

## RELATION BETWEEN FOOD CONSUMPTION PATTERN AND DMF-T INDEX OF STUDENTS IN WETLANDS AREA OF KABUPATEN BARITO KUALA

### Observation on MTs students in Kabupaten Barito Kuala

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#### ABSTRACT

**Background:** Food consumption pattern is the composition of type, and amount of food material consumed by a person or population in a particular frequency and period of time. Data taken from 2013<sup>th</sup> RISKESDAS show that 75,5% Barito Kuala citizens over 10 years old have the tendency to consume sugary foods more than once a day. The high pattern of consuming sugary foods affects the dental plaque formation on tooth surface because strongly-attached plaque has great potential to induce caries. Caries plays an important part in oral health problems in Barito Kuala. Report shows that Barito Kuala citizens over 12-year-old have high caries history, even reaching 89%. This report is supported by 2007<sup>th</sup> RISKESDAS, which states that DMF-T index of Barito Kuala is 6.61 or very high. **Purpose:** The purpose of this study was to assess the relation between food consumption pattern and DMF-T index of students in wetlands area of Barito Kuala. **Methods:** This study was quantitative analytical study using cross sectional approach. Data were collected using Food Frequency Questionnaire and DMF-T index sheets. 100 samples were chosen using cluster sampling method. **Results:** Data were analyzed using Spearman test with 0.001 significance ( $p < 0.05$ ) and strong correlation ( $r = -0,648$ ). **Conclusion:** There was a relation between food consumption pattern and DMF-T index of students in wetlands area of Barito Kuala

**Keywords:** food consumption pattern, DMF-T index, students in wetlands area.

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#### INTRODUCTION

Oral and dental health maintenance is one of the efforts to improve quality of life because it is an inseparable integral of our general health.<sup>1</sup> Kalimantan Selatan is one of three provinces with high prevalence of oral and dental health problems, with 36,1% of population suffering from dental-related diseases. Kalimantan Selatan also has the second highest DMF-T index (7,2) in Indonesia after Bangka Belitung (8,5); while the lowest index belongs to Papua Barat (2,6). Data Nasional Kesehatan Gigi (National Data of Dental Health) in Indonesia shows that around 90% of 238 millions Indonesia population suffered from dental caries and

almost 76,5% of the number was children aged 15 years old and younger.<sup>2</sup>

School-aged children are susceptible to experience caries because of their eating habits and the lack of care towards dental health. Untreated caries can be a focal infection in oral cavity which causes pain.<sup>3</sup> This condition will ultimately affect appetite and nutrition intake, and gradually interfere with growth. Growth disturbance will impact on children's nutritional status and decrease a child's quality of life.<sup>3,4</sup>

Caries plays an important part in oral and dental health problems in Kabupaten Barito Kuala; reports show that active caries prevalence reached 66,2% and caries history reached 89% in citizens over 12 years old. The prevalence of citizens experiencing oral and

dental health problems was 48,6%; this number is supported by RISKESDAS, which reported Kabupaten Barito Kuala's DMF-T index as 6,61 or very high.<sup>5,6</sup>

Study by Adhani et al. showed that average DMF-T index of MTsN Marabahan students living in wetlands area of Kabupaten Barito Kuala was 4,2 or moderate. Barito Kuala is a kabupaten (district) with the largest wetlands, almost 142.050 hectares of its land is swamp. The extensive wetlands in Barito Kuala cause most of the areas to produce water with low pH and high acidity.<sup>1</sup>

Food consumption pattern is any information that gives description to type, amount, and frequency of food consumed by an individual daily and is a characteristic of a particular population.<sup>6</sup> This pattern affects plaque formation on tooth surface because strongly-attached plaque has great potential to induce caries.<sup>6,7</sup> One of the food types that can cause plaque is easily attached materials or usually described as cariogenic food.<sup>6</sup> Nowadays, we can easily find cariogenic food sold in attractive and practical package, tasty, and cheap. These factors are really appealing to students that they gladly consume this kind of food.<sup>7</sup> Preliminary study showed that the most common cariogenic food found in wetlands area are chocolates, candies, sponge cakes, rices, fried noodles, fried cassavas, and meatballs. These food are children's favourite, thus we need to assess cariogenic food's relation with caries incidence.<sup>8</sup>

Sugary food and beverages consumption by citizens aged 15 years old or above in Barito Kuala reached 75,5%. At 15 years old, a person is less concerned about their eating habits and permanent dentition has been exposed to oral cavity for 3-9 years.<sup>6</sup> When a person consumes sugary or cariogenic food, the leftover materials will attach themselves on tooth surface. Cariogenic food contains sucrose which can become substrates for *Streptococcus mutans* to create acid in oral cavity. The combination of bacterial acid and low pH in oral cavity will trigger demineralization. Demineralization can be slowed down by remineralisation by saliva but the contrasting process needs quite a long time, around 30 – 60 minutes.<sup>8,9</sup>

Remineralisation will occur efficiently if there is available fluoride in saliva, because this component will form the more resistant fluorapatites against demineralisation. According to Adhani, wetlands

community still use river water with low pH to brush their teeth. In fact, river water cannot be consumed straight from the source because it has low fluoride, low pH (3-5), and high iron and sulphur. These aren't favourable for oral and dental health.<sup>9</sup> This is why author chose to do a study about relation between food pattern consumption and DMF-T index of students in wetlands area of Kabupaten Barito Kuala.

## MATERIALS AND METHODS

This was a quantitative analytical study with cross sectional approach. The population used was MTs ninth grade students in wetlands area of Kabupaten Barito Kuala. Samples were chosen using cluster sampling, consisted of 100 students. Assessment sheets used were questionnaires about food pattern consumption, and DMF-T sheets. Questionnaires about food pattern consumption was called FFQ (Food Frequency Questionnaire), compiled with different scores per item, and then the total FFQ scores would be measured per sample. FFQ scores were then totalled together and the average score would be assessed. Each sample's FFQ scores would then be categorized as: good ( $\geq 289$  (average FFQ) and bad ( $\ll 289.10$ ). Materials used were 70% alcohol, cotton, tissue, and toothpaste. Tools used were diagnostic tools, nierbekken, handscoon, mask, toothbrush, and writing tools. The study was started with informed consent filling by MTs Kabupaten Barito Kuala students, followed by mass tooth-brushing session, questionnaire distribution, and DMF-T index examination. After collecting the answered questionnaires and completing the examination, data were analysed to obtain results. Data went through *Kolmogorov-smirnov* normality test; if the data were distributed normally, the next test would be *Pearson* test, but if it were not, then author would use *Spearman* test.

## RESULTS

Results of this study could be seen in following tables.

Table 1. Food Consumption Pattern

Food Consumption Pattern	Male	Female	Total
Good	12	26	38
Bad	42	20	62
Total	54	46	100

Table 1 showed that the number of male students with bad food consumption pattern was higher than female students. In general, total respondents with bad food consumption pattern was higher than those with good food consumption pattern.

Table 2. DMF-T Index

DMF-T Index	Total Respondents	Total DMF-T
0,0 – 1,1	13	10
1,2 – 2,6	15	30
2,7 – 4,4	14	48
4,5 – 6,5	36	200
>6,6	22	173
Total	100	461
Average		4,61

Table 2 showed that the number of respondents with high DMF-T index was higher and average DMF-T index was 4,61 or high according to WHO.

Table 3. Food Consumption Pattern and DMF-T Index of Students in Wetlands Area of Kabupaten Barito Kuala

DMF-T Index	Food Consumption Pattern			
	Good	%	Bad	%
0,0 – 1,1	21	100	0	0
1,2 – 2,6	7	63,6	4	36,7
2,7 – 4,4	5	41,7	7	58,3
4,5 – 6,5	4	11,1	32	88,9
>6,6	1	5	19	95

Table 3 showed that more students with bad food consumption pattern had high DMF-T index and more students with good food consumption pattern had very low DMF-T index. Data were analysed using *Kolmogorov-smirnov* normality test, and the result showed  $p$  as 0,001 which meant the data

weren't normally distributed; thus the author used *Spearman* test as the next analysis.

The result of non-parametric correlation *Spearman* test showed  $p$  as 0,001, thus the hypotheses of this study were accepted: there was a relation of Food Consumption Pattern and DMF-T Index of Students in Wetlands Area of Kabupaten Barito Kuala. The test also revealed that the correlation coefficient value of the study was -0,648, stating there was a strong relation with negative direction: the worse food consumption pattern is, the higher DMF-T index will be.

## DISCUSSION

Food consumption pattern is grown from students' indulgence of sugary food, advertisements influence, and the massive amount of sugary foods sold in schools' cafeterias. According to this study's results, there were 62 MTsN students with bad food consumption pattern. The number was higher than students with good food consumption pattern. This result was in accordance to 2013<sup>th</sup> RISKESDAS, stating that the sugary food consumption behaviour was high in age-group older than 10 years old. This was also supported by Hurlock's theory (1980), which remarked that teens preferred snacks such as cakes that are sweeter than vegetables and fruits.<sup>5,11</sup> The results also showed that bad food consumption pattern was more common in males than females. According to Gibney et al (2009), gender was one of the variables affecting food preference. Generally, females have higher knowledge about food and nutritional facts than males and usually were more concerned about the unfavourable effects of food on their health.<sup>12,13</sup>

Azrimaidaliza's study (2008) also supported this theory, stating that male teens weren't picky in choosing food compared to female teens. This was caused by the fact that in adolescence, male teens' physical activities were usually higher and with lacking knowledge of food, they usually didn't particularly care about pros and cons about a certain type of food. On the other side, female teens considerably cared about their *body image* that they tended to limit their food consumption. Suhardjo (1989) also theorized that female teens' appetite was lower because the fear of gaining weight, thus the

amount of food they consumed was unbalanced to what they needed.<sup>14</sup>

DMF-T index of students in Kabupaten Barito Kuala was categorized high. This result was in accordance to the previous study by Adhani (2016) on MTsN Marabahan students living in wetlands area of Kabupaten Barito Kuala, who used river water, and had high DMF-T index of 5,6.

The high caries index in wetlands area of Kabupaten Barito Kuala was affected by a number of factors, such as lifestyle, their socio-culture pattern which heavily relied on river water, the lack of knowledge about dental health, and the preference to consume sugary, less-fibre, and easily-attached food.<sup>15,16</sup>

The lifestyle and culture of wetlands community, especially their method of brushing teeth using river water highly affected the progress of tooth decay. River water in wetlands Kabupaten Barito Kuala came from swamp areas which produced acidic water (pH 3,5-5,5), and the ample swamp water with high acidity made the groundwater unfeasible to be consumed because it contained iron and sulphur, or usually described as pyrite solution which wasn't favourable for dental health.<sup>17</sup>

The behaviour of wetlands community who used river water to brush their teeth from generation to generation affected the mineral concentrations of their teeth. According to Adhani et al's study in 2014, the more exposed teeth to acidic water was, the faster the decrease of mineral concentrations of teeth would be, thus teeth would be more susceptible to suffer from demineralisation.<sup>17</sup> Aside from the incorrect tooth-brushing behaviour, according to 2013<sup>th</sup> RISKESDAS, wetlands community of Kabupaten Barito Kuala also had low healthy-sick perception, whereas dental diseases couldn't cause death so people weren't concerned to maintain their dental health and put oral and dental health diseases as secondary needs.<sup>5</sup>

Anggi (2013) also remarked that average DMF-T index of students in wetlands area of Kabupaten Barito Kuala was as high as 5,77. The high DMF-T index was influenced by factors such as incorrect tooth-brushing method, bad food consumption pattern, and the lack of dental health services utilization.<sup>15</sup>

Statistical test results showed that there was a relation between food consumption pattern and DMF-T index of students in wetlands area of Kabupaten Barito

Kuala. The results were in accordance to previous study by Alim Sabri and Fatimah (2014), stating that there was a relation between food consumption pattern with the induction of caries in children because of the high frequency of sugary and sticky food consumption, such as candies, chocolates, and cakes. If the carbohydrates in food consumed were in vast amount, especially in sticky food, the students were more susceptible to suffer from caries.<sup>18</sup>

Caries is a major problem in dentistry because it has high prevalence.<sup>19</sup> The high prevalence according to Adhani et al (2016) was caused by wetlands community's habits of brushing their teeth using river water with low pH. This low pH came from swamp environment around the river and contained high iron and sulphur, thus causing the water to be acidic.<sup>17</sup>

The results were also supported by Rosidi et al, stating that there was a significant relation between cariogenic food consumption with caries incidence in SDN 1 Gogodalem students.<sup>19</sup> The relation emerged because the food had physical effect on plaque formation on tooth surface. More plaque will be formed when we consume soft and sticky food, especially food containing sucrose, because it will produce dextrans and levans which have important roles in plaque matrix formation.<sup>20</sup>

A high number of oral bacteria can colonize on tooth surface and form plaque continuously. *Streptococcus mutans* and *Lactobacillus* are the most common bacteria found in plaque. These bacteria metabolize leftover cariogenic food, such as sucrose, glucose, fructose, and maltose.<sup>4</sup>

*Streptococcus* and *Lactobacillus*'s metabolic results are acid, extracellular polysaccharides, intracellular polysaccharides, and CO<sub>2</sub>. The acids are used by bacteria to gain energy and also can cause tooth decay. These acids will decrease pH on enamel as low as 5,2-5,5 (critical pH) in 1-3 minutes. Plaque will remain acidic for a while and to return to normal pH of 7, it will need 30-60 minutes.<sup>4</sup>

When someone frequently consume sugary and cariogenic food, their oral cavity pH will stay below normal value. This will trigger demineralisation on susceptible enamel. The process will destruct enamel and induce caries.<sup>4</sup>

Citizens living in Kabupaten Barito Kuala with the largest wetlands in Kalimantan Selatan have teeth that are more susceptible to caries because they have been exposed to acidic water continuously. The

characteristics of swamp water in wetlands are disadvantageous as drinking water, because its low pH can cause tooth decay and stomachache.<sup>20</sup>

Oral cavity that has been exposed to wetlands water turn enamel's pH critical, reaching 5,5. When the oral cavity turns acidic, H<sup>+</sup> ions from wetlands area will bond to PO<sub>4</sub><sup>3-</sup> ions in saliva, and form HPO<sub>4</sub><sup>3-</sup>. In this form, HPO<sub>4</sub><sup>3-</sup> cannot balance the enamel and saliva condition, thus causing the minerals in enamel to dissolve. The more often someone is exposed to acidic water, the more calcium, zinc and phosphate concentrations in teeth will decrease. The lack of those minerals in teeth will make it easier for demineralisation to occur and halt the remineralisation.<sup>17</sup>

If wetlands community have lacking awareness to watch over their food consumption, they will be even more susceptible to caries because their teeth condition is already compromised to demineralisation. Combination of oral bacteria and sugars from food can produce lactate acid. Acidic environment will gradually cause decay.<sup>20</sup>

According to Azrimaidaliza, a person with high sugary food consumption tends to have more carious dentition. The most cariogenic food is sugar or sucrose because it can increase cariogenic bacterial growth in oral cavity. Sugar is usually used as sweetener and preservative materials, and gives aromatic smell. These characteristics are so stimulating that people prefer sugary food.<sup>14</sup> The limitations and obstacles in this study were: respondents' writing that were unclear and DMF-T indexes couldn't be used to assess the carious teeth's surfaces.

In conclusion, there was a relation between food consumption pattern and DMF-T index of students in wetlands area of Kabupaten Barito Kuala, in which, the worse the food consumption pattern is, the higher the DMF-T index will be.

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