

PUFA Index-Based Rate of Untreated Dental Caries Children in Sungai Kupang Kalimantan Indonesia

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Abstract. Dental caries is a multifactorial disease that is a health problem in children. Children 5-9 years old have the highest caries prevalence. Measurement of untreated dental caries can be measured using the PUFA/pufa index. Sungai Kupang Village has a pH value of acidic waters ranging from 3.09-6.45 and an iron (Fe) content above the maximum allowable level, which is 1.044mm/ltr. Most people use wetland water for their daily life, one of them is for gargling after brushing their teeth. Brushing teeth with acidic water can reduce the surface hardness of tooth enamel which causes dental caries. The study used a descriptive method with a cross-sectional design. The sampling technique used was purposive sampling. The sample of 47 children aged 5-9 years was examined visually with the aid of a dental mirror to assess the severity of dental caries using PUFA/pufa index criteria including pulp involvement (P/p), ulceration (U/u), fistula (F/f), and Abscess (A/a). The research data were analyzed descriptively and expressed in terms of frequency, percentage, and average PUFA/pufa. PUFA/pufa index of untreated dental caries in the form of pulp involvement (P/p) was 3.0; ulceration (U/u) was 0.06; fistula (F/f) was 0.1, and abscess (A/a) was 0.02. The caries severity of untreated dental caries based on the PUFA/pufa index was 3.1. The 7-year-old age group and female gender had the highest average PUFA index. According to the average PUFA/pufa index, children 7 years old and female have the most severe untreated dental caries.

Keywords: Dental caries children, PUFA/pufa index, Sungai Kupang district, Wetland.

1 Introduction

Dental and oral problems that are often complained about by society, both children and adults, are dental caries. Nationally, according to Riskesdas 2018 data, the age group that has the largest proportion of dental and oral problems is the age group of 5-9 years (67.3%) with 14.6% having received treatment from dental medical personnel. Dental caries is a multifactorial disease that is a health problem for most of the world's population. Based on World Health Organization (WHO) survey data, it is recorded that 60-90% of children experience caries worldwide. Based on the results

of Basic Health Research (RISKESDAS) in 2018, the prevalence of caries in Indonesia reached 88.8% with a DMF-T index of 7.1. The group of children aged 5-9 years has a caries prevalence of 92.6% with a DMF-T index of 0.7.[1], [2], [3], [4]

Dental caries is a disease that can occur due to several factors that cause each other to influence each other, namely the host, microorganisms, substrate, and time. Some factors that can facilitate caries to occur are predisposing factors. Predisposing factors of dental caries that play a role in the severity of caries are caries experience, socioeconomic, age, gender, behavior towards dental health, and geographical location. Some important environmental factors have an influence on the occurrence of caries including the water drunk, the socioeconomic culture of the population. Untreated dental caries in a child often causes problems associated with general health, significant pain, facial abscesses, and eating disorders.[5]

The impact on untreated caries can lead to conditions in the oral cavity such as pulpitis, ulceration, fistulas, and abscesses (PUFA/pufa). One of the measurements of untreated dental caries can be measured using the PUFA / pufa index. The PUFA/pufa index is an index used to assess the condition of the oral cavity caused by untreated dental caries. The PUFA/pufa index establishes four different clinical stages of developing caries so as to provide a real picture of the general condition of the mouth. The PUFA/pufa index is proven to be adequate for measuring the severity of tooth decay, and can be used universally, besides that it is safe and easy to use even in simple field conditions.[3] Pufa/pufa index checking only takes a short time and does not require any additional equipment. The PUFA index in permanent teeth has a score between 0-32 while the pufa index in the firstborn teeth has a score between 0-20. The PUFA/pufa index was assessed based on the involvement of the pulp (P/p), ulceration in soft tissues (U/u), the presence of Fistulas (F/f), and abscesses (A/a).[6], [7], [8], [9]

The Kalimantan Island has a distribution of 9.75 million ha of wetlands where as South Kalimantan has 1.48 million ha. Most parents living in wetlands have a habit of using wetland water for their daily routine, such as gargling after toothbrushing.[27] Dental and oral problems themselves were included in the top ten diseases in peat district health centers in 2020. According to the central statistics agency of Banjar Regency in 2020, in sungai kupang village there are no hospitals, puskesmas, auxiliary health centers, polyclinics, and pharmacies. The nearest puskesmas from sungai kupang village itself is near the Gambut Subdistrict office. The distance between sungai kupang village and Gambut sub-district office is 13.50 km. According to data from the central statistics agency of peat districts in 2020, there were no general practitioners or paramedics. The pH value of waters in the Peat District area is also said to be acidic, this pH value ranges from 3.09-6.45. The iron (Fe) content in the water consumed by the people of Banjar Regency is 1,044mm / ltr, the iron content (Fe) is above the maximum allowable level of 0.3mm / ltr.[10], [11], [12], [13] The purpose of this study was to determine the severity of untreated dental caries in children aged 5-9 years in Sungai Kupang Village based on the PUFA index.

2 Methods

The research began with making a research permit and ethical clearance issued by the Faculty of Dentistry, University of Lambung Mangkurat No. 059 /KEPKG-FKGULM/EC/V/2022. This

study used a descriptive type of research with a cross-sectional design to determine the frequency distribution of severity of untreated dental caries using the PUFA / pufa index based on age and gender variables. The population in this study were children aged 5-9 years in Sungai Kupang Village, Gambut District, Banjar Regency. The sampling technique of this study used the purposive sampling technique.

The tools used in this study were glass mouth, stationery, and personal protective equipment. The research materials used in this study. The materials used in this study were hair caps, gowns, medical masks, handsoons, face shields, hand sanitizers, informed consent sheets, and dental examination status cards. Research data were obtained from the examination of the oral cavity of the subjects. To assess the severity of untreated dental caries using the PUFA/pufa index criteria. Pufa indices include P/p, U/u, F/f, and A/a. P/p represents pulp involvement, which can be noted if the pulp chamber can be seen. No probing was performed on this examination of pulp involvement. U/u is ulceration that can be noted if there is a traumatic ulcer resulting from the sharp edges of the dislocation with pulp involvement or root fragments. F/f is a fistula, it can be marked if pus comes out of the sinus tract associated with a tooth with pulp involvement. A/a is an abscess that can be noted if there is swelling accompanied by pus associated with pulp involvement. This assessment is made visually without the use of any other auxiliary tools besides the dental mirrors. PUFA/pufa score per person, which is the number using the same method as DMF-T/def-t & represents the number of teeth included in the PUFA/pufa diagnosis criteria. Capital letters for permanent teeth & lowercase letters are used for deciduous teeth. Scores for deciduous & permanent teeth are recorded separately. So for an individual score person, the PUFA/pufa score range is based on 0-20 for primary teeth, & 0-32 for permanent teeth. The prevalence of PUFA/pufa is calculated into a percentage of the population using one or more PUFA/pufa scores.

The data analysis used in this study is a descriptive analysis that aims to provide an overview of the severity of untreated dental caries in children aged 5-9 years in Sungai Kupang Village. Descriptive analysis is analyzing data by describing or describing the data collected without making conclusions that apply to the public. Data analysis in this study is by grouping, tabulating, and presenting data collected from the examination of the oral cavity of respondents. The data needed in this study are age, gender, and score from the PUFA/pufa index. Based on this data, it will be expressed in the form of frequency, percentage, and an average of the PUFA / pufa index in decimal numbers and then presented in the form of a table input in Microsoft Excel.

3 Results and Discussion

3.1 Results

This research was conducted from January 2022 to May 2022. The following is the result of a study related to the description of the severity of dental caries and dental caries that were not treated based on the PUFA/pufa index in children aged 5-9 years in Sungai Kupang Village, Gambut District, Banjar Regency with a total of 47 samples.

Table 1. Table of Distribution of Respondents' Characteristics by Age and Gender

Variable	Frequency (n)	Percentage (%)
Age (years)		
5	8	17%
6	11	23%
7	16	34%
8	6	13%
9	6	13%
Total	47	100%
Gender		
Male	20	43%
Female	27	57%
Total	47	100%

Based on Table 1, the age group in this study was divided into five groups: children aged 5, 6, 7, 8, and 9. The most respondents at the age of 7 were 16 people, with a percentage of 34%. The fewest respondents at the age of 8 and 9 were 6 people, with a percentage of 13%. The majority of respondents were female, as many as 27 people, with a percentage of 57%.

Table 2. Severity Table of Untreated Dental Caries Using PUFA Index Based on Sex Frequency Distribution

Gender	Frequency (n)	%	P	U	F	A	Index's PUFA
Male	20	43%	55	1	4	0	3,0
Female	27	57%	84	2	1	1	3,3
Total	47	100%	139	3	5	1	3,1

Based on Table 2, it is known that children with the female sex have an average PUFA/pufa index of 3.3. Meanwhile, a child with a male gender has an average PUFA/pufa index of 3.0. This average result was calculated by summing the teeth with the categories P/p, U/u, F/f, and A/a then divided by the number of respondents from the study. Based on the calculation of the PUFA / pufa index, it is obtained that females have higher numbers than males.

Table 3. Severity Table of Untreated Dental Caries Using PUFA Index Based on Age Frequency Distribution

Age	Frequency (n)	%	P/p	U/u	F/f	A/a	Index's PUFA
5	8	17%	22	0	2	1	3,1
6	11	23%	31	1	2	0	3,1
7	16	34%	57	0	0	0	3,6
8	6	13%	13	1	0	0	2,3
9	6	13%	16	1	1	0	3,0
Total	47	100%	139	3	5	1	3,1

Based on Table 3, research in children aged 5-9 years showed that the 7-year-old age group had the largest average PUFA/pufa index, which was 3.6. The age group that has the smallest average PUFA/pufa index at the age of 8 years, which is 2.3. The average value was obtained by summing the teeth with the categorie P/p, U/u, F/f and A/a then divided by the number of respondents by age group.

Table 4. Frequency Distribution Table of Dental Caries

Dental Caries	PUFA/pufa		Sum
	With PUFA/pufa	Without PUFA	
Permanent (D)	56	48	104
Primary (d)	92	156	248
Total	148	204	352

Table 4, shows that primary teeth have more dental caries than permanent teeth, namely 248 teeth with 92 pufa teeth and 156 pufa. Table 4 shows the total teeth with caries in children aged 5-9 years in Sungai Kupang Village as many as 352 teeth. Teeth that experienced severity based on the PUFA/pufa index were 148 consisting of permanent teeth and primary teeth. PUFA/pufa *ratio* is calculated using the formula (Tarigan, 2020). Based on the results of the PUFA / pufa *ratio* calculation, a result of 42 was obtained, meaning that every 100 teeth that are caries there are 42 teeth that experience severity due to untreated dental caries and cause pulp involvement, *traumatic ulcers*, fistulas and abscesses (PUFA / pufa) in children aged 5-9 years in Sungai Kupang Village.

Table 5. PUFA Index Average

Category	Sum	Average
P/p	139	3
U/u	3	0,06
F/f	5	0,1
A/a	1	0,02
PUFA/pufa	148	3,1

Based on Table 5, it shows the average severity of dental caries that are not treated in children aged 5-9 years in Sungai Kupang Village and cause the involvement of pulp (P/p), ulcers (U/u), fistulas (F/f), and abscesses (A/a). The severity of dental caries that is not treated based on the PUFA/pufa index in children aged 5-9 years in Sungai Kupang Village has an average of 3.1.

3.2 Discussion

The results of this study showed that the severity of untreated dental caries based on the PUFA/pufa index was highest in children with the female sex. The results of the study by Tarigan (2020) and Sumual (2016) also stated that the severity of untreated dental caries based on the PUFA/pufa index was highest in girls.[8], [14] These results are by the theory described by Volker and

Russel which states that female have a higher prevalence of dental caries than male because the eruption of female's teeth is faster so that female's teeth stay longer in the oral cavity. Teeth that are longer in the oral cavity result in the teeth will be more likely to be associated with risk factors for caries.[8] According to Listriana (2018) hormonal factors in females also affect the occurrence of caries, if the hormone estrogen in females increases, the number of caries also increases.[13] The biochemical composition of saliva and the flow rate of saliva are affected by hormonal fluctuations, which results in a more cariogenic state of the female oral cavity than male.[15] Milhahn- Turkeheim states that dental caries in the first molar teeth in females are higher than that of males.[13]

The severity of dental caries that is not treated in children aged 5-9 years in Sungai Kupang Village is based on the highest PUFA/pufa index in the 7-year age group, which is 3.6. The results of this study are in line with research by Tarigan (2020) which states that children the age of 7 years have the severity of untreated dental caries based on the highest PUFA / pufa index of 2.06. 14 The results of the same study were also obtained in a study by Sumual (2016) which stated the frequency distribution of children with untreated dental caries severity based on the highest PUFA / pufa index in children aged 7 years of 1.8.[8] Children with an age group of 6-7 years tend to consume a lot of cariogenic and sticky foods, such as chocolate, sweets, sugar, and cakes. In addition, children at the age of 6-7 years tend not to be able to carry out the maintenance of dental and oral hygiene properly and regularly.[16], [17] According to Sumual's research (2016) the severity of dental caries in schoolchildren aged 6-9 can be caused by the large number of children who have firstborn teeth.[8] Damage to deciduous teeth spreads faster and more severely than permanent teeth. This is because the enamel structure on the deciduous teeth is thinner and less dense.[18] In addition, the factor that affects the health of the teeth and mouth is behavior. According to research by Widayanti (2014) children with caries are caused by parents who are less able to carry out primary prevention which results in the child's lifestyle and diet is out of control.[19]

Based on the results of this study, it was also found that P / p or teeth with the severity of dental caries that were not treated and resulted in pulp involvement had an average of 3.0. The average P/p value in this study is higher than the results of a study by Sumual (2016) which stated that the average P/p in the study was 1.5.[8] The results of the lower average P/p were also stated in a study by Siregar (2019) and Tarigan (2020) which showed an average of 1.54 and 0.84.[6], [14], [20] The average value of U/u in this study was 0.06. This result is in line with research by Siregar (2019) which also states the average value of U / u of 0.06. Average F / f in this study is 0.1. This average result is almost the same as the average F / f in the study by Tarigan (2020) which stated an average of 0.17.[14] The average A/a value found in this study was 0.02. This result is almost close to the average A/a result in a study by Sumual (2016) which stated an average of 0.03.[8] The severity of untreated dental caries most results in pulp involvement (P/p). The sample from this study was school-aged children 5-9 years who tended to consume a lot of cariogenic foods containing sugars such as sucrose. Sucrose is the main food of the *Streptococcus mutans* bacteria to develop in the oral cavity and help the attachment of other bacteria to the teeth. The bacteria that cause caries that accumulate result in increased acid production so that the pH of plaque drops and causes caries. If not treated immediately the damage will extend deeper than the tooth part, that is, the pulp.[21] Dental caries can cause holes in the teeth which then give rise to abscesses and fistulas on the gums.[22] Ulcers can be caused by physical trauma such as the sharp surface of the teeth due to caries.[23]

The average value of the pufa index as a whole in this study was 3.1. This result is almost close to the results of Monse's research in the journal by Siregar (2019).[20] This study and the study by Siregar (2019), Tarigan (2020), and Sumual (2016) used school-age children as research samples, but there were differences in the place of study. This research was conducted in Sungai Kupang Village, Gambut District, Banjar Regency. The research conducted by Siregar (2019), Tarigan (2020), and Sumual (2016) was carried out in elementary schools that are still in urban areas. According to Imran's research (2019), there are many differences between the behavior of rural and urban communities regarding dental health. Environmental factors result in differences in the behavior of rural and urban communities. The place of residence affects the knowledge of a person. People living in villages have less knowledge of dental and oral health compared to people living in cities. Knowledge of dental health in rural areas is still uneven.[24] People living in remote villages still do not know the benefits of dental health maintenance and do not have the motivation to go to the dentist, besides that the influencing factors are the behavior of the community in seeking health services, distance and shelter with health services, and difficulties in accessing transportation.[25], [26], [27]

4 Conclusion

According to the average PUFA/pufa index, children 7 years old and female have the most severe untreated dental caries.

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