ABSTRACT

Background: Particular care must be taken to preserve healthy mouths and teeth, especially in school-aged children. Offering counseling and education through engaging media is one of the possible measures for children. Media that has a good effectiveness value for children are the pop-up book and pocket book media. The aim of this research is to compare the impact of health education delivered through pop-up books versus pocket books on school-age children's oral hygiene status.

Method: This type of experimental research uses a nonequivalent control group design. The sample in the study were 23 students with pop-up book media and 23 students with pocket books at Kedungmundu Elementary School, who underwent an OHI-S examination and received counseling interventions with pop-up book media and pocket books with material on maintaining oral hygiene.

Result: Dental Health Education using pop-up books and pocket books obtained a significant value of 0.000 (<0.005), which means that there was a difference before and after the intervention was given. The OHI-S score shows that the majority have a good category after being given the pocket book and pop-up book intervention.

Conclusion: Dental Health Education with pop-up book media is more effective than pocket book media on the level of dental and oral hygiene in school-age children.

BACKGROUND

Efforts to maintain healthy teeth and mouth require special attention, especially in school-age children. School-age children experience a process of growth and development of habits that are carried over into adulthood.\textsuperscript{1} The practice of keeping teeth and mouth clean is one of the habits that should be ingrained in children. As children get older, they are more at risk of experiencing health problems, especially in dental and oral hygiene. School children aged 6 to 7 year experience a vulnerable period, because at this age permanent teeth begin to grow.\textsuperscript{2} Newly erupted teeth are immature and prone to caries. The age group 9-11 years is an important age group, because children at this age experience mixed dentition so that children of this age have a high risk of caries.\textsuperscript{3}
Based on result of national health research (RISKESDAS) 57.6% of Indonesia's population has dental and oral hygiene problems. This hygiene problem occurs in several regions of Indonesia. One of them is the city of Semarang, which has low dental and oral hygiene. As many as 43.90% of the people of Semarang City have cavities. However, only 3.50% of the teeth are filled because of cavities. The 5-9 years age group is a transitional period from primary teeth to permanent teeth, as much as 53.1% of children at this age are more susceptible to caries compared to other age groups. Children aged 10-12 years have an average caries index of 1.89%. World Health Organization (WHO) data shows that 60-90% of children worldwide suffer from dental and oral hygiene problems. The category of school-age children is vulnerable to dental and oral diseases, one of which is caries.

The Kedungmundu Health Center in Tembalang District is one of the health centers that has many assisted schools. In 2018, in an effort to maintain dental health, the school's health center had 30 assisted schools, there are 9,491 students were examined and 35,37% need dental treatments. Based on the data, there are many students who have dental and oral health problems, so it is necessary to increase promotive and educative efforts for the community to be more aware of maintaining oral hygiene by going to the dentist. The causes of dental and mouth problems in children are microbiological factors, food consumption, oral hygiene, how to brush their teeth, and lack of education in children about maintaining oral hygiene. This problem is important because at school age children experience growth and development so they need to get used to good habits to maintain oral hygiene. Problems that are usually experienced by children are cavities, teeth growth problems, tartar, canker sores, and bad breath. This problem can be overcome through health promotion to support changes in children's behavior. WHO recommends that dental health research be conducted on children aged 10-12 years because they are more cooperative and understand the material provided.

This promotive activity is a forum for providing information, increasing knowledge, and changing people's behavior in a positive direction. The educational program is a series of activities that are arranged in a directed manner to be implemented together with the aim of changing people's behavior in a healthy direction. Dental health education is one of the directed efforts to create changes in the habits of a person or group of people from bad old behavior to become better, especially in maintaining dental hygiene. Some media from education include posters, game cards, pamphlets, pocket books, pop-up books, lecture methods, and others. Promotional activities should be done with a more attractive development. Pop-up books are unique and interesting educational media that can help students understand the material to be provided. Pop-up or moving books are three-dimensional books that move when the book looks more real and easily understood by school-age children. Books are printed media used in education, for example pocket books. Pocket books contain writing, but are much shorter and clearer, no more than 24 pages, and are small enough to fit in a pocket.
Dental health education through pop-up books rather than posters is more effective in increasing the dental and oral health knowledge of grade 5 students at SD Negeri 20 Banda Aceh.\textsuperscript{11} Health education using the pocket book method is also effective compared to the lecture method. This is evidenced by an increase in knowledge before and after the promotion activities were given to participants at the Posyandu, Andalas Village, Padang City.\textsuperscript{12} Health education showed changes in the level of dental and oral hygiene in Al-Kautsar Islamic Boarding School students, measurements of dental and oral hygiene before conducting three-dimensional media education obtained an increase of 60%. The purpose of this research was to determine the differences in the effectiveness of health education through pop-up books and pocket books on the level of dental and oral hygiene in school-age children.\textsuperscript{13}

\textbf{METHOD}

This type of research uses a quasi-experimental research design. This research was carried out by obtaining research permits (ethical clearance) from the research ethics commission with number 0167/KEPK/VII/2023. The research design uses a nonequivalent control group design with different interventions for respondents. The population used in this research were school-age children in grades IV and V at SD Negeri Kedungmundu aged 10-11 years with a total of 72 students. The sampling technique used in this study is probability sampling. Probability sampling is a retrieval technique sample that gives equal opportunity to each member population to be sampled.

In this research, the variable level of dental and oral health and media education using pop-up books and pocket books was used. There were two groups: the first group was given the pop-up books media intervention and the second group was given the pocket book intervention. Samples were divided into 2 groups randomly using a lottery. A total of 23 samples received educational treatment using pop-up book media and 23 samples were given educational treatment using pocket book media\textsuperscript{15}. According to the results of the proportionate stratified random sampling technique, the number of research subjects was 46 students. Then it was divided into 2 groups, namely the pop-up book media intervention group and the pocket book. Each group consists of 23 students who will be divided into small groups. Small groups consist of 7 - 8 students.

The inclusion criteria used in this study included children aged 10-11 years, children who read fluently, children who wished to be research subjects, and children who did not consume food and drink for one hour before the examination. Exclusion criteria in this study included children with visual impairments and children who were sick during activities. This research was conducted at Kedungmundu Public Elementary School in September 2022 – January 2023.
The tools and materials needed include an OHI-S assessment sheet which contains an assessment of the debris index and calculus index, media pop-up books and a pocket book which consists of dental and oral hygiene materials, factors affecting dental and oral hygiene, types of teeth, the process of cavities, good and bad foods for oral health, good and right way to brush your teeth, and how to maintain healthy teeth and mouth. Other tools needed include writing instruments, teeth brushing props (phantom), dental kits, nierbeken, dappen glass, and trash cans. The research materials needed include masks, handscoons, alcohol, cotton rolls, mineral water, tissue, and disclosing agents.

The OHI-S examination was carried out simultaneously by 16 researchers assisted by research assistants (enumerators). Enumerators have the same educational status as researchers. Enumerators have carried out common perceptions through calibration and interrater reliability carried out with researchers.

The research subjects were examined before and after the intervention by conducting dental hygiene examinations (OHI-S index). The examination was carried out in the morning before the
school break. Examination of the OHI-S index is obtained from the sum of the calculus index scores and the debris index. How to check for index debris by applying a disclosing agent to the tooth surface then placing the probe on the tooth surface in the incisal/occlusal 1/3 area and moving it towards the gingival/cervical 1/3 area. Scoring for index debris according to the criteria. While the calculus index examination using a dental explorer is placed on the distogingival cervix and moved towards the subgingival area. The mode of movement is from the distal to the mesial contact area. Scoring for index debris is adjusted according to the criteria.

The researcher provided an intervention in the form of education in accordance with the intervention group, namely the pop-up books media intervention group and pocket books accompanied by enumerators. Education is given for 10 minutes. The intervention will be repeated once. After 1 week the evaluation was carried out, namely the study subjects were examined for dental hygiene (OHI-S index) after the intervention. The examination was carried out in the morning before the school break. The OHI-S measurement was carried out like the first OHI-S measurement. After the data is collected, do data processing. The next stage is the final report and research results. Analysis of the results was carried out with the normality test (Shapiro – Wilk) first. In this study the distribution is normal, so it is continued using the paired t-test.

RESULTS

In this study, there were 29 female children and 17 male children as subjects. The majority of subjects aged 10-11 years. A total of 29 students had never been to the dentist, 11 students had been to the dentist more than once every 6 months, and 5 students had been to the dentist every 6 months. So it can be concluded that the majority of research subjects had never been to a dentist.

Table 1. Distribution of Respondents Based on the Level of Dental and Oral Hygiene Before and After the Pop-Up Book Intervention

<table>
<thead>
<tr>
<th>The Level of Dental and Oral Hygiene</th>
<th>Before intervention n</th>
<th>%</th>
<th>After intervention n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>6</td>
<td>26</td>
<td>22</td>
<td>96</td>
</tr>
<tr>
<td>Moderate</td>
<td>16</td>
<td>70</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Bad</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Average</td>
<td>1.7 (moderate category)</td>
<td>0.6 (good category)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on table 1, before the intervention was given, the subject's dental and oral hygiene level had an average of 1.7 (moderate category). After the intervention, the average increased to 0.6 (good category).
Table 2. Distribution of Respondents Based on the Level of Dental and Oral Hygiene Before and After the Pocket Book Intervention

<table>
<thead>
<tr>
<th>The Level of Dental and Oral Hygiene</th>
<th>Before intervention n</th>
<th>%</th>
<th>After intervention n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>7</td>
<td>30</td>
<td>10</td>
<td>43</td>
</tr>
<tr>
<td>Moderate</td>
<td>10</td>
<td>43</td>
<td>11</td>
<td>48</td>
</tr>
<tr>
<td>Bad</td>
<td>6</td>
<td>27</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Average</td>
<td>2.1 (moderate category)</td>
<td></td>
<td>1.6 (moderate category)</td>
<td></td>
</tr>
</tbody>
</table>

Based on table 2, before the intervention was given, the subject's dental and oral hygiene level had an average of 2.1 (moderate category). After the intervention, the average increased to 1.6 (moderate category).

Table 3. Effectiveness of Health Education Through Pop-Up Books and Pocket Books on Dental and Oral Hygiene in School-Age Children

<table>
<thead>
<tr>
<th>Dental and Oral Health</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pop-up book media before</td>
<td>1.71</td>
<td>0.89</td>
<td>0.000</td>
</tr>
<tr>
<td>Pop-up book media after</td>
<td>0.64</td>
<td>0.39</td>
<td>0.000</td>
</tr>
<tr>
<td>Pocket book media before</td>
<td>2.10</td>
<td>1.14</td>
<td>0.000</td>
</tr>
<tr>
<td>Pocket book media after</td>
<td>1.60</td>
<td>0.99</td>
<td>0.000</td>
</tr>
</tbody>
</table>

The results of the paired t test concluded that the value of p = 0.000 (p <0.05) so that it can be concluded that there is a significant difference in the OHI-S score in the treatment of pop-up book media and pocket book media before and after treatment. The difference between the mean of the pop-up book before and after the intervention has a value (mean = 1.07) and the difference between the mean of the pocket book before and after the intervention (mean = 0.5) so that the pop-up book has a larger mean than the pocket book.

DISCUSSION

Oral stomatitis is inflammation that occurs in some location in the mouth such as on the tongue, palate, cheek mucosa, lips mucosa, gums, floor of the mouth and other locations. Oral stomatitis can lower quality life somebody like difficulty in speaking, chewing, and swallowing. The circumstances can too reduce the quality sufferer in studying and working. 3,12

In this study, before the health education pop-up book, most of the dental and oral hygiene subjects were in the moderate category. The majority of study subjects had soft debris covering more than 1/3 of the labial surface of the anterior teeth and less than 1/3 of the buccal surface of the posterior teeth. Calculus was mostly in the posterior buccal teeth. After being given pop-up book health education in the dental and oral hygiene category, the majority of the subjects had a good category.
Anterior and posterior teeth have decreased scores for both debris and calculus so that the average school-age child has a good category.\textsuperscript{15}

This is supported by research by Akbar which shows a significant difference between before and after being given pop-up book media to children. Increasing information will make someone more positive. Pop-up books can convey 75\% to 87\% of information to the brain, while only 13\% to 25\% of human knowledge is obtained and channeled through other senses so that pop-up books are more effective than other media. This is an advantage of pop-up books that present interesting pictures to children. Pop-up book media is suitable for use as teaching media, especially in improving dental and oral health. Pop-up book filled with interesting stories. He is able to build a better understanding of the essence of the book because the three-dimensional appearance is more real and easily understood by children.\textsuperscript{9}

The choice of media must be appropriate because it is adapted to learning needs. Pop-up books can increase children's creativity and stimulate children's imagination so that they will foster motivation to read in children. Pop-up books can display the potential to move and interact through folded, rolled, wheeled or rotating paper. This will make the visualization of the story more interesting when the page is opened. The results of research conducted at SDN 1 Pakunden showed the same result that pop-up books can help students better understand the material. Tests conducted before and after being given pop-up books showed a significant difference and the average value of school-age children increased.\textsuperscript{16}

The development of pop-up books media can be adapted to the needs of the material to be taught. Pop-up books can be used as teaching materials for students individually or in groups and pop-up books are practical and can add enthusiasm to student learning. The appearance of pop-up books is one of the advantages because it looks unique and different from other media. Pop-up books are one of the interesting innovations that can affect student learning outcomes themselves. The role of health education media in the form of pop-up books is very important to help students learn to understand the material.\textsuperscript{17}

In this study, before health education, most of the dental and oral hygiene subjects were in the moderate category. The majority of study subjects had soft debris covering less than 1/3 of the labial surface of the anterior teeth and 1/3 of the buccal surface of the posterior teeth. The calculus in the study subjects was not more than 1/3 of the tooth surface starting from the cervical to the buccal surface of the posterior teeth. After being given pocketbook health education in the category of dental and oral hygiene, the majority of subjects had the moderate category. Anterior and posterior teeth have decreased scores for both debris and calculus so that the average school-age child has a good category.\textsuperscript{18}
The pocket book used contains writing and pictures that describe the material. The subject's knowledge can increase because the absorption of information is obtained from reading and seeing, according to the pyramid of learning theory by Edgar Dale which states that absorption of information by reading is 10% and seeing is 30%. This pocket book contains information that is clear, firm and easy to understand, besides that it also contains writing and pictures so that the use of a pocket book can increase knowledge\(^{19}\). The use of media to carry out health promotion must fulfill several aspects so that it is easily accepted and understood by the subject group. The pocket book in the form of print media used, among other things, must generate interest in the target group to read the messages contained therein.\(^{12}\)

In today's modern era, many parents are found who have limited time in caring for or teaching children such as health problems that will affect the growth and development of children. So, it is necessary to hold programs such as health education for parents and children as an alternative to overcome this problem, one of which is using pocket book learning media. The pocket book has a function that can motivate the interest as well as the actions and emotions of those who read it. A good pocket book can convey clear information and messages and can develop the senses in children. This pocket book has simple language, attractive colors, and pictures that can support the message of the material to be conveyed.\(^{19}\)

Pocket books have a positive impact as indicated by changes in knowledge, attitudes, and skills of SD Negeri 33 Kendari students. This can be seen from before and after giving pocket book media to school-age children. Material with the pocket book can strengthen the information conveyed orally or used as a medium to convey information because print media is the media closest to children. The use of pocket books can help provide meaningful experiences for children so that children can implement their knowledge through physical activity and skills.\(^{20}\)

The difference in OHI-S scores before and after receiving education on maintaining oral hygiene using pocket books and pop-up books is closely related to the learning media used. The use of this program has several advantages, such as the presentation is attractive because there are games of colors, letters, and text animations as well as animated images or photos, it further stimulates students to find out more information about the teaching materials presented, and information messages are visually easy to understand for students.\(^{11}\)

Changes in behavior in children are influenced by age, experience, information, culture, and socio-economic. The characteristics of the age of the respondents who are in the range of 10-11 years will affect the way a person receives information, the older the child is, the mindset and ability to grasp information will develop. This situation is also influenced by the success factor of parents in educating school-age children to be able to clean their teeth and mouth.\(^{1}\)
In this study, the majority of the samples had never been to a dentist and had OHI-S criteria which were initially classified as moderate. The current OHI-S condition is influenced by the lack of health education by dentists. Children who are used to going to the dentist will be more disciplined in maintaining oral hygiene. The results of this study show that children who have good OHI-S are children who often go to the dentist. Early care from the dentist and daily care at home can allow children to have a clean and healthy mouth. Parenting style is a determining factor for independence and child development. This independence factor will affect the child's ability to maintain personal hygiene. Dental and oral health education and dental health services greatly affect the cleanliness of the oral cavity of children.

Age can affect the level of dental and oral hygiene. Someone with low understanding has less knowledge in maintaining oral hygiene. In contrast to people who have a higher ability to keep their teeth and mouth clean because they pay more attention to the condition of their mouth. Age is not a major factor but it does influence a person's oral hygiene. Oral hygiene is largely determined by a person's behavior in maintaining oral hygiene. Improper maintenance of oral hygiene will lead to easy accumulation of plaque, alba material, and calculus which will ultimately harm periodontal health. Poor oral hygiene can lead to complications such as tonsillitis, gingivitis, halitosis, xerostomia, plaque formation and dental caries. Several recent studies have shown that there is a relationship between infection in the thoracic cavity and poor oral hygiene. Oral health plays an important role as an important component of healthy living. Oral hygiene that is not maintained properly will cause disease in the oral cavity. Periodontal disease (such as gingivitis and periodontitis) and dental caries are the result of poor oral hygiene. Periodontal disease and dental caries are diseases in the oral cavity that can cause pathological tooth loss.

The brain stores information by inputting what is received by the sensor is passed on to the brain and stored in short-term memory, some information will be forwarded to long-term memory which is determined by attention to the information input. Attention, motivation, and the linkage of information to pre-existing knowledge in the brain are the most influential factors for storing information in long-term memory. These factors have the most influence on the storage of information in long-term memory. The use of the five senses will affect the knowledge gained. The more the five senses are used, the clearer the understanding or knowledge obtained from this information. Health education for Kedungmundu Public Elementary School students using pop up books and pocket books makes children use more than one sense, not only the sense of sight but also the sense of hearing, so that the knowledge given can be well received.

Pop up books media is more effective than pocket book media in reducing the OHI-S score. Pop up books are one of the simplest and most effective print media. Pop up books consist of 3D-shaped
sheets that can enhance children's sensory perception. This media contains messages and is explained with pictures for students to observe and re-evaluate these activities. The results of this study show that both media (pocket books and pop up books) in education for Kedungmundu Public Elementary School students can increase children's OHI-S. The OHI-S post test scores look better than the pretest scores. This relates to the brain and memory and the five senses of these children. Giving knowledge about brushing teeth using pocket books or pop up books is equally interesting and acceptable to children.23

Researchers in data collection have limited research time constraints because research subjects have limited time. This research also has constraints on children who have not been optimally conditioned to cooperate in research.

CONCLUSION

Based on the results of the research, there were differences between pop-up books and pocket books on the level of dental and oral hygiene in grades IV and V Kedungmundu Elementary School Semarang City. The dental health education with pop-up book media is more effective than pocket book media on the level of dental and oral hygiene in school-age children.

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