

Kiddie Doctors Education Strategy in Improving the Knowledge, Attitude, and Oral Hygiene Status of Elementary School Children

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ABSTRACT

Objectives: This study aimed to assess the improvement in the knowledge, attitude, and oral hygiene scores of elementary school children after being provided education by kiddie doctors. **Materials and Methods:** A quasi-experiment design with pretest–posttest control group model was conducted on 143 students belonging ages 8–12 years old in two selected elementary schools. Kiddie doctors educated their peers three times at four-week intervals. Baseline data were collected a week before the education, and the final data were collected a month after the third education session. Data regarding knowledge and attitude were collected using questionnaires filled in by the respondents. The oral hygiene index simplified (OHIS) and patient hygiene performance (PHP) index data were obtained through intra-oral examinations. Data were analyzed using dependent and independent *t* tests and multiple linear regression analysis. **Results:** After receiving education, there was a change in the knowledge, attitude, OHIS, and PHP scores ($P = 0.005$). Kiddie doctors were estimated to decrease the OHIS and PHP scores by 0.312 and 0.579 points, respectively. **Conclusions:** The education provided by kiddie doctors improved the knowledge, attitude, and oral hygiene status of children. Kiddie doctors could help health workers who are still constrained in routine promotional activities.

KEYWORDS: Dental health education, oral hygiene, peer education, plaque score

INTRODUCTION

Most Indonesian children do not have healthy dental health behaviors. As per the 2018 Indonesian national data, of the 98% of Indonesian children who brushed their teeth daily, 97.2% did not brush twice a day (in the morning after breakfast and at night before going to bed). This behavior could have affected 65.5% of Indonesian children, causing dental caries.^[1] Tooth brushing before going to bed can prolong the time of plaque formation and reduce the potential for dental caries and periodontal disease.^[2]

To increase the dental health awareness in children, the Government of Indonesia implemented a school-based regular oral health education program, the School Dental Health Work (UKGS), which was managed by community health centers (CHC) around the school

area. Once a year, the CHC assigned a health worker to visit the school, provide health education, and perform dental examination and simple dental filling on site.^[3] Oral health education in many forms can directly improve knowledge and attitude and indirectly change the OHIS and PHP scores.

This government’s effort faced many obstacles, including a lack of human resources; consequently, UKGS activities could not be conducted routinely. The 2011 Indonesian national research data revealed that only 4.2% of CHC conducted routine activities, whereas

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the rest conducted erratic and unplanned activities.^[4] Repeated educational activities were required to reinforce the behavioral changes and prevent reversion to the original condition.^[5] These obstacles need to be overcome to meet the target of making Indonesia dental caries free by 2030.

Strategies to aid health workers through other components, for example, education by teachers or through peers, should be considered. In Indonesia, health education using peer learning methods, known as the kiddie doctor program, has been ongoing since a long time. In this program, children are trained to share personal health information and become role models of good health behavior for their peers. However, unfortunately, the promotional educational content related to dental health has been very limited.

The kiddie doctor program, particularly for dental health, is a challenge that needs to be tested. This learning method has been proven to increase knowledge and improve oral health behavior.^[5-8] It has also been shown to provide better results than education provided by teachers and to be almost as good as education provided by health workers.^[9] Children felt more comfortable getting lessons from their peers because they focused on social interaction and sharing knowledge, ideas, and experiences.^[10,11] Therefore, the peer learning method for dental health should be tried, and its impact on the knowledge, attitude, oral hygiene index simplified (OHIS) and patient hygiene performance (PHP) index data of children should be tested. The primary outcome to be assessed in this study is a change in oral hygiene scores, while the secondary outcome is the improvement of the knowledge and attitude toward oral hygiene.

MATERIALS AND METHODS

This research was conducted in the South Tangerang District, where the knowledge level and oral hygiene status of elementary school children were in the low-to-moderate category. Therefore, it could represent the described conditions in Indonesia. We conducted a quantitative study involving a quasi-experiment design with pretest–posttest control group model on two elementary schools randomly selected out of 160 elementary schools, which had students ages 8–12 in grades 3, 4, and 5 on at least two classes. Students in that ages already have permanent teeth which needed for OHIS and PHP measurements. Randomly, one elementary school was assigned as the group with a kiddie doctor (intervention group) and the other was assigned as the group without a kiddie doctor (control group). Both the schools had the UKGS program.

Using the hypothesis test formula for paired mean difference, a minimum sample of 66 students per group was obtained. The sampling was performed randomly among grade 3, 4, and 5 students from the selected elementary schools, who met the following criteria: did not use orthodontics, did not experience dental malposition or deformity, did not have periodontitis and did not have mental disorders. The number of samples from each class was calculated proportionally.

The study was conducted in January–April 2018 which had previously received ethical approval from the Research and Community Engagement Ethics Committee, Faculty of Public Health Universitas Indonesia with certificate No.682/UN2.F10/PPM.00.02/2018.

In the intervention program, we used the Kiddie Doctor Activity Guide Module for Elementary School Children, which was a development of the School-Based Dental Health Education Activity Guidelines for the Ministry of Health, Republic of Indonesia, and the results of discussions with experts; therefore, the module was more in line with the cognitive abilities of children. The module included dental and periodontal diseases and the causes of and ways to prevent them, including the technique of brushing teeth using the Bass method. Before use, the module was tested to determine the level of attractiveness, comprehensiveness, acceptance, believability, relevance, persuasiveness, and involvement to match the expected results.

Preparation for the activity started by selecting 17 children to become kiddie doctors. The selection was based on suggestions from their classmates and considerations from their teachers, with emphasis on the speaking ability, communication skills, and competence to perform tasks. The candidates were trained thrice by health workers (60 min each time) outside school hours using the prepared modules. This training aimed to develop the children's ability to deliver material, build positive attitudes toward maintaining oral hygiene, and show and practice brushing their teeth using the Bass method. At the end of the training, the kiddie doctor candidates were evaluated to determine whether they had the ability to present the material according to the established criteria. The results showed that 15 candidates were capable of becoming kiddie doctors, whereas two candidates were eliminated because they did not meet the criteria.

The kiddie doctors provided education in the intervention group three times at an interval of four weeks. Each education session lasted 100 min, in which the first 60 min involved information sharing, game card playing and discussion about dental and periodontal diseases, their causes and ways of prevention and tooth brushing techniques, while the next 40 min involved a

demonstration and practice of bass brushing technique by the kiddie doctors. Every kiddie doctor provided education to six to seven classmates and was assessed by supervisors using a checklist to determine whether the module material had been fully delivered. The aim of the intervention was to improve students' knowledge, attitudes, and skills for maintaining oral hygiene by brushing their teeth daily to perfectly remove dental plaque and debris. Students in the control group did not receive any information other than the regular programs conducted in their schools, but their knowledge, attitudes, and skills for maintaining oral hygiene were assessed at the beginning and end of the study.

Data were collected twice in both the groups. Baseline data were collected a week before the intervention, whereas final data were collected a month after the last education session in the intervention group and three months after baseline data collection in the control group. The collected data included^[1] the demographic data of the students and parents that were obtained through questionnaires filled in by the parents,^[2] students' knowledge and attitudes toward maintaining oral hygiene (13 questions) that were assessed through questionnaires filled in by the students (the validity and reliability of the questionnaire had been tested) and^[3] oral hygiene of the students that was assessed by the intra-oral measurement of debris and plaques deposits by two examiners that had been calibrated and validated using the OHIS instrument by Green and Vermillion 1964 and PHP index by Poshadley and Haley 1968 with good kappa score ($P = 0,731$).^[12,13] OHIS and PHP data collection is taken one day before knowledge and attitude data. Before data collection, written informed consent was obtained from all the students and their parents, and permission was obtained from the school principal and teachers.

Dependent and independent *t* tests were conducted to evaluate changes in the knowledge, attitude, and oral hygiene status (OHIS and PHP scores) before and after the intervention and to determine the differences between the two groups. The magnitude of changes in these variables after the intervention was analyzed by multiple linear regression analysis using Statistical Package for the Social Sciences SPSS software version 22.0 (IBM Corp., 2013, New York).

RESULT

Initially, the number of students participating in our study was 190 (95 in the intervention group and 95 in the control group). However, 47 students were unable to participate in the activity until it was finished because of illness or other causes; therefore, at the end of the study, there were 143 students (consisting of 69

students in the intervention group and 74 students in the control group) [Figure 1]. This number still met the minimum sample size of the study.

There were no significant demographic (sex, age, parents' occupation/education, and socioeconomic status) differences in the two groups at the beginning of the study. Similarly, the knowledge ($P = 0.082$), attitude ($P = 0.266$), OHIS ($P = 0.146$), and PHP ($P = 0.192$) scores were equivalent between the intervention and control groups and could be compared [Table 1].

The results showed an improvement in the mean knowledge, attitude, OHIS, and PHP scores of the students a month after all educational activities were conducted. In the intervention group, the knowledge and attitude scores increased and the OHIS and PHP scores decreased after receiving education ($P = 0.005$ for all). In contrast, there were no differences in the knowledge ($P = 0.614$), attitude ($P = 0.107$), and PHP ($P = 0.596$) scores in the control group [Table 2].

To determine the effect of education, a test was also conducted in both the groups. The results showed that the knowledge, attitude, OHIS, and PHP scores differed among students in the intervention and control groups [$P < 0.005$; Table 3].

DISCUSSION

The increase in knowledge in our study was higher than that in Keikhaee *et al.*'s study but lower than that in

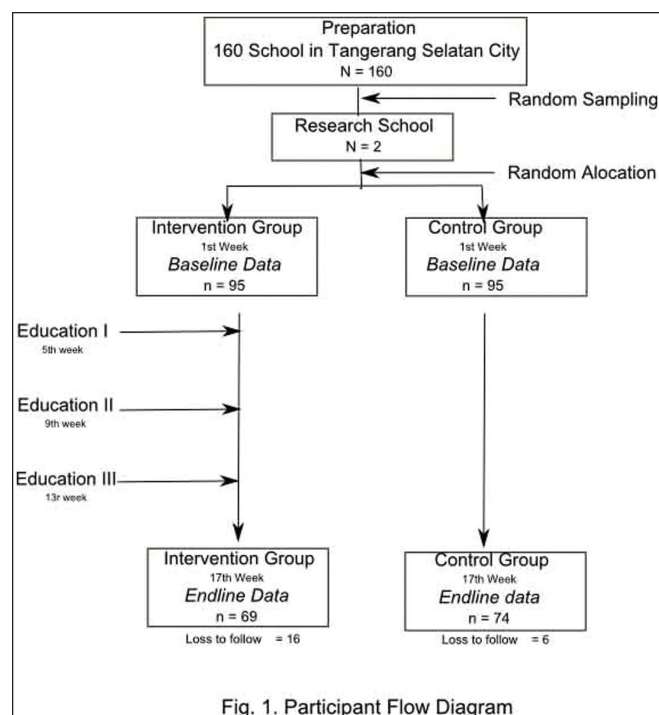


Fig. 1. Participant Flow Diagram

Figure 1: Participant flow diagram

Table 1: Comparison of knowledge, attitude, oral hygiene index simplified, and patient hygiene performance scores between intervention and control groups before the intervention

| | Intervention group | | Control group | | P Value |
|-----------------|--------------------|---------|---------------|---------|---------|
| | Mean ± SD | Min-max | Mean ± SD | Min-max | |
| Knowledge score | 4.84 ± 1.63 | 1-8 | 4.36 ± 1.61 | 1-8 | 0.082 |
| Attitude score | 6.94 ± 2.16 | 1-12 | 6.53 ± 2.27 | 1-10 | 0.266 |
| OHIS score | 1.37 ± 0.57 | 0.1-3.2 | 1.51 ± 0.41 | 0.5-2.7 | 0.146 |
| PHP score | 1.96 ± 0.57 | 0.5-3.0 | 1.83 ± 0.61 | 0.7-3.5 | 0.192 |

Table 2: Comparison of knowledge, attitude, OHIS, and PHP scores pre- and post-education within intragroup comparison

| | | Mean ± SD | Δ | % | P Value |
|--------------------|------|--------------|-------|----|---------|
| Intervention group | | | | | |
| Knowledge | Pre | 4.84 ± 1.63 | 2.58 | 53 | 0.005 |
| | Post | 7.42 ± 1.62 | | | |
| Attitude | Pre | 6.94 ± 2.16 | 3.79 | 54 | 0.005 |
| | Post | 10.73 ± 1.89 | | | |
| OHIS score | Pre | 1.51 ± 0.40 | -0.80 | 54 | 0.005 |
| | Post | 0.71 ± 0.41 | | | |
| PHP score | Pre | 1.83 ± 0.61 | -0.75 | 40 | 0.005 |
| | Post | 1.08 ± 0.58 | | | |
| Control group | | | | | |
| Knowledge | Pre | 4.36 ± 1.61 | -0.09 | 2 | 0.614 |
| | Post | 4.27 ± 1.47 | | | |
| Attitude | Pre | 6.52 ± 2.27 | 0.31 | 4 | 0.107 |
| | Post | 6.83 ± 2.23 | | | |
| OHIS | Pre | 1.39 ± 0.62 | -0.31 | 22 | 0.005 |
| | Post | 1.08 ± 0.75 | | | |
| PHP | Pre | 1.96 ± 0.57 | 0.06 | 3 | 0.596 |
| | Post | 2.02 ± 0.91 | | | |

Δ (score change) = post-pre data

Table 3: Comparison of knowledge, attitude, OHIS, and PHP scores between the intervention and control groups after the intervention

| Variables | Group | n | Mean ± SD | Mean difference | 95% CI | P Value |
|-----------------|--------------|----|--------------|-----------------|-------------|---------|
| Knowledge score | Intervention | 69 | 7.42 ± 1.62 | 2.715 ± 0.293 | 2.136-3.295 | 0.005 |
| | Control | 74 | 4.27 ± 1.47 | | | |
| Attitude score | Intervention | 69 | 10.73 ± 1.89 | 3.486 ± 0.345 | 3.073-4.367 | 0.005 |
| | Control | 74 | 6.83 ± 2.23 | | | |
| OHIS score | Intervention | 69 | 0.71 ± 0.41 | 0.974 ± 0.128 | 0.325-0.568 | 0.005 |
| | Control | 74 | 0.36 ± 0.30 | | | |
| PHP score | Intervention | 69 | 1.08 ± 0.58 | -0.863 ± 0.142 | 0.720-1.228 | 0.005 |
| | Control | 74 | 2.02 ± 0.91 | | | |

Haleem *et al.*'s study, in which oral health education by peers increased the knowledge score by 15% and 75%, respectively.^[12,13] These results indicated that although information on educational activities was delivered by a child, it was captured well by the peers.

The information provided by kiddie doctors in their own language makes the educational material more easily understandable.^[11] In addition, the use of educational media in the form of game cards makes children feel more comfortable receiving information, as if they were playing with other peers. Thus, children trained

as kiddie doctors can provide health education to their peers just as efficiently as health workers or teachers.^[8]

Systematic processing in the heuristic systematic model indicated that a person's knowledge could influence and encourage changes in their attitudes.^[14] The results of this study revealed that changes in student knowledge were followed by changes in their attitudes. Kiddie doctors increased the students' mean attitude score toward maintaining oral hygiene by 54%. This result was higher than that of a previous study, in which a 25% increase in the attitude score was observed.^[15]

The formation of attitudes from knowledge begins when students analyze and compare health messages delivered by kiddie doctors with their prior knowledge and experience. Initially, many students did not know that tooth decay could occur because of being lazy to brush their teeth; hence, they behaved negatively or disagreed to brush their teeth before going to bed. However, after getting educated, they understood the causes and ways to prevent tooth decay. Their attitude then changed and they agreed to clean their teeth and mouth before going to bed.

The decrease in the mean OHIS score in our study was higher than that in Khorakian *et al.*'s study and lower than that in Sushanth *et al.*'s study.^[8,16] In our study, the OHIS scores of students in the control group also decreased. This finding can affect the estimated number of OHIS score reduction attempted by kiddie doctors. Our results indicated that kiddie doctors could reduce OHIS scores by 0.312 points [Table 4]. This was possibly due to the influence of the measurement parameters used. Although the OHIS and PHP index are usually used to measure oral hygiene, the PHP index is far more sensitive.^[17] The debris in OHIS measurements can easily be lost by chewing fibrous food or gargling hard without having to brush the teeth.^[18] In contrast, the plaque in PHP measurements can only be removed by brushing teeth routinely with the correct technique.^[19]

In our study, kiddie doctors could reduce the PHP score by 0.579 points [Table 4]. The average PHP score of the students decreased by 40% in the intervention group [$P=0.005$; Table 3]. A similar result was obtained in previous studies three and six months after the intervention.^[5,7,20] The decrease in the PHP score can be due to the increase in knowledge. Dental plaque can easily grow on cervical teeth, molars, and rough hidden tooth surfaces.^[21] Children who have knowledge about the location of plaque growth can brush their teeth more perfectly.

The tooth brushing demonstration by kiddie doctors also affected the PHP score. The Bass brushing teeth technique shown by kiddie doctors and the subsequent

tooth brushing practice and supervision influenced the students' tooth-cleaning skills.^[22,23] Thus, the tooth brushing instructions provided by kiddie doctors were in motivating and increasing the students' confidence in cleaning their teeth.^[24] Similarly, kiddie doctor supervision in practicing tooth brushing together reduced the students' errors in brushing, as evident from the decreased amount of debris and plaque in the students' oral cavity.

The decrease in PHP scores in our study was higher than that in previous studies using the same education model,^[6,7,22] possibly because of the differences in the frequency and duration of education; education was provided just once in some previous studies,^[6,7] whereas it was provided thrice in our study.

Although provided by a kiddie doctor, the repetition of education could strengthen the students' knowledge, attitudes, and skills for maintaining oral hygiene. The reduction in plaque scores was greater in subjects who received repeated education than in those who did not.^[25] Repetition of education was needed to reinforce good behavior and prevent reversion to the original condition.^[5,25]

Our study is proving that education strategy could improve the knowledge, attitudes, OHIS, and PHP scores effectively. Kiddie doctor not only can play a role as educator but also can present education with more satisfaction, comfortable and more excitement for students. Otherwise it offered the availability of student resources as peer educators so that the activities could take place throughout the year without depending on the arrival of health workers from the CHC. The limitation of this study is that the researchers did not take data scores 12 months after the last education so that the effects of kiddie doctors in the long run cannot be known.

RECOMMENDATION

Oral health education in schools using the kiddie doctor program was quite effective in resolving the challenges faced by children's dental health promotion programs in Indonesia

Table 4: Effect of interventions by kiddie doctors on OHIS and PHP score changes, parameter estimates, and 95% confidence intervals by linear regression analyses

| | B ± SE | P Value | 95% CI | |
|------------|----------------|---------|--------|--------|
| OHIS index | | | | |
| Constant | -0.280 ± 0.054 | 0.000 | -0.386 | -0.174 |
| Group | -0.312 ± 0.113 | 0.006 | -0.535 | -0.090 |
| Knowledge | -0.019 ± 0.022 | 0.388 | -0.064 | 0.025 |
| Attitude | -0.042 ± 0.019 | 0.029 | -0.079 | -0.004 |
| PHP index | | | | |
| Constant | 0.123 ± 0.099 | 0.216 | -0.072 | 0.318 |
| Group | -0.579 ± 0.207 | 0.006 | -0.988 | -0.171 |
| Knowledge | -0.048 ± 0.041 | 0.242 | -0.130 | 0.033 |
| Attitude | -0.044 ± 0.035 | 0.210 | -0.113 | 0.025 |

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CONFLICTS OF INTEREST

There are no conflicts of interest.

AUTHOR CONTRIBUTIONS

All authors had contributed to study conception, data collection, data acquisition and analysis, data interpretation, and manuscript writing. All authors have read and approved the manuscript.

ETHICAL POLICY AND INSTITUTIONAL REVIEW BOARD STATEMENT

Approval for this study was obtained from the Research and Community Engagement Ethics Committee, Faculty of Public Health, Universitas Indonesia (No.682/UN2.F10/PPM.00.02/2018).

PATIENT DECLARATION OF CONSENT

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

DATA AVAILABILITY STATEMENT

The data set is available on request and with the agreement of Muri Maftuchan, Faculty of Public Health, Universitas Indonesia.

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