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**CORRELATION BETWEEN MALOCCLUSION SEVERITY LEVEL AND CARIES  
STATUS OF 12-14 YEARS OLD STUDENTS IN SMPN 5 MARABAHAN**

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**ABSTRACT**

**Background:** South Kalimantan is one of the provinces in Indonesia that occupies the highest second of dental and oral health problems. One of the dental and oral health problems that often faced in school age group is malocclusion that is 15,6%. Malocclusion is an occlusion condition that is not right or an occlusion that deviates from normal condition. The said condition can be happened because tooth shape abnormalities and jaw size. The crowded tooth position can cause caries occurrence, because the overlapped tooth position can complicate in the process of tooth brushing. The food remains that accumulated formed plaque retention and if it's left alone continually, it will form a cavity in the tooth, causing email demineralization called caries. **Purpose:** To find out the correlation between malocclusion severity levels and caries status of 12-14 years old students in SMPN 5 Marabahan **Material and Methods:** This research was an analytic observational with cross sectional approach. The respondents were 12-14 years old students in SMPN 5 Marabahan that were taken with simple random sampling method. The respondents were 47 people. **Results:** The malocclusion severity level on mild category was 24 people (51%) and the caries status on moderate category was 19 people (40%). The result of Spearman test is  $p=0,000 < 0,05$ . **Conclusion:** There is a correlation between malocclusion severity level and caries status of 12-14 years old students in SMPN 5 Marabahan.

**Keywords :** Caries status, DMF-T Index, Index (MAL I), Malocclusion severity

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**INTRODUCTION**

The dental and oral health problems in Indonesia are categorized high, the said matter caused by the low awareness of society to maintain their dental and oral health. Based on 2013 RISKESDAS data, the percentage of Indonesia residents that experiencing dental and oral health problem is 25,9% that obtained from the examination and interview of 1.0277.763 respondents.<sup>1</sup> An increasing occurs in 2018 that is up to 57,6% from 962.045 residents that experiencing dental and oral health problems.<sup>2</sup>

The society in South Kalimantan has the second highest dental and oral problems after South Sulawesi, that is 3.854.485 people. The said number is increasing in 2018 up to 59,60%.<sup>3,4</sup> One of the region in South Kalimantan that has the highest dental and oral health problems is Barito Kuala Regency, that is 68,66% in 2018.<sup>4</sup>

One of the dental and oral health problems is malocclusion. Malocclusion is an occlusion condition that is not right. Malocclusion can also

define as the correlation of the deviated occlusion from normal condition, Andrew stated that there are six occlusion keys that resulting in normal or ideal occlusion, which can be seen from molar correlation, crown inclination, tooth crown angulation, diastema, rotation and can be seen from occlusal area.<sup>5,6,7</sup>

Singh G stated that malocclusion can also cause caries occurrence that will complicate in the tooth brushing process. Caries is a dental hard tissue disease that the triggers are more than one (multifactorial). 2013 RISKESDAS data stated that the DMF-T in South Kalimantan region is the second highest in Indonesia after Bangka Belitung that is 7,2%. The research by Anggriani M stated that from 90 samples of children age 12-15 years old, there is a meaningful correlation and directly proportional, which is the worse the malocclusion, the higher the caries risk.<sup>3,8,9</sup>

The caries examination can be done with various measuring indexes, one of which is DMF-T index (Decay, Missing, Filled Teeth). This

index can be used to measure caries incident in permanent tooth of a group or an individual. Dewanto stated that malocclusion assessment can be done with malalignment index (Mal I) calculation. This index can measure irregularity of tooth placement, such as tooth rotation, also it can be used to group the malocclusion severity level. Mal I was founded in 1959 by Van Krik and Panel. Mal I was used in this research because it is a simple, objective and also practical method.<sup>5,10</sup>

The recent report of 2013 RISKESDAS in South Kalimantan shows that the prevalence of the crowded teeth occurrence is 15,6% which experienced by adolescents. The high in malocclusion occurrence number are in 12-14 years old because in the said age, the process of posterior teeth shift occurs towards mesial direction, also there is a shape change occurred in mandibular.<sup>3,11</sup>

Barito Kuala Regency is one of the regions with the high number of dental and oral health problems. Riskesdas data (2018) stated that the number of tooth cavity and ache occurrence occupies the first place from 13 regencies in South Kalimantan that is 59,67% corresponds with the low percentage of the society that get health counseling and dental and oral health treatment, that is only 6,42%.<sup>4</sup> SMPN 5 Marabahan is a junior high school that located in Jl. Gawi Sabumi Marabahan Sub-District Barito Kuala Regency. The result of preliminary study of 15 examined students, they all experiencing malocclusion in the anterior part in the form of crowded teeth, in this school also does not have UKGS program and periodic examination from health institution such as a public health center that only conduct one time in a year.

Based on the description above and the conducted preliminary study, the research is motivated to conduct the research with the purpose to find out the correlation between malocclusion severity level and caries status of 12-14 years old students in SMPN 5 Marabahan.

## **MATERIAL AND METHODS**

The research was started with submit a research permit letter and attended an ethical clearance test which held by Health Research Ethical Committee, Dentistry Faculty, Lambung Mangkurat University, and stated passed with No. 316/UN8.1.32/PG/2020. The method that was used in the research was the analytic observational with cross sectional research design. The population in the research were all of the SMPN 5 Marabahan students aged 12-14 years old with 88 people total. The sampling technique was simple random sampling with 47 respondents using a proportion estimation formula calculation.

The inclusion criteria of this research are the children that had already been informed consent agreed from their parents, already agreed voluntarily to attend the research, and experiencing malocclusion. The exclusion criteria are uncooperative children, unsupportive health children, the children that during fixed orthodontic treatment and easily vomiting children when the process of jaw impression conducted. The used instruments in this research were stationary, impression tray, bowl, spatula, Mal I special ruler, assessment sheets, measuring cup, flashlight, diagnostic set (mouth glass, tweezers, probe). The used materials were tissue, clean water, alginate, gypsum stone, handschoen and mask.

The research was conducted in SMPN 5 Marabahan with the research steps that were to submit the research permit letter, then the researcher conducted preliminary study. The researcher chose the 12-14 years old students and conducted drawing to obtaining the samples. The researcher gave explanation to the students and also the teachers regarding the research procedures. The collecting of informed consent from the parents or guardians and the students that had already been chosen, also determined the samples that had already into inclusion criteria.

The preparation of the early stage was preparing the tools and materials, then instructing the student to wear dental apron also try in the impression tray. Conducting jaw impression, then conducting mould filling to obtaining study model. The next step is caries examination by using mouth glass and probe, then continued with malocclusion and caries status assessment with malalignment index (Mal I) and DMF-T index. The whole obtained data were analyzed by using a computer program with the final result in the form of narration and table. The analysis test using the Rank Spearman test to find out the correlation between malocclusion severity and caries status.

## RESULTS

Based on the research that has been conducted, the obtained result as follows:

**Table 1.** The frequency distribution of malocclusion severity level of 12-14 years old students in SMPN 5 Marabahan

Malocclusion severity	Total (n)	Percentage (%)
Mild (7-12)	24	51%
Moderate (13-18)	18	38%
Severe (>18)	5	11%
<b>TOTAL</b>	<b>47</b>	<b>100%</b>

Based on table 1, the result distribution of the most malocclusion in mild category was 24 people (51%).

**Table 2.** The frequency distribution of malocclusion based on gender

Malocclusion severity	Gender		Total
	Male	Female	
Mild (7-12)	10(21%)	14 (30%)	24 (51%)
moderate (13-18)	5 (11%)	13 (28%)	18 (38%)
Severe (>18)	1 (2%)	4 (8%)	5 (11%)
<b>TOTAL</b>	<b>16(34%)</b>	<b>31(66%)</b>	<b>47 (100%)</b>

In table 2, the frequency distribution result of malocclusion based on the most gender in female student was 31 people (66%).

**Table 3.** The distribution of malocclusion based on age

Malocclusion severity	Age			Total
	12	13	14	
Mild (7-12)	4 (9%)	8 (17%)	12 (25%)	24 (51%)
Moderate (13-18)	1 (2%)	12 (26%)	5 (11%)	18 (38%)
Severe (>18)	1 (2%)	2 (4%)	2 (4%)	5 (11%)
<b>TOTAL</b>	<b>6 (13%)</b>	<b>22 (47%)</b>	<b>19 (40%)</b>	<b>47 (100%)</b>

The characteristic of respondent that experiencing the most malocclusion was in age 13

years old that was 22 people (47%) and 14 years old with 19 people in severe malocclusion category on each group.

**Table 4.** The frequency distribution of caries status in SMPN 5 Marabahan student age 12-14 years old

Caries Status	Total (n)	Percentage (%)
Low (1,2-2,6)	14	30%
Moderate (2,7-4,4)	19	40%
High (4,5-6,5)	14	30%
<b>TOTAL</b>	<b>47</b>	<b>100%</b>

Based on table 4, the result distribution of caries status in moderate category was 19 people (40%).

**Table 5.** The distribution of caries status based on gender

Caries Status	Gender		Total
	Male	Female	
Low (1,2 - 2,6)	8 (17%)	6 (13%)	14 (30%)
Moderate (2,7 - 4,4)	2 (4%)	17 (36%)	19 (40%)
High (4,5 - 6,6)	6 (13%)	8 (17%)	14 (30%)
<b>TOTAL</b>	<b>16 (34%)</b>	<b>31 (66%)</b>	<b>47 (100%)</b>

In table 5, the most distribution of caries status based on the gender was in female student with in moderate category (36%).

**Table 6.** The distribution of caries status based on age

Caries Status	Age			Total
	12	13	14	
Low (1,2-2,6)	1 (2%)	6 (13%)	7 (15%)	14 (30%)
Moderate (2,7-4,4)	4 (9%)	8 (17%)	7 (15%)	19 (40%)
High (4,5-6,6)	1 (2%)	8 (17%)	5 (11%)	14 (30%)
<b>TOTAL</b>	<b>6 (13%)</b>	<b>22 (47%)</b>	<b>19 (40%)</b>	<b>47 (100%)</b>

In table 6, the distribution of caries status based on age, of the most caries status in 13 years old with moderate category caries (17%) and high category caries (17%).

**Table 7. The frequency distribution of the average DMF-T index value of all students age 12-14 years old**

AGE	Average of DMF-T			WHO category
	D	M	F	
12	13	1	0	2,3= low
13	93	4	2	4,5= high
14	76	6	4	4,52= high
<b>TOTAL</b>	<b>182</b>	<b>11</b>	<b>6</b>	<b>4,2=moderate</b>

The DMF-T index average of all students age 12-14 years old in SMPN 5 Marabahan is 4,2 that includes into moderate category, with (D) = 182, (M) = 11, and (F) = 6. The age of the highest caries status was found in age 13-14 years old group.

**Table 8. The data analysis and frequency distribution of malocclusion severity level and caries status of 12-14 years old students in SMPN 5 Marabahan**

Malocclusion severity level	Caries Status			Total
	Low (1,2-2,6)	Moderate (2,7-4,4)	High (4,5-6,5)	
Mild (7-8)	12 (26%)	11 (23%)	1 (2%)	<b>24 (51%)</b>
moderate (13-18)	1 (2%)	8 (17%)	9 (19%)	<b>18 (38%)</b>
severe (>18)	1 (2%)	0 (0%)	4 (9%)	<b>5 (11%)</b>
<b>Total</b>	<b>14 (30%)</b>	<b>19 (40%)</b>	<b>14 (30%)</b>	<b>47 (100%)</b>

Based table 8, the distribution of malocclusion severity level and caries status of 12-14 years old students in SMPN 5 Marabahan, the malocclusion severity in mild category were 24 respondents (51%) with the most widely caries status is in mild category that were 12 respondents (26%). Respondents with severe malocclusion level and experiencing high category of caries were 9%.

The obtained data regarding malocclusion severity level with caries status of students in SMPN 5 Marabahan continued by conducting analysis test using Spearman correlation test. The result obtained was  $p = 0,000 < 0,05$  which means there is a meaningful correlation between malocclusion severity level and caries status of students in SMPN 5 Marabahan with a strong correlation coefficient that is 0,600\*\*

## DISCUSSION

Based on the research result, it is known that the malocclusion severity level of students in SMPN 5 Marabahan included in mild category that is 24 respondents (51%) from 47 respondents that has been examined. SMPN 5 Marabahan is one of the public junior high school in Barito Kuala area that already had UKS program. Corresponds with the research by Syada in the junior high school that has UKS and has not UKS in Martapura using the same index, Mal I, shows that the school that has UKS had the mild malocclusion severity level. It is in line with the research by Gaikwad in India that investigating the malocclusion severity in children age 12-14 years old which stated that 73,2 cases of mild malocclusion obtained.<sup>10,12</sup> The occurrent difference with the research that was conducted in Soppeng Regency in children age 11-12 years old found in the heavy category and treatment need that is 70 samples (31%). The difference in malocclusion severity, according to Graber, can be affected by the lack of nutrition intake in the body that can cause the lack of mineralization in bones and teeth. The said matter can trigger the occurrence of malocclusion.<sup>13,14</sup>

One of the form of malocclusion is the crowding or overlapped teeth. This caused by the difference between the width of the teeth with the size of the jaw such as someone that has teeth that relatively bigger in size but their jaw is small, even in male or female. The diversity of size and shape of teeth and jaw of each individual is a condition that passed down by the parents (genetic).<sup>15</sup>

The difference of malocclusion severity level of male and female respondents also found in this research. The female is more tend to experiencing malocclusion. The research by Dayataka also obtained the same result that is the malocclusion severity level is higher in female. This caused by the difference of bone thickness and the bone shape between male and female, also the lateness growth of jaw size also can cause the tooth size can be unfit with the width of the jaw arch that caused by eating and chewing habit.<sup>16,17</sup> The difference also can be caused by the total of female respondents in this research that is more than the male.

Beside the gender, malocclusion severity level also influenced by age. From the research result, the tendency of malocclusion severity level escalates as a person get older. The escalation of malocclusion severity can occur if the child's age has already experienced malocclusion condition and a treatment cannot be conducted, there might be an escalation of malocclusion severity prevalence in the older age or more.<sup>14</sup>

Malocclusion can obtain a treatment since the early age which can minimize the severity in older age. One of the treatments to fix the tooth structure can be handled in dentistry field that is orthodontics.

There are four phases of orthodontic treatment, according to Ricket, the earlier step is preventive, the second is interceptive, the third is corrective, and the fourth is rehabilitative. The preventive and interceptive steps often named as early treatment. In these steps, it is intended to maintain the normal occlusion and fix it if there is a possibility of malocclusion occurrence in the early age.<sup>18</sup> The crammed teeth condition or malocclusion is left alone and not being treated is one of the caries occurrence causative factors. Caries is a disease which affects the dental hard tissue, which can affect dental layers that are email, dentin and cement.<sup>8,19</sup>

Caries in this research is a dependent variable. One of the caries causes is the teeth or host, beside bacteria, time and food. The tooth position that is overlapped or incompatible with jaw arch can complicate in the process of tooth brushing.<sup>7,19</sup> The other factor is dietary habit, social status, age and gender. As in the table 5 shows that the female respondent tends to experiencing more caries. This can be triggered from few factors such as the habit. Female tend to like more sweet foods and hormonal factor when the period comes.<sup>11</sup>

The collected caries index average result in SMPN 5 Marabahan is in the moderate category. The research result corresponds with the research by Rohimi in SMPN 5 Marabahan in 2018 that the DMF-T average in moderate category was obtained. The most problems that occurred is a cavity in the tooth caused by caries that is (D) component with 240 pieces and the least is the filled tooth (F) with 13 pieces.<sup>20</sup>

Some people that experiencing malocclusion will have problem in the tooth brushing process. It is caused by the difficulties to reach the food remains that attached in the crammed teeth area. It causes plaque attaches easily which can create calculus and the occurrence of caries. The bacteria in plaque have a role to ferment carbohydrate in attaching food in the tooth surface, resulting in a pH reduction in the oral cavity that can cause the atmosphere of oral cavity becomes acidic. If the condition is left alone, it can cause demineralization on the surface of the teeth which can slowly forming a cavity called caries.<sup>7,19,22</sup>

The malocclusion condition such as anterior open bite on someone can cause the caries. The said condition can cause someone tends to breathe through their mouth which can

reduce salivary flow rate to ease the development of caries microorganism cause.<sup>23</sup>

The research result shows that the knowledge regarding dental and oral health is very needed for junior high school aged children such as how to maintain the dental health in good and right way, with expectations that even though the teeth condition is experiencing malocclusion, but the teeth condition is still healthy and not experiencing damage such as caries. This is very important to apply remembering that the damage of the teeth is not just in aesthetic function but also chewing and talking function. SMPN 5 Marabahan already had UKS but it is not well managed. The socialization regarding dental and oral health is also still lacking, and UKGS program is also still not held there. So in the next research, it is expected that the solution of the said problems is found, resulting in the increasing of dental and oral health degree.

Based on the results of this research, it can be concluded that there is a correlation between malocclusion severity level and caries status of 12 - 14 years old students in SMPN 5 Marabahan.

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