdas, 2018b). Public awareness of dental and oral hygiene is still not good. There are remote areas that contribute to a lack of health information. DKI Jakarta and Denpasar, Bali (98.5%), West Java (95.8%), and East Kalimantan (95.5%) are provinces with good dental health outcomes. The provinces of NTT (74.7%) and Papua (58.4%) have low achievement in brushing their teeth. Bali Province is one of the provinces in Indonesia with a higher prevalence of dental caries than the national prevalence, which is 68.2%. Parents, especially mothers, have a vital role in developing children's positive behavior toward dental and oral health. Participation in maintaining their dental and oral health is by paying attention to their behavior regarding dental and oral health and diet. Mother's knowledge, attitudes, and behavior significantly influence children's knowledge, attitudes, and behavior (Ggodme & Jin, 2010).

Dental and oral health is related to knowledge, attitudes, and behavior closely. The environment plays a vital role in forming attitudes and behavior in preschool-aged children (kindergarten children). The closest environment where preschoolers are located is the family (parents and siblings) and the school environment. The role of parents and teachers is crucial in changing children's attitudes

and behavior in maintaining oral health (Schroth et al., 2010). Global Burden of Disease Study (2016) states that dental and oral health problems, especially dental caries, are diseases experienced by almost half of the world's population (3.58 billion people). In Indonesia, the prevalence of dental caries reaches 88.8% with a tendency for an average individual caries experience (DMF-T = Decay Missing Filling-Teeth) ranging from 7.0-7.2, which means that on average Indonesian people have as many dental caries as 7 per person, while WHO has set the DMF-T index of 3. Dental and oral disease is exacerbated by attitudes or behaviors that ignore dental and oral hygiene because they are unaware of the importance of maintaining healthy teeth and mouth, such as being lazy to brush their teeth and often eating sweet foods and drinks (Schroth et al., 2010). Dental caries is the most common oral cavity disease in children, adolescents, adults, and the elderly (Kassebaum et al., 2015).

Self-care is a mandatory skill for children to maintain healthy teeth and mouth. Personal hygiene is an effort to keep teeth and mouth clean. The goal of dental and oral hygiene is to keep the oral cavity, tongue, and teeth clean from all food residue by brushing the teeth at least twice a day, the aim is to free the mouth from disease and tooth decay (Saldunaite et al., 2014). Dental and oral health education in early childhood is vital for various health problems in children, such as dental caries. Methods and approaches are needed to create the knowledge, attitudes, and behaviors required to maintain oral health. The study aimed to obtain a comparative description of the debris index and knowledge about dental and oral health for 5th-grade elementary school students in Jakarta and Denpasar, Bali, after counseling was carried out through the dental health e-book training program.

Researchers are interested in further research in DKI Jakarta and Denpasar, Bali, because both are provinces whose residents have a good record of brushing their teeth. Riskesdas 2018 mentioned that 97.8% of DKI Jakarta residents brushed their teeth well, while in Bali, 92.89%. Researchers compared the debris index and knowledge about the oral health of 5th-grade elementary school students in Jakarta and Denpasar, Bali. The research is expected to be usable in efforts to improve dental and oral health. The result is an innovative counseling intervention program in the form of an Android "E-Book Dental and Oral Health Maintain" application, which can be usable as an educational tool for dental health workers to maintain the dental and oral hygiene of the community. In this case, the UKGS program in elementary schools. The program "E-Book Dental and Oral Health Maintain" with an Android

application should be able to reduce the burden of dental health costs in the community. This program also improves the skills of parents to prevent dental caries in children as early as possible by brushing their teeth regularly. The program “E-Book Dental and Oral Health Maintain” with an Android application can be usable as a guide for maintaining community dental health, in line with dental health program policies, namely dental and oral health services in promotive and preventive efforts. This intervention aims to strengthen families in the community and increase knowledge about oral health, both in rural and urban communities.

METHOD

This research method is a new one. It uses the educational program “E-Book Dental and Oral Health Maintain” with an Android application to improve dental and oral hygiene. This study is a follow-up to a previous study conducted in 2021 at elementary schools in Jakarta and Denpasar, Bali. The research was conducted in 2022, with trials on 5th-grade students at SD Negeri Cinere 1 Jakarta and SD Saraswati I Denpasar, Bali. A group of 50 people was given dental health education through a demonstration of brushing teeth using a dental phantom with the “E-Book Dental and Oral

Health Maintain” program with an Android application. The main sources needed for this research are 1) toothbrushes and dental phantoms; 2) elementary school students; 3) elementary school teachers; 4) parents of students; and 5) the “E-Book Dental and Oral Health Maintain” program with an Android application. The following are figures related to the “E-Book Dental and Oral Health Maintain” program with an Android application.

The “E-Book Dental and Oral Health Maintain” program with an Android application is the result of collaboration with the State Electronics Polytechnic Surabaya (PENS), which has been tested for validity and reliability on elementary school students in Denpasar, Bali, and has been used by elementary school students in Manado. This program has also received legalization as a copyright (HAKI) with registration letter number 00039789 dated November 1, 2022, issued by the Ministry of Law and Human Rights. The multi-step research protocol includes: 1) Evidence-based education and delivery of the “E-Book Dental and Oral Health Maintain” with an Android application training program; 2) Enhancing the skills of elementary school teachers and parents to actively participate in the use of the “E-Book Dental and Oral Health Maintain” program with an Android application; 3) Monitoring teeth brushing activities



Fig 1. Display of the E-Book Program with Android Application



Fig 2. Lay-out of the E-Book Program with Android Application

with the “E-Book Dental and Oral Health Maintain” program with an Android application; 4) Direct testing with field studies; and 5) Conclusions and suggestions.

RESULT AND DISCUSSION

The results of the study concluded that counseling and tooth brushing demonstrations using the “E-Book Dental and Oral Health Maintain” program with an Android application can improve dental and oral hygiene for 5th-grade elementary school students in Jakarta and Denpasar, Bali. Another factor is the role of parents and teachers who have shown a strong interaction with students’ knowledge to improve dental and oral health (Đorđević, 2018; Khanduri et al., 2018). This study shows that the role of health educators and dental health workers, dental cadres or teachers and parents who actively participate in conducting education and educational innovation with the help of the “E-Book Dental and Oral Health Maintain” program with an Android application will improve skills in maintaining dental and oral health, which ultimately creates optimal

dental and oral health for elementary school students. Therefore, it is necessary to increase the involvement of parents and teachers to increase dental and oral health knowledge in elementary school students in Jakarta and Denpasar, Bali.

The selection of the experimental method was based on the theory that dental health can be maintained by brushing teeth and demonstrating how to brush teeth using a dental phantom. Strengthening using the “E-Book Dental and Oral Health Maintain” program with an Android application greatly supports dental and oral health improvement. The community can play an active role as a companion, coach, or motivator, with teacher supervision and fostering student dental health behavior by parents as a vital role in maintaining their children’s dental health (Mitrakul et al., 2012). Providing an “E-Book Dental and Oral Health Maintain” educational program will increase students’ knowledge of maintaining healthy teeth. Dental and oral health is influenced by student compliance and the intensity of parental assistance in maintaining

Table 1. Mean Distribution of Debris Index (DI), Knowledge, and Parental Roles Before and After Dental and Oral Health Education to Elementary School Students in Jakarta and Denpasar, Bali

| Variables | Mean | Deviation Standard | Error Standard | p-Value | N |
|-------------------------------------|------|--------------------|----------------|---------|-----|
| Debris Index Jakarta | | | | | |
| Measurement I | 2.03 | 0.5275 | 0.0746 | 0.001 | 140 |
| Measurement IV | 1.23 | 0.4716 | 0.0667 | | 140 |
| Debris Index Denpasar, Bali | | | | | |
| Measurement I | 1.72 | 0.6091 | 0.0861 | 0.001 | 140 |
| Measurement IV | 0.83 | 0.2182 | 0.0308 | | 140 |
| Knowledge Jakarta | | | | | |
| Before | 12.2 | 2.9 | 0.04 | 0.001 | 140 |
| After | 21.5 | 2.2 | 0.03 | | 140 |
| Knowledge Denpasar, Bali | | | | | |
| Before | 15.2 | 1.99 | 0.32 | 0.001 | 140 |
| After | 18.7 | 1.64 | 0.26 | | 140 |
| Parents’ Role Jakarta | | | | | |
| Before | 4.7 | 0.86 | 0.16 | 0.001 | 140 |
| After | 6.6 | 0.63 | 0.12 | | 140 |
| Parents’ Role Denpasar, Bali | | | | | |

dental and oral health (Shetty et al., 2016). The positive impact of the “E-Book Dental and Oral Health Maintain” program with an Android application is an increase in the dental and oral hygiene of students, as seen from the decrease in the debris index in students given the educational, as shown in Table 1.

The results of research in Jakarta and Denpasar, Bali, showed a significant decrease in Debris Index score. Respondents in Jakarta experienced a decreased Debris Index from 2.03 to 1.23. While respondents in Denpasar, Bali, experienced a decrease from 1.72 to 0.83. The results of this study are significant by obtaining a p-value = 0.001. This method, which is a combined dental health care theory and tooth brushing with a demonstration using a dental phantom, equipped with an “E-Book Dental and Oral Health Maintain” program with an Android application, achieves better results when compared to without the use of an Android application. Parental involvement is necessary for care, education, encouragement, and supervision. Parents, especially mothers, play a vital role in maintaining the health of their children’s teeth by developing positive behaviors and efforts to improve their children’s dental health (Tamura, 2005). Parents’ attitudes in maintaining dental health significantly impact children’s behavior (Mahmoudi et al., 2016). An e-book educational program about maintaining oral and dental health delivered through an Android application is proven to improve the habit of maintaining healthy teeth and mouth. And in the end, children can brush their teeth better. Children’s dental and oral health is highly influenced by children’s obedience and the intensity of parental assistance in maintaining dental and oral health. Along with developing skills and commitment of parents to care for their children’s teeth from an early age, it will

have a positive impact by increasing knowledge about maintaining healthy teeth and mouth. The results are in Table 1.

This study aims to find differences in the knowledge before and after the intervention with the “E-Book Dental and Oral Health Maintain” program with Android applications. Respondents’ knowledge in Jakarta experienced a very significant increase before and after treatment, with p-Value = $0.001 < 0.05$, where the mean knowledge of respondents after receiving the “E-Book Dental and Oral Health Maintain” program with the Android application was 21.5 ± 2.2 , which is up from 12.2 ± 2.9 . Respondents’ knowledge in Denpasar, Bali, increased significantly before and after treatment, with p-Value = $0.001 < 0.05$, where the mean knowledge of respondents after receiving the “E-Book Dental and Oral Health Maintain” program with the Android application was 15.2 ± 1.99 from the previous 18.7 ± 1.64 . Providing an “E-Book Dental and Oral Health Maintain” program with an Android application can increase elementary school students’ knowledge of maintaining oral and dental health.

The health education intervention program provides demonstrations and additional interventions in the form of an e-book program through an Android application and will improve the skills of parents as a small group in the community as agents for early prevention of dental caries, with the habit of brushing their teeth regularly, will improve skills in maintaining health teeth in elementary school students. Parents will accompany and monitor good and correct tooth brushing habits. The intervention program “E-Book Dental and Oral Health Maintain” with an Android application can be used as an innovation in dental and oral health services to carry out various promotive and preventive

Table 2. Bivariate Analysis between Debris Index Variables and Sex, Knowledge, Parents’ Role through the “E-Book Dental and Oral Health Maintain” Program to Elementary School Students in Jakarta and Denpasar, Bali

| No | Variables | p-value | Related/Not Related |
|----|---------------|---------|---------------------|
| 1 | Sex | 0,613 | Not related |
| 2 | Knowledge | 0,001 | Related |
| 3 | Parents’ Role | 0,001 | Related |

activities in dental and oral health. Intervention programs increase family participation and capacity to maintain oral health through family community arrangements and dental and oral health services in rural and urban areas. The role of mother/parents in maintaining dental and oral hygiene influences improving children's dental and oral health (Jackson et al., 2011). The results of the study are in Table 1.

Research in Jakarta succeeded in showing significant differences in the role of parents before and after the intervention of the "E-Book Dental and Oral Health Maintain" program with an Android application, with a $p\text{-value} = 0.001 < 0.05$, where the mean role of parents reached 6.6 from initially 4.7. Research in Denpasar, Bali also showed significant differences in the role of parents of students before and after the intervention with the e-book education program, with a $p\text{-value} = 0.001 < 0.05$, where the mean role of the parents of students receiving the e-book program intervention reached 6.77 from 5.73 initially. It can be concluded that the "E-Book Dental and Oral Health Maintain" program with an Android application is proven to be able to increase parents' role in maintaining dental and oral hygiene. In this study, the role of parents in Bali is higher than in Jakarta, although if it is accumulated, it can be seen that the increase in parents in Jakarta is better by 1.9 compared to Bali, which is only 1.04.

In multivariate analysis with linear regression, 3 (three) variables related to the Debris Index, namely sex, knowledge, and parents' role. To create a multivariate model with 3 (three) variables, a bivariate chi-square analysis was performed using the Debris Index as the dependent variable. Variables with $p < 0.25$ on the bivariate and of substantial significance can be used for inclusion in the multivariate model. The results of the bivariate analysis between the independent variables and the dependent variable are in Table 2.

Table 2 shows the bivariate relationship of the variables related to the Debris Index. Based on the table, only 2 variables are closely related, namely knowledge and parents' role, with a $p\text{-value} < 0.25$, so they are candidate models.

Table 3 shows that after multivariate testing using logistic regression, the two variables tested together have a significant effect in changing the Debris Index score, as evidenced by the $p\text{-value} = 0.001$. For the variable included in the multivariate test, only one variable had a significant effect on the Debris Index, namely the parents' role variable, which gave a decrease in the Debris Index score 68 times better than without the parents' role, while knowledge variable provides a reduction in the Debris Index score 34 times better than in children with poor knowledge. In this study, a strong interaction between parental roles and knowledge was shown by an increase in oral hygiene as measured by the Debris Index.

The innovative "E-Book Dental and Oral Health Maintain" program with an Android application is a new step in implementing interactive media technology to improve elementary school dental and oral health in Jakarta and Denpasar, Bali. In this case, children's knowledge, and parents' role, represented by the mother, about dental and oral health are important in shaping behavior that supports the children's dental and oral health maintenance. Parents' lack of knowledge about maintaining children's dental and oral health will be a non-conductive predisposing factor to behavior to monitor children's dental and oral health (Lauris et al., 2012; Shetty et al., 2016). Parents are the main social force that influences children's development, including dental and oral health care (Bozorgmehr et al., 2013).

Health education is a simple and cost-effective approach (Duguma, 2019; Garbin et al., 2015; Suma Sogi et al., 2016). Education, equipped with real practice and integrated with the "E-Book Dental and Oral Health Maintain" program with an Android application, will make it easier for children and parents, especially mothers, to expand their children's knowledge about maintaining healthy teeth and mouth. E-book programs with Android applications help children and mothers to always participate actively in monitoring their children's teeth and mouth health. The attention of parents, especially mothers, to maintaining children's dental and oral health from an early

Table 3. Advanced Analysis between Debris Index Variables and Knowledge and Parents' Role through the "E-Book Dental and Oral Health Maintain" Program to Elementary School Students in Jakarta and Denpasar, Bali

| No | Variables | p-value | OR |
|----|---------------|---------|----|
| 1 | Knowledge | 0,001 | 68 |
| 2 | Parents' Role | 0,001 | 34 |

age makes healthy family behavior, a daily habit (MirzaeiAlavijeh et al., 2013).

A parent's role is influential in maintaining their children's teeth and mouth health. By changing the parents' attitudes and behavior about maintaining healthy teeth and mouth, the family has a vital role in improving children's dental and oral health. Families will create a healthy lifestyle environment, increase self-esteem, and help form good habits (Saldunaite et al., 2014). Behavior and health practices are greatly influenced by the attitudes and behavior of parents when intervening with their children to maintain dental health (Almoudi et al., 2016). The role of parents, especially mothers, can be role models for children when they learn to find idols whom they see and hear, as well as from their life experiences. Children learn by observing the activities of their parents or teachers. Children learn from what they hear from parents, teachers, and the environment. Children modify their parents' activities to gain experience from their life experiences (Gauga et al., 2013). The more actively parents participate in their child's education, the better the child's positive behavior changes. Parents not only participate and contribute to a healthy lifestyle, but also improve dental health status due to the influence of health behavior factors, including factors related to knowledge, attitudes, and practice (Qiu et al., 2016). Therefore, the role of parents is vital in guiding, providing information, and providing the best role models so that children grow and develop properly. Parental responsibility and attention to children are needed to maintain good dental and oral health. Teachers can represent parents at school and are the closest people to children at school, so the teacher's role and behavior are also vital in maintaining and improving the dental and oral health of students (Brogårdh-Roth et al., 2009).

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