

Caries Risk of Candijati 01 Jember Elementary School Students Using "CARA" Application

Berlian Prihatiningrum*, Niken Probosari*, Sulistiyani*, Dyah Setyorini*, Roedy Budirahardjo*

* Faculty of dental medicine, Department Pediatric Dentistry, UNIVERSITY of JEMBER

Correspondence: berlian.fkg@unej.ac.id

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ABSTRACT

Background: The key to successful treatment to prevent dental caries in children is accuracy in determining the risk factors that cause dental caries. Caries risk is a person's chance of having several caries lesions over a certain period of time. Measuring the risk of caries is carried out so that preventive measures can be directed directly at people who have a higher risk of caries

Method: Research used is analytical observational with a cross sectional approach. The total population in this study were 170 students aged 6-12 years at Candijati 01 Elementary School. The results of filling out the questionnaire by respondent, dietary survey sheet and also a clinical examination of the oral cavity will be entered into the CARA application to obtain caries risk level for each individual and will display all data in a bar chart.

Result: Based on this study, 53,5% students in Candijati 01 elementary School is low caries risk. Based on the indicators used in the CARA application, the results showed that caries indicators and dental treatment history play an important role in causing dental caries. Meanwhile, dental health indicators act as predisposing factors for dental caries.

Conclusion: Based on the CARA analysis found that 6-12 years old students of Candijati 01 Elementary School who had were at a low risk category, but still having medium potential of avoiding new caries occurrence by controlling risk factors. CARA Application can be used as caries risk assessment because this application is easy to use and simple

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INTRODUCTION

The key to successful treatment to prevent dental caries in children is accuracy in determining the risk factors that cause dental caries.¹ Dental caries is a chronic disease that often occurs in children. This disease attacks children 7 times more often than fever. 1 Based on Basic Health Research in 2018 2, the total prevalence of dental caries in children aged 5-9 years increased from 54% to 93%. Meanwhile, data on the prevalence of dental caries in the Agro industrial area of Jember Regency based on research by Prihatiningrum, et al ³ in children aged 6-12 years is in the medium category with a def-t index of ^{4,11}. Based on research by Normansyah, et al ⁴, data on dental caries in stunted children aged 2-5 years in Panduman Village, Jember Regency shows a high incidence of caries. This shows that the risk of dental caries in children in the Agro-industrial area of Jember Regency is still high and requires attention.

Dental and oral disease in children if left untreated can cause pain, bacteremia, high treatment costs, growth and development disorders, speech disorders, premature tooth loss, which affects chewing and disrupts the growth of permanent teeth. ¹ Assessment of the risk of dental caries must be carried out as early as possible. possible to reduce the risk of caries becoming severe and to improve the quality of dental and oral health. ⁵ According to the American Academy of pediatric Dentistry (AAPD), the caries risk assessment procedures carried out generally provide accurate quantitative data for assessing risk factors that cause caries and providing preventive advice ⁵. AAPD has established a caries risk measurement that can be used by clinicians to determine treatment plans according to the child's individual level of caries risk. ⁶

Caries risk is a person's chance of having several caries lesions over a certain period of time. Caries risk measurement is carried out so that preventive measures can be aimed directly at people who have a high risk of caries. ⁷ The caries risk assessment model involves a combination of caries-causing factors including diet, fluoride exposure, host susceptibility and microorganisms which are influenced by various social factors, cultural and behavioral.⁵ A person's caries risk level can be determined in several ways, namely according to the AAPD (American Association of Pediatric Dentistry), according to the American Dental Association (ADA), using a cariogram, Traffic Light Matrix Model (TL-M), according to Caries Management By Risk Assessment (CAMBRA) and Irene's Donut.^{8,9}

The methods that have been developed have their respective advantages and disadvantages. For this reason, the research team wants to create an Android-based application to measure caries risk that is tailored to the needs of the agro-industrial community but still based on recommendations from AAPD. This application includes the presence of carious lesions, saliva flow rate, plaque on teeth, high sugar consumption, use of removable appliances, general child health, socio-demographic factors, and dental protection factors. ⁵

Candijati 01 Elementary School is one of the elementary schools located in the Tobacco Agroindustry area in Arjasa District, Jember Regency. According to research by Prihatiningrum, et al ³, data was obtained that children aged 6-12 years in the Agroindustrial area of Jember Regency have a caries incidence rate and oral hygiene is in the moderate category, so they still need more attention so that their dental and oral health can improve.¹⁰ The characteristic of an agro-industrial area is that the majority of the population works as plantation laborers and factory workers, with access to health services that is relatively further than the other villages or cities. Based on this background, the researcher aims to analyze the risk factors for dental caries in children aged 6-12 years in the Tobacco Agro-Industry Area of Jember Regency using the CARA (Caries Risk Assessment) application.

RESEARCH METHOD

This type of research is a research and development study conducted on elementary school-age children attending Candijati 01 Elementary School, Arjasa, Jember Regency in June - September 2023 to get a description of the level of caries risk. The population of school-age children at Candijati 01 Elementary is 170 students. The sampling technique in this study used total sampling. Subject criteria in this research were active students at Candijati 01 Elementary School, subjects who returned informed consent, questionnaire, and also diet survey filled in before the examination was carried out, subjects were in good health, and the subject's index teeth were complete ^{11, 31, 16, 26, 36, and 46} or there are namesake teeth if the index teeth are not present. ¹⁰ The CARA application is compiled using a Linux Ubuntu 20.04+ VM with 4GB+ RAM and sudo access. The CARA (Caries Risk Assessment) application has 3 indicator factors examined to determine the level of caries risk, there are dental caries experience, dental treatment history, and medical history. The results of filling out the questionnaire by the respondent, dietary survey sheet, and also clinical examination of the oral cavity will be entered into the CARA application to obtain the caries risk level for each individual. They will display all data in a bar chart. The data received will be analyzed and presented descriptively grouped based on caries risk level, including low caries risk level, medium caries risk level, and high caries risk level which will then be presented in narratives, piechart, bar charts, and tables. This research has been reviewed by The Ethical Committee of Medical Research Faculty of Dentistry University of Jember with certificate number 2010/UN25.8/KEPK/DL/2023.

RESULTS

The results obtained from Candijati 01 Elementary School were presented in Table 1, Table 2, Table 3, Table 4 and Table 5.

Table 1. Distribution of subjects based based on class, age and gender

Group	N	Percentage
Grade		
1	32	18,8 %
2	29	17,1 %
3	27	15,9 %
4	29	17,1 %
5	26	15,2 %
6	27	15,9 %
	Total 170	Total 100%
Age		
6 year	8	4,7 %
7 year	34	20 %
8 year	27	15,9 %
9 year	27	15,9 %
10 year	32	18,9 %

11 year	26	15,2 %
12 year	16	9,4 %
	Total 170	Total 100 %
Gender		
Male	89	52,4 %
Female	81	47,6 %
	Total 170	Total 100 %

Table 1 presents information on distribution of subjects based on grade, ages and gender. Overall, 18,8% subject is grade 1, 20% is 7 years old and 52,4% is male.

Table 2. Distribution Caries Risk Assesment Based on “CARA” Application (n=170)

Category	N	Percentage
Low	91	53,5 %
Medium	79	46,5 %
High	0	0 %

Table 2 presents information on distribution of Caries Risk Assesment based on CARA show that 53,5% is low category and 46,5% is medium category.

Table 3. Distribution of Frequency Consumption of Cariogenic Food

Category	N	Percentage
< 3 times a day	7	4,1 %
3-5 times a day	24	14,1 %
>5 times a day	139	81,8 %

Table 3 presents information on distribution of Frequency Consumption of Cariogenic Food. Overall, 81,8% subjects have more than 5 times a day for comsume cariogenic food, 14,1% subjects consume 3-5 times a day and only 4,1% that consume cariogenic food less than 3 times a day.

Table 4. Distribution of Plaque Index (n=170)

Category	n	Percentage
Excellent	3	1,8 %
Good	6	3,5 %
Medium	108	63,5 %
Poor	53	31,2 %
Total	170	100 %

Information on distribution of Plaque index (PI) show in table 4. 63,5% subject is medium category of PI, 31,2% subjects is poor category, 3,5% subjects is good category and only 1,8% subjects is excellent.

Table 5. Distribution of Saliva Volume (n=170)

Category	n	Percentage
High	7	4,1 %
Normal	9	5,3 %
Low	154	90,6 %
Total	170	100 %

Information on distribution of Saliva volume show in table 5. 90,6% subject is low category, 5,3% subjects is normal category, and 4,1% is high category.

Table 6. Distribution of Indicator in CARA based on Age (n=170)

Age (years old)	Caries History	Dental treatment History	Medical History	Chance of avoiding caries
6	17,28%	12,71%	2,13%	67,88%
7	13,00%	11,30%	2,10%	67,7%
8	15,06%	13,53%	2,87%	68,54%
9	24,13%	13,45%	4,37%	58,05%
10	17,24%	13,79%	6,90%	62,07%
11	19,75%	13,05%	2,85%	64,35%
12	15,96%	15,04%	2,75%	66,25%

Based on table 6, it show that the lowest chance to avoiding caries is in 9 years old group (58,05%), and the highest is on 8 years old group.

DISCUSSION

The caries risk assessment using CARA Application of the children were found in as much as 53,5% for low risk category and 46,5% for medium risk category. Caries risk factors can be identified from the subjective results, objective and clinical examination also supported by laboratory tests. From the results of risk factors evaluation, obtain three groups of caries risk, high, medium and low risk. By knowing a person's caries risk factors, a doctor can determine an appropriate promotional and preventive program to prevent the severity of caries.¹¹

The CARA application consists of three assessment indicators, namely caries history, dental treatment history and health history. In the caries history indicator, there are 7 assessment components including a) frequency of food consumption; b) number of cavities; c) tartar; d) saliva volume; e) presence of white spots; f) presence of gum inflammation; and g) history of using a pacifier or suckling food. Dental treatment history consists of 6 indicators, namely: a) tooth brushing history; b) history of dental treatment with fluoride; c) use of mouthwash; d) consumption of fibrous foods; e) history of tooth fillings, and f) history of visits to the dentist. And

Dental health history includes a) disability; b) medical compromise; c) history of drug use; d) history of chemotherapy; e) history of use of orthodontic treatment and f) the presence of bad habits related to tooth and jaw growth.

The research instrument used was the android-based CARA (caries risk assessment) form used for children from the age of 6 years and adults. Bacterial culture examination is not required in this method, to avoid high costs and efficiency.¹² Caries risk assessment is a method or concept based on the fact that dental caries is a disease whose severity can be prevented. The CRA instrument can be widely developed as a reasoning and algorithm-based method. As a reasoning-based models, risk factors and other important indicators are collected in a questionnaire and the risk is assessed qualitatively. While the concept of an algorithm-based, the risk is calculated quantitatively to increase the objectivity and accuracy of the diagnostics that are poured into an application¹³. According to Stamm *et al.*¹³, to be useful, a functioning caries prediction model must produce a sensitivity level of 0,75 or higher and a specificity level of at least 0,85 or higher. This is the main requirement that must be met by a caries risk assessment instrument. They further elaborated that any model, regardless of its ultimate accuracy, would have to be based on a data collection system that is relatively quick, inexpensive, requires a limited armamentarium, and be acceptable to those to whom it is applied.

Based on table 4, the results show that the oral hygiene of children at Candijati 01 Elementary School is in the medium category (63,5%) and followed by poor category (31,2%). The most frequently found indicators of dental caries history instrument are dental plaque and bleeding gums. While the history of dental care shows that respondents brush their teeth twice a day. In addition, the occurrence of dental plaque, bleeding gums, and balanced by the methods of brushing are important factors in the occurrence of dental caries and must be considered as factors causing the risk of caries in a person.¹⁴ Children with a high plaque index have a 4.3 times higher risk of suffering from dental caries compared to children with a low plaque index.¹⁵

Saliva also has an important role in the process of caries occurrence. One of them is saliva volume, based on table 5, the saliva volume of children at Candijati 01 Elementary School is in the low category (less than 0.9ml/minute) at 90.6%. However, saliva plays an important role in the process of plaque formation, and also as a life medium of microorganisms. The function of saliva is as a cleansing, anti-bacterial, lubricant, protective buffer and anti-solvent. There is a strong correlation between saliva's pH and dental caries risk. The decreasing buffer pH will increase risk of dental caries.¹⁶ The other factor of saliva is a during the night flow saliva will decrease that cause bacteria more active.¹⁷ Although it is acknowledged that there is a significant relationship between saliva pH and dental caries, there are still differences of opinion regarding the direct relationship between caries frequency and factors found in saliva such as chemical composition, viscosity, saliva buffers, flow and antibacterial factors.¹⁴

It was reported that clinical variables such as caries experience were the strongest predictor factors for the occurrence of caries in the future. Another contributing factor to dental caries is a diet high in sucrose.¹⁴ From table 3 show, more than half of the study population exhibited poor diet choices and consumed high sucrose foods more than 3 times per day (81,8%). The relationship between sucrose consumption and caries experience did not come from the amount of sucrose consumed but rather the frequency.¹³ The influence of diet on the caries process is usually more local than systemic, especially in terms of frequency of food consumption.¹⁸ In a study conducted by Setiawan *et al.* (2016), it was stated that the habit of consuming food or drink containing sugar more than 3 times a day can increase the risk of caries.¹⁸ Increasing the frequency of

consuming of snacks between meals will stimulate an increase of plaque acidity and the dominance of lactic acid bacteria.¹³

Based on the indicators used in the CARA application, the results showed that caries indicators and dental treatment history play an important role in causing dental caries. Meanwhile, dental health indicators act as predisposing factors for dental caries. From table 6, group of 9 years old show the lowest possibility to avoid caries in the future (58,05%). This means that a chance to avoid new caries still moderate potential level. Behaviours in maintaining oral health and hygiene such as brushing teeth, cleaning the tongue and using dental floss are influenced by socio-psychological consequences such as attitude, social norms and behavioral control.¹⁷ Because prevention of tooth decay can be done by controlling risk factors such as diet, bacteria, susceptibility factors and other conditions. By knowing the caries risk status, a more appropriate dental and oral care management model can be developed in the form of health promotion in the form of counselling on how to maintain healthy teeth and mouth as well as caries prevention through controlling caries risk factors in children such as giving fluoride, closing gaps/curvatures on the tooth surface (fissure sealant), so that the prevalence of caries can be reduced.²⁰

CONCLUSION

Based on the CARA's analysis, it was found that Candijati Elementary School students aged 6-12 years old had low risk, but still had moderate potential to avoid the occurrence of new caries by controlling risk factors. And the CARA Application can be used as a caries risk assessment because this application is easy to use and simple.

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