

## Control of Risk Factors through sCD14 Analysis in Groups of Children with Very High and Very Low PUFA Index

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### Abstract

Control of risk factors is necessary for preventing the occurrence of caries severity in children. Risk control can be obtained through analysis of sCD14 levels in saliva. sCD14 is one of the first receptors to recognize caries that is used as a factor of many caries. The purpose of this research is to analyze the control of risk factor of the sCD14 level with pufa index through filling, in order to establish their role as an instrument of early detection of caries risk.

Materials and tools used are a glass of mouth, sonde, tweezers, tray, examination form, saliva kit and Elisa kit. Analytical observational research design with a case-control design. Case group is subject to very high pufa index, while the control group is subject to very low pufa index. The sample size is determined by rule of thumb. Sample selection using Simple Random Sampling technique. Indicators measured were caries incidence using individual puff values and sCD14 levels by ELISA method, then analyzed by Wilcoxon test.

Individual self-sufficiency rates in SDN Mekarjaya at very low and very high pufa values (31.1% and 33.8%), while the individual self-sufficiency in SDN Cikawiri was at most very high pufa (42.6%). Mean CD14 concentrations before treatment at the puff are very high (8.91 ng / mL), whereas average CD14 concentrations in puffs are very low (28.02 ng/mL). Mean CD14 concentrations after intervention through preventive efforts were fissure sealant (control) (26,41) and after patching (23.17). There was no difference of CD14 concentration before and after fissure sealant ( $P=0.173$ ) and there was a difference of CD14 concentration before and after pilling ( $P=0.001$ ).

There is no difference of sCD14 concentration before and after fissure sealant intervention. However, there is a difference in sCD14 concentrations before and after the patch intervention.

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### Introduction

Protein CD14 serves as a bacterial receptor, contributing to bacterial removal in the oral cavity to maintain oral hygiene out of saliva daily.<sup>1</sup> Salivary protein sCD14 is reduced in a sample of young patients with active caries, while in young patients free of caries it is possible to detect the presence of sCD14 protein clearly in the salivary.<sup>2</sup> The inverse association between the presence of sCD14 in saliva between active

caries and caries-free patients with early-stage tooth decay results suggests that this saliva protein may play an important role in the development of dental caries.<sup>3</sup> For revealed that it is necessary to study the relationship of sCD14 levels in saliva with PUFA index. PUFA Index is an index used to assess caries severity/oral condition due to untreated caries.<sup>4</sup>

Biria research mentioned that the intervention of filling in children with early childhood caries had a significant effect. Significant effects were seen in the presence of elevated sCD14 levels in these children after being treated in the form of patches.<sup>5</sup>

Untreated carious caries or active caries can be measured using the pufa index.<sup>4</sup> The results of a study of 39 children in elementary school in SDN Mekar Jaya and SDN Cukawari Kabupaten Bandung found that 100% of children have pulp involvement, therefore it is necessary

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to control risk factors through Protein analysis sCD14 (Cluster of Differentiation 14).<sup>6</sup> Protein sCD14 is an antibacterial protein in saliva plays an important role in protecting the hard tissues in the oral cavity from infection by pathogenic bacteria and can be used as biomarker.<sup>7</sup>

Children aged 6-12 years are the most susceptible to dental caries, therefore caries risk assessment should be done as early as possible by each child. Cooperation between dentists and parents is necessary to implement the management protocol.<sup>8</sup>

The description of the research background led to the need to investigate the association of sCD14 levels in saliva with PUFA Index in order to establish their role as an instrument of early detection of dental caries risk. So the research aims to analyze the control of risk factor in children who have sCD14 with very high pufpa index as treatment group and children who have sCD14 with very low pufa index.

### Materials and methods

Materials and tools used are a glass of mouth, sonde, tweezers, tray, examination form, saliva kit and Elisa kit. The study design was an experimental study comprising two groups of treated populations. The sample was taken randomly simple random sampling technique.<sup>9</sup> The number of samples followed the rule of thumb in the sample determination of 30 people.<sup>10</sup> The treatment group was the subject of the study which had a very high puffer index treated with tetracycline restoration treatment (ART), while the group control is a subject of research that has a very low puff index with the treatment of fissure sealant.

Indicators measured were caries incidence using individual puff values and sCD14 levels by ELISA method, then analyzed by Wilcoxon test, because the assumption of normality test is not normally distributed.<sup>11</sup> The research variables in this research are puff index as independent variable and sCD14 as the dependent variable. The operational definitions of the indices of pufa and sCD14 are as follows:

**The Pufa Index:** p/pulp, is noted on the examination form when it appears that the opening of the pulp chamber when the coronal structure of the tooth has been damaged by the caries process or left is only the root fragment or when the sonde hooks on the tooth surface.

u/ulser, is recorded on the examination form when there is a trauma derived from sharp pieces derived from the teeth dislocated with pulp involvement or derived from root fragments causing ulcer trauma in soft tissues, tongue, or buccal mucosa. f/fistulas are recorded on the examination form when there is evidence of pus coming out of the sinus cavity associated with a carious tooth with pulp involvement. a/abscess is recorded on the examination form when seen when pushing the swelling dislocation associated with dental caries with pulp involvement.<sup>4</sup>

The pufpa index is calculated by summing individual scores of individual scores ranging from 0-20 for primary dental puffs and 0-32 for permanent teeth. the pufa for the population is calculated from the average and has a decimal value,<sup>4</sup> then criticized according to the def-t index into very high, high, high, low and very low categories.

sCD14 was measured using saliva as a sample.<sup>7</sup> The salivary collection was performed without the use of stimuli. Research subjects, it is suggested to bend the saliva accumulated under saliva for more than 90 seconds,<sup>12</sup> then the collected saliva is taken for examination using the Suction method. Saliva is constantly sucked from the bottom of the mouth to a measuring cup using a saliva ejector or aspirator. Saliva was then centrifuged and calculated sCD14 using the Elisa test.

### Results

Table 1 shows that individual self-sufficiency rates in SDN Mekarjaya are almost equal to very low (0.01.1) and very high (> 6.6) puffs of 31.1 percent and 33.8 percent. The percentage of low-case pufpa (1.2-2.6), moderate (2.7-4.4) and high (4.5-6.5) is in the range of 6-18 percent.

Rating	Category	Number	%
Individual PUFA	Very Low	23	31.1
	Low	5	6.8
	Moderate	13	17.6
	High	8	10.8
	Very High	25	33.8
Total		74	100

**Table 1.** Values of Individual PUFAs SDN Mekar Jaya. Individual Value Data of SDN Mekar Jaya and SDN Cikawiri<sup>13</sup>

Rating	Category	Number	%
Individual PUFA	Very Low	46	24.2
	Low	4	2.1
	Moderate	29	15.3
	High	30	15.8
	Very High	81	42.6
Total		190	100

**Table 2.** Values of Individual PUFAs SDN Cikawiri<sup>13</sup>

Table 2 shows that individual self-sufficiency rates in Cikawiri Elementary Schools are at the highest (> 6.6) of 42.6%, others are in very low criteria (0.0-1.1), low (1, 2-2.6), moderate (2.7-4.4) and high (4.5-6.5).

Data on the number of dental research subjects who received fissure sealant and patching as follows:

Sample	Samples with low pufa values	Samples with high puffa values
	Number of teeth in fissure sealant	Number of Patched Teeth / ART
1	1	3
2	1	3
3	1	4
4	2	2
5	1	4
6	2	3
7	1	2
8	1	3
9	3	2
10	1	2
11	1	2
12	1	3
13	1	4
14	1	1
15	1	3
Total	19	41

**Table 3.** Control of Risk Factors in Group of Children with very high and very Low Puff.

Table 3 shows the frequency distribution of curative interventions by conducting preventive interventions by fissure silent at very low puff index and patching in groups of children with very high puff index.

Sample	Samples with low pufa values	Samples with high puffa values
	Teeth in the fissure sealant	Teeth that are patched
Number of teeth intervened	1.3	2.7

**Table 4.** Average number of study subjects subjected to fissure sealant treatment and patching of ART.

Table 4 above shows the most abundant number of tooth-treated teeth in 1-2 groups in very low puffs and 2-3 teeth in groups with very high puffs.

The CD14 data before and after the fissure sealant intervention in the low-index indices group (table 5) and CD14 data before

and after the administration of the pilling intervention (Table 6), as follows:

Table 5. SCD14 concentrations before and after fissure sealants in the puff group were very low. Table 5 shows the average sCD14 concentration at very low puffa before the intervention of 28.02 ng/mL, whereas after fissure sealant intervention the sCD14 concentration was 26.41 ng/mL.

Table 6 shows the average sCD14 concentration at very high puffa before the intervention of 8.91 ng/mL, whereas after intervention concentration interval of 23.17 ng/ML.

Sample	Concentrations of sCD14 (ng / mL)	
	Before Fissure Sealant	After the Fissure Sealant
1	7,17	43.23
2	30,82	16.13
3	30,51	19.25
4	31,74	40.47
5	30,82	40.11
6	29,59	19.97
7	30,21	27.40
8	29,59	20.21
9	29,9	33.52
10	28,06	35.79
11	28,37	12.42
12	26,84	22.85
13	28,68	28.12
14	30,21	18.29
15	27,76	18.41
Total	420,27	396.16
Average	28,02	26.41

**Table 5.** SCD14 Concentrations Before and After Fissure Sealants in the Puff Group Were Very Low.

Sample	Concentrations of sCD14 (ng / mL)	
	Before Patching	After ART Patching
1	5.49	19.73
2	5.7	27.76
3	13.39	14.10
4	5.24	47.30
5	9.78	25.00
6	4.63	40.83
7	9.62	27.16
8	5.03	20.45
9	5	19.13
10	12.72	14.45
11	3.44	37.23
12	7.14	32.08
13	5.03	21.77
14	7.88	30.16
15	33.58	39.87
Total	133.67	417.02
Average	8.91	23.17

**Table 6.** Concentrations of sCD14 before and after Patching in the puff group were very high.

The results of homogeneity test data using Kolmogorov test are presented in the tables below:

Data	Significance Value	Information
Concentration sCD14 (ng/mL) Before Fissure Sealant	0.046	Normal Data
Concentration of sCD14 (ng/mL) After Fissure Sealant	0.585	Data Not Normal
Concentration of sCD14 (ng/mL) Before Patching	0.290	Data Not Normal
Concentrations of sCD14 (ng/mL) After Patching	0.971	Data Not Normal

**Table 7.** Kolmogorov Smirnov Normality Test Result.

Table 7 shows the data is not normally distributed. The next test using nonparametric test with a paired sample that is by using Wilcoxon signed rank<sup>10</sup> test as follows:

Data	Significance Value	Information
Concentration of sCD14 (ng/mL) Before and After Fissure Sealant	0.173	Ho accepted

**Table 8.** Wilcoxon Signed Rank Test Result Risk Factor Control in Children Group with high pufa through Fissure Sealant Intervention.

Table 8 shows the significance value of 0.173. This value is greater than the significance value of 0.05 which means this value indicates that there is no difference in sCD14 concentration before and after fissure sealant intervention.

Data	Significance Value	Information
Concentrations of sCD14 (ng/mL) Before and After Patching	0,001	H1 accepted

**Table 9.** Wilcoxon Signed Rank Test Results in Risk Factor Control in Children Group with High Pufa through Intervention Patch of ART.

Table 9 shows the significance value of 0.001. This value is smaller than the significance value of 0.05, which means that this value indicates that there is no difference in sCD14 concentrations before and after the filling intervention.

## Discussion

SCD14 concentration after fissure sealant intervention showed difference value, that is equal to 28.02 ng/mL, while after fissure sealant intervention equal to 26.41 ng/mL. Differences in concentration value seen decreased sCD14 concentration of 1.61 ng/ml. Wilcoxon Signed Rank test results showed no difference in sCD14 concentrations before and after fissure silent intervention in group group with very low puff index. This result is consistent with Beria et al. study which states that there is a decrease in sCD14 concentration in caries after intervention in the form of patching on all cavities, although the difference in concentration decrease is not the same, ie 11.38 ng/ml.<sup>5</sup>

The ADA expert panel concluded, based on evidence-based and systematic reviews, that the resin-based sealant placement on the permanent molars of children and adolescents is effective in reducing caries; Reduced caries incidence in children and adolescents after resin-based sealant placement ranged from 86% at 1 year; sealants were effective in reducing occlusal caries due to infection in the first permanent molars of children, with caries reduction of 76.3% at 4 years, when sealants were reapplied as needed.<sup>14</sup>

Fissure sealants based on private and government insurance reports proved to consistently provide a reduction in the financing of subsequent restorative services. Evidence from Medicaid claims for children who continue to be registered for 4 years shows that permanent molars receiving fissure sealant treatment tend to receive fewer restorative treatments than those who do not receive fissure sealants.<sup>14</sup>

The above results can occur because the intervention performed on the very low puffa group is only a fissure sealant at 1-2 tooth, unlike in the Biria et al study in the form of intervention on all teeth. Protein sCD14 is an antibacterial protein in the saliva plays an important role in protecting hard in the oral cavity from infection by pathogenic bacteria.<sup>7</sup> The decrease after fissure sealant indicates that there is another infection found in the oral cavity causing decreased sCD14, elevated SCD14 levels associated with the disease periodontal.<sup>15</sup> Taylor, mentioned that high sCD14 concentrations due to the presence of one of the host-response components associated with clinical manifestations of

periodontal disease,<sup>16</sup> so that this respondent needs to be further investigated about the state of the periodontal tissue.

The sCD14 concentration after the patching intervention showed a difference value, where the concentration of sCD14 before patching was 8.91 ng/mL, while after intervention the concentration was 23.17 ng/mL. Differences in concentration value seen increased sCD14 concentration. This result is consistent with the Dario Giho study which states that the salivary concentration of SCD14 is reduced in samples of young patients who have active caries, whereas in young, caries-free patients it is clearly possible to detect the presence of sCD14 protein in the salivary.<sup>1,2</sup> The presence of CD14 on the mucosal surface and secretion reflects the importance of CD14 to the body as a substance that combines the existing Gram-negative infections in the mucosa of the body.<sup>17</sup>

The above may occur because the sCD14 protein can be used as a diagnostic testing method to determine an individual's tendency to suffer dental caries or to detect the presence of active caries in the oral cavity. This finding is characterized by a step to test a salivary sample of an individual to look for the presence of water-soluble sCD14 protein. While the absence of such proteins from the sample or its presence in smaller amounts compared to a predetermined threshold value in caries-free individuals marks the tendency of an individual to suffer from caries or the presence of active caries.<sup>18</sup>

Wilcoxon Signed Rank test results show there are differences in sCD14 concentrations before and after intervention patching in group groups with very high puff index. Where the concentration difference after patching is higher. This result differs from the research of Biria et al. Which states that in its study there was a decrease of sCD14 concentration in caries after giving intervention in the form of patching on all cavities.<sup>5</sup>

This can happen because many saliva proteins have a carcinogenic or anti-carcinogenic role. These anti-carcinogenic characteristics depend on their ability to inhibit the growth of acidic bacteria, by binding these bacteria and preventing bacterial attachment to the tooth surface.<sup>5</sup>

The above results can occur also because not all teeth can be done patching, only

2 to 3 teeth are done penlaying that is on the teeth can be done tetbaratic restoration treatment retreat (ART).<sup>5</sup> This happens because of limited access, facilities and infrastructure at the research site .

Atraumatic Restorative Treatment (ART) is recommended for use worldwide, not only in developing countries but also in developed countries. ART is considered acceptable, both for children and adults. ART is based on maintaining healthy dental tissue and reducing discomfort. The use of hand instruments on ART reduces the pain due to the reduced vibration that occurs when the use of dental drilling. The use of minimally invasive dentistry and patient comfort is very important, especially for school children and anxious and uncooperative patients.<sup>19</sup>

ART was originally developed in response to the need to find methods of preventing the occurrence of dental caries in the charcoal of people of all ages in society, where resources such as electricity, tap water, conventional and financial equipment are less available and difficult to do.<sup>19</sup>

In other studies stated that the amount of the enzyme was lower in caries free and no caries activity subjects by comparing to subjects with caries and caries active that aims to determine the risk of caries.<sup>20</sup>

## Conclusions

The conclusion of the study was no difference between sCD14 concentration before and after fissure sealant intervention but found the difference between sCD14 concentration before and after the intervention of ART filling.

## Declaration of Interest

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