

RESEARCH ARTICLE

Effect of A'yun's predictor software on the behavior, saliva pH, and PHPM index

Quroti A'yun*, Ani Subekti**

*Health Polytechnics of the Ministry of Health Yogyakarta, Yogyakarta, Indonesia

**Health Polytechnics of the Ministry of Health Semarang, Semarang, Central Java, Indonesia

*Jl Kyai Mojo No. 56 Yogyakarta, Indonesia; e-mail: ayunquroti@yahoo.com

Submitted: 4th April 2017; Revised: 4th August 2017; Accepted: 12nd March 2018

ABSTRACT

Health Research in 2013 showed that 24.8% of children with health problems and dental caries index reached 1.4. A'yun's Predictor Software (APS) was a new tool to describe the interaction of various factors that play a role in the caries process. The program was developed to establish a better understanding of the multi-factorial aspects of dental caries in children, as well as a guide to improve behavior to reduce the risk of new caries. This study in children aged 10-12 years in SDN Baturan I, SDN Baturan II, SDN Mayangan and SD Muhammadiyah Trini in Sleman, Yogyakarta. Sampling technique was simple random sampling. This type of research was quasi-experimental control group (pretest and posttest design with control group). The independent variable was oral health education with APS and the dependent variable was the behavior of dental health maintenance oral and mouth, salivary pH and PHPM (Personal Hygiene Performance-Modified) index. Results data were analyzed by t-test. Research shown that there were significant differences between the treatment group and control group on the behavior of the maintenance of oral health of children and PHPM index ($p < 0.05$), while the pH of saliva there was not to be difference ($p > 0.05$). The conclusions of this study was significant APS application on dental health maintenance behavior oral and mouth, salivary pH, and the index PHPM in school children.

Keywords: A'yun's Predictor Software; behavior; PHPM Index; salivary pH; school children

INTRODUCTION

The results of the Basic Health Research (Riskesmas) in 2013 showed that in the age group of 12 years old, 24.8% of children had dental health problems and the dental caries index (DMF-T) reached 1.4. In addition, these results also showed that, along with an increasing age, the DMF-T index also increases.¹ Untreated dental caries may disrupt the growth and development of children.² This is due to a lack of understanding in dental and oral health maintenance. The factors that play direct roles in the caries processes are dental plaques, microorganisms, and carbohydrate diets. In addition to dental-oral condition factors, these processes Caries required time for processes time.³

WHO had stipulated that Global Goals for Oral 2020 targets to minimize the impacts of dental and craniofacial disease. These activities are

comprised of, for examples, providing dental and oral health education, and reducing the impacts of systemic diseases that manifest in the oral cavity through early diagnosis, prevention, and effective management of systemic diseases.⁴ According to WHO, one of the approaches to preventing dental diseases is to know the risk factors and the extent of the caries risk.⁵ In public health, it is necessary to measure the risk of caries for a health planning program. The future of the risk factor assessment programs can be an instrument for the planning and monitoring of dental and oral diseases.⁶

A previous study succeeded in developing A'yun's Predictor Software (APS), that is a software for predicting the caries risk in children based on the results of a study conducted to some elementary school children in the Special Region of Yogyakarta. There are nine new caries risk factors



Figure 1. APS Program

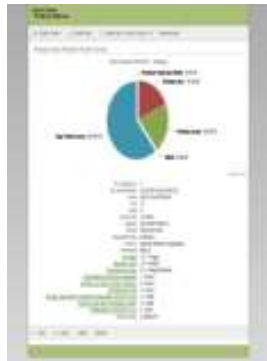


Figure 2. Caries risk



Figure 3. Suggestion and follow up of new caries prevention

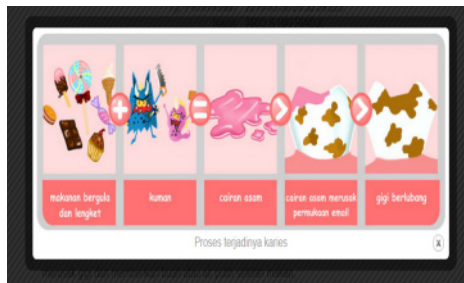


Figure 4. Caries processes



Figure 5. Suggestion for brushing teeth

for school children, namely: saliva pH, the amount of plaque, caries experience, utilization of dental health services, mother's behavior in selecting food for children, children's knowledge about dental health, children's behavior of dental health maintenance, children's behavior in selecting food; and the implementation of UKGS by teachers.⁷ A'yun's Predictor Software has high sensitivity and specificity. This software is one of the new ways to describe the interaction of various factors that play a role in caries process APS was developed to create a better understanding of the multi-factorial aspects of dental caries for children and their parents, as well as to serve as a guideline in estimating the risk of new caries in school children.⁸ This study aimed to determine the effect of APS on dental-oral health maintenance behavior, saliva pH, and PHPM index.

MATERIALS AND METHODS

This study used a pre-test and post-test design with control group. The population of this study was elementary school children in Sleman Regency. The samples of this study were school children aged 10-

12 years at SD Negeri Baturan I, SD Negeri Baturan II, SD Negeri Mayangan, and SD Muhammadiyah Trini in Sleman Regency. The samples were selected using simple random sampling, i.e. 365 children divided into: 198 respondents belonging to the group given dental and oral health education or DHE with APS (treatment group) and 167 respondents to the group given lecture method (control group).

The instruments of this study were: 1) questionnaires of children's behavior in dental-oral health maintenance, consisting of four questions 2) the format of saliva pH testing, and 3) the format of PHPM index (Personal Hygiene Performance-Modified) from Podshadley and Haley. The research materials were: 1) disclosing solution, 2) cotton swabs, 3) toothbrushes and 4) toothpaste. The tools used in this study were: 1) APS program software (Figure 1-5), 2) pH meter, 3) small glasses, 4) dental diagnostic tool.

New caries risk was measured in each of the respondents using APS program, i.e. testing the saliva pH, the amount of plaque, the utilization of

dental health care providers, children's behavior, mothers' behavior, and implementation of UKGS by the schools. Based on the caries risk obtained, the children in the treatment group were given DHE with APS and those in the control group were given lecture method twice, with an interval of four weeks. The data were analyzed using t-test to determine the differences in terms of dental and oral health maintenance behavior, saliva pH, and PHPM index between the treatment and control groups. This research was approved by the Health Research Ethics Commission (KEPK) Yogyakarta Health Polytechnics the Ministry of Health No: L.B.0.1/KE/VIII/065/2016.

RESULTS

From the results of the study of the effect of dental and oral health education using APS program on dental and oral health maintenance behavior, saliva pH, and PHPM index conducted from April

to August 2016 in Sleman Regency, the distribution of the respondents' characteristics is shown as follows (Table 1). Table 1 shows that most of the respondents were female (53.97%), aged 11-12 years old (61.10%), and most of their parents' education was Junior High School (35.07%).

Based on the results of the study shown in Table 2, there was an increase in dental health maintenance behavior by 11.62%, PHPM index by 8.59%, and saliva pH by 3% in the treatment group. In the control group, there was an increase in behavior by 0.6%, PHPM index by 9.59%, and saliva pH by 2.4% (Table 3). Table 4 shows that there was a significant difference in the treatment group ($p < 0.05$), while in the control group there was a significant difference in dental and oral health maintenance behavior (Table 5). Table 6 shows that there was a significant difference in PHPM index and behavior between the treatment and control groups ($p < 0.05$).

Table 1. Description of research respondents' characteristics

CHARACTERISTICS	CRITERIA	n	%
Gender	Male	168	46.03
	Female	197	53.97
Age	9-10 years old	142	38.90
	11-12 years old	223	61.10
Parents' education	Elementary School	63	17.26
	Junior High School	117	32.06
	Senior High School	128	35.07
	University	57	15.62
Income level	Low (<IDR 1,300,000.00)	25	6.85
	Middle (IDR. 1,300,000.00-IDR 4,999,999.00)	261	71.51
	High (>IDR 5,000,000.00)	79	21.64

Table 2. Distribution of Behavior, PHPM Index, Saliva pH in treatment group

Variable	Before APS				After APS			
	High		Low		High		Low	
	n	%	n	%	n	%	n	%
Behavior	175	83.38	23	11.62	198	100	0	0
PHPM	57	28.79	141	71.21	40	20.20	158	79.80
Saliva pH	159	80.30	39	19.70	162	81.81	36	18.19

Table 3. Distribution of Behavior, PHPM Index, Saliva pH in control group

Variable	Before Promotive using lecture method				After Promotive using lecture method			
	High		Low		High		Low	
	n	%	n	%	N	%	n	%
Behavior	152	91.02	15	8.98	153	91.62	14	8.38
PHPM	97	58.08	70	41.92	113	67.67	54	32.33
Saliva pH	148	88.63	19	11.37	144	86.23	23	13.77

Table 4. Paired t-test on pH, PHPM Index and behavior in treatment group

Item	Mean	SB	95 CI		p-value (sig)
			Lower limit	Upper limit	
saliva pH	-.0207	.0941	-.0339	-.0075	.002
PHPM index	2.066	3.972	1.509	2.622	.000
Behavior of dental-oral health maintenance	-2.500	2.549	-2.857	-2.143	.000

* there is a difference (P<0.05)

Table 5. Paired t-test on pH, PHPM Index and behavior in control group

Item	Mean	SB	95 CI		p-value(sig)
			Lower limit	Upper limit	
saliva pH	-.0090	.0849	-.0 22	.0040	.173
PHPM index	.144	.990	0.007	0.295	0.062
Behavior of dental-oral health maintenance	-.228	.896	-.364	-.091	.001

* there is a difference (P<0.05).

Table 6. Results of Independent t-test of saliva pH, PHPM Index and attitude of dental-oral health maintenance before and after DHE with APS and lecture method

Item	Mean	SB	95 CI		p-value(sig)
			Lower limit	Upper limit	
saliva pH	-.001	.15	-.023	.0205	0.926
PHPM index	5.54	4.58	4.89	6.18	0.000*
Attitude of APS	2.31	2.7	1.936	2.680	0.000*

* there is a difference (P<0.05).

DISCUSSION

The results showed that there were significant differences between the treatment and control groups (This shows that the Predictor of Childhood Caries is a learning tool to reduce the caries risks by improving behavior that is not yet good. There are three key elements of belief in the Health Belief Model, which are used to assess if someone will follow the recommendations of disease prevention behaviors, including threats, outcome expectations, and efficacy expectations.⁹ A'yun's predictor software produces a number in the form of a percentage of new caries risk predictions that children could perceive as a threat that their teeth may experience caries.⁸ If adjusted to the Health

Belief Model theory, children will perceive as vulnerability (caries risk factors) and severity (caries risk prediction). According to the Health Belief Model theory, any actions to improve behavior are the expected outcomes, and these expectations can be manifested by following the suggestions for the prevention of caries based on the amount of new caries risk obtained. Certain person is motivated to improve dental health behavior because he/she feels that dental diseases can be bad for health, and dental diseases can be prevented.¹⁰

A'yun's Predictor Software is an educational tool for dental and oral health education, therefore in the section of suggestions for the prevention of new caries, caries preventive measures can be

given in the form of images.⁸ In accordance with the development of school children, educational tools shall provide more images more because children will be more interested and it will be easier for them to remember what they read or see. A'yun's predictor software is a visual tool for dental health promotion to describe the extent of caries risk and its prevention. Learning media used for the learning process becomes more interesting. The media conveys audio and visual information, so as to describe the principles, concepts, processes and procedures that are abstract and incomplete to become clearer and more complete.¹¹

The results showed that the saliva pH in the treatment and control groups underwent no significant difference. A high saliva pH was obtained because the children's saliva was mucous and had a high volume, so the saliva pH was neutral. Most children aged 9-11 years old have a saliva pH that is alkaline or high because salivary gland secretion in children is quite high, making children have high salivary volume as well. One of the functions of saliva is as buffer which helps neutralize the pH of plaque after eating, maintaining the balance of saliva pH and reducing the occurrence of demineralization.¹⁰

The results of analysis using paired t-test showed that the saliva pH in the treatment group had a significant difference. This indicates that the risk of new caries motivates children and their parents to improve the behavior in dental-oral health maintenance in accordance with the recapitulations of the risk factors and suggestions as a follow-up of the APS.⁸

There was a significant difference between the PHPM index in the treatment and control group. Most children had an enormous amount of plaque related to their habits of eating cariogenic foods and their dental health maintenance behavior which is not good.¹² A decline in the PHPM index indicated that children's dental and oral hygiene increases or improves. This occurred to children who were treated with APS), whereas in the control group there was no significant difference. This situation is due to the implementation of DHE using APS which presented instructions using pictures.

Children could directly see and pay attention to it because DHE visually involves the sight through the symbols presented. Visual aid is a communication medium that is most easily understood by the recipients of the message because the sight plays the most significant role (90%), while hearing only 5%, smell and touch only 5%.¹³

The most commonly used method of dental and oral health education by health workers is lecture because it can be directly observed and believed, even imitated by the participants, so that it could provide/influence the beliefs, even the emotions, of students. Beliefs and emotions can be the basis of one's behavior.⁹ However, learning can be done in three styles, namely by utilizing the sight such as through reading and observing something, utilizing the hearing such as through radio and telephone, and learning through practice by directly applying knowledge or skill. Combining more of these learning styles as a learning method may result in a more effective method to increase knowledge.¹¹

The success of education is influenced by the utilization of strategies, methods and tools that could support the success of any educational activities. The success of an educational program or activity is seen when there is an increase in the results of educational activities that are performed.¹³ However, retention may last a long time if the information is given repeatedly. To avoid or prevent a decline in children's knowledge and skills, it is necessary to carry out any efforts to strengthen, i.e. by continuously and gradually supervising and refreshing the health promotion materials. This will be able to maintain the results of an educational activity. The supervision and refreshment may recall any things stored in someone's memory through a recall system.¹¹ Based on the results and discussion of the study on elementary school children in Sleman Regency, the suggestions are as follows: 1) The implementation of dental and oral health education for school children should use APS, 2) To maintain good children's dental health behavior, it is necessary to measure the risk caries and dental and oral health education every 6 months.

CONCLUSION

There is an effect of APS application on the attitude of dental-oral health maintenance, saliva pH, and PHPM index in school children.

ACKNOWLEDGMENT

Our thanks goes to the Health Polytechnics of the Ministry of Health Yogyakarta for providing grant for our research, the Headmasters, students and their parents at SDN Baturan I, SDN Baturan II, SDN Mayangan and SD Muhamadiyah Trini in Sleman Regency, DIY, for their willingness to be the respondents of this research.

REFERENCES

1. Kemenkes. Riset Kesehatan Dasar. Kemenkes. Jakarta: 2013. 110–119.
2. Martine CM, Ebert W, Irene HA, Johanna MB, Jacob M, Johannes J. The influence of dental caries on body growth in pubertal children. *Clin Oral Invest*. 2011; 15: 144–149.
3. Fisher-owens SA, Gansky SA, Platt LJ, Weintraub JA, Soobader MJ, Bramlett MD, Newacheck PW. Influences on children's oral health: conceptual model, American Academy of Pediatrics, Available from: <http://pediatrics.aapublication.org/content/120/3/e510.full.html>. 2007.
4. Kemenkes. Perencanaan program kesehatan gigi dan mulut. Kemenkes. Jakarta: 2010. 2011–2025.
5. Katsumura S, Nishikawara F, Tamaki Y, Yamafa H, Nakamura Y, Sato K, Tsuge S, Nomura Y, Hanada N. Evaluation of risk factors for dental caries from 6 to 8 years old children. *J Paediatr Dent*. 2008; 18(1): 27–33.
6. Twetman S, Fontana M. Patient caries risk assesment. *Monogr oral science*. 2009; 21: 91–101.
7. A'yun Q, Hendrartini J, Santoso AS, Nugroho LE. Prediction about the Incidence of caries in children base on children's behavior, parent's and environment. *The Indonesian journal of Dental Research. Proceeding of The International Symposium on Oral and Dental*. 2013: 149–155.
8. A'yun Q, Hendrartini J, Fatmasari D. Perangkat lunak karies anak berdasarkan faktor anak, perilaku ibu, dan UKGS. *Majalah Kedokteran Gigi Indonesia*. 2015; 1(1): 68–70.
9. Kaplan MP, Sallis JrJF, Patterson TL. *Health and human behavior*. McGraww-Hill; 1993.
10. Gudkina J, Brinkame A. A Caries experience in relation to oral hygiene, salivary cariogenic microflora, buffer capacity and secretion rate in 6 year olds ad 12 year olds in Riga. *Baltic Dental and Maxillofacial Journal*. 2008; 4: 76–80.
11. Dange JK. Learning and Experience: A Step model. *The online Journal of New Horizons in Education*. 2015; (5). 2
12. Darwita RR, Novrida H, Budiharto, Pratiwi, PD, Amalia R, Asri SR. Improving oral health awareness in primary school student. *J Indon Med Assoc*. 2011: 6.
13. Davis B, Summer M. Applying Dale's cone of experience to increase learning and retention: a study of student learning in a study of student learning in a foundation leadership course. *Qscience Proceedings*. 2015.