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1 message

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Wed, Aug 25, 2021 at
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To: tania-s@fkg.unair.ac.id

24-Aug-2021

Dear Dr. Saskianti:

Manuscript ID MJMHS-2021-0817 entitled "RELATIONSHIP OF NUTRITIONAL STATUS WITH THE INCIDENCE OF PERMANENT MANDIBULAR FIRST MOLAR CARIES CHILDREN AGED 7 YEARS OLD IN PLALANGAN VILLAGE JEMBER" has been submitted to the Malaysian Journal of Medicine & Health Sciences.

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Sincerely,
Assoc. Prof. Dr. Su Peng Loh
Malaysian Journal of Medicine & Health Sciences Associate Editor
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MANUSCRIPT DETAILS

TITLE: RELATIONSHIP OF NUTRITIONAL STATUS WITH THE INCIDENCE OF PERMANENT MANDIBULAR FIRST MOLAR CARIES CHILDREN AGED 7 YEARS OLD IN PLALANGAN VILLAGE JEMBER

ABSTRACT: Introduction: Nutritional status is a condition caused by a balance between food intake and nutritional needs. The nutritional needs of children are relatively greater than adults because children are still experiencing a period of growth and doing high physical activity. Body health and oral health influence each other. Proper nutrition can maintain optimal oral health, otherwise, good oral health can also maintain adequate nutritional intake for the body. This study aims to determine the relationship between nutritional status and the incidence of caries in the permanent mandibular first molar in children aged 7 years in Plalangan Village, Jember. Methods: This is analytic observational research with a cross-sectional approach. This research was conducted by measuring the nutritional status of BMI-for-age based on anthropometric standards from the Minister of Health of the Republic Indonesia No. 2 of 2020 and examining the oral cavity to see whether there is caries or not in the permanent mandibular first molar. Results: The results of measuring the

nutritional status of BMI-for-age obtained 0% severe thinness, 9.3% thinness, 79.6% normal, 11.1% overweight, and 0% obesity. The caries examination of the permanent mandibular first molar obtained that 53.7% of children had caries. Conclusion: The results of the Chi-Square test showed a value of 0.036 which means that there is a significant relationship between nutritional status and the incidence of caries in the permanent mandibular first molar in children aged 7 years in Plalangan Village, Jember.

Keywords: nutritional status, dental caries, permanent mandibular first molar, children aged 7 years



tania saskianti <tania-s@fkg.unair.ac.id>

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31-Aug-2021

Dear Dr. Saskianti:

Thank you for agreeing to review Manuscript ID MJMHS-2021-0817 entitled "RELATIONSHIP OF NUTRITIONAL STATUS WITH THE INCIDENCE OF PERMANENT MANDIBULAR FIRST MOLAR CARIES CHILDREN AGED 7 YEARS OLD IN PLALANGAN VILLAGE JEMBER" for Malaysian Journal of Medicine & Health Sciences. Please try your best to complete your review by 21-Sep-2021.

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All communications regarding this manuscript are privileged. Any conflict of interest, suspicion of duplicate publication, fabrication of data or plagiarism must immediately be reported to me.

Thank you for evaluating this manuscript.

Sincerely,
Assoc. Prof. Dr. Su Peng Loh
Malaysian Journal of Medicine & Health Sciences Associate Editor
sploh@upm.edu.my

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RELATIONSHIP OF NUTRITIONAL STATUS WITH THE INCIDENCE OF PERMANENT MANDIBULAR FIRST MOLAR CARIES CHILDREN AGED 7 YEARS OLD IN PLALANGAN VILLAGE JEMBER

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**RELATIONSHIP OF NUTRITIONAL STATUS WITH THE
INCIDENCE OF PERMANENT MANDIBULAR FIRST MOLAR
CARIES CHILDREN AGED 7 YEARS OLD IN PLALANGAN
VILLAGE JEMBER**

Journal:	<i>Malaysian Journal of Medicine & Health Sciences</i>
Manuscript ID	MJMHS-2021-0817
Manuscript Type:	Original Article
Keywords:	nutritional status, dental caries, permanent mandibular first molar, children aged 7 years

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Table I: The distribution of the sample by gender

Gender	n	%
Boy	27	50
Girl	27	50
TOTAL	54	100

For Review Only

Table II: The distribution of sample nutritional status

Nutritional Status	n	%
Severe Thinness	0	0
Thinness	5	9.3
Normal	43	79.6
Overweight	6	11.1
Obesity	0	0
TOTAL	54	100

For Review Only

Table III: The distribution of samples in each category of nutritional status by gender

Nutritional Status	Boy		Girl	
	n	%	n	%
Severe Thinness	0	0	0	0
Thinness	2	7.4	3	11.1
Normal	22	81.5	21	77.8
Overweight	3	11.1	3	11.1
Obesity	0	0	0	0
TOTAL	27	100	27	100

Table IV: The distribution of the number of samples based on the presence and absence of caries in the permanent mandibular first molar

Caries	n	%
Caries	29	53.7
No Caries	25	46.3
TOTAL	54	100

For Review Only

Table V: The distribution of the number of samples with the presence or absence of caries in the permanent mandibular first molar by gender

Gender	Caries		No Caries	
	n	%	n	%
Boy	15	51.7	12	48
Girl	14	48.3	13	52
TOTAL	29	100	25	100

For Review Only

Table VI: The distribution of the number of samples in each category of nutritional status based on the presence or absence of caries in the permanent mandibular first molar

Nutritional Status	Caries		No Caries	
	n	%	n	%
Severe Thinness	0	0	0	0
Thinness	4	13.8	1	4
Normal	20	69	23	92
Overweight	5	17.2	1	4
Obesity	0	0	0	0
TOTAL	29	100	25	100

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Table VII: The data analysis of nutritional status and caries of the permanent mandibular first molar using Chi-Square Statistic Test

Variable	p-value	Information
Nutritional Status – Permanent Mandibular First Molar Caries	0.036	There is a relationship between nutritional status (BMI-for-age) with the incidence of caries in the permanent mandibular first molar children aged 7 years

For Review Only

Abstract

Introduction: Nutritional status is a condition of the body which is the result of a balance between food intake and nutritional needs. The nutritional needs of children are relatively greater than adults because children are still experiencing a period of growth and doing high physical activity. Body health and oral health influence each other. Proper nutrition can maintain optimal oral health, otherwise, good oral health can also maintain adequate nutritional intake for the body. The purpose of this research is to determine the relationship between nutritional status and the incidence of caries in the permanent mandibular first molar in children aged 7 years in Plalangan Village, Jember. **Methods:** This is an analytic observational research with a cross-sectional approach. This research was conducted by measuring the nutritional status of BMI-for-age based on anthropometric standards from the Minister of Health of the Republic Indonesia No. 2 of 2020 and examining the oral cavity to see whether there is caries or not in the permanent mandibular first molar. **Results:** The results of measuring the nutritional status of BMI-for-age obtained 0% severe thinness, 9.3% thinness, 79.6% normal, 11.1% overweight, and 0% obesity. The caries examination of the permanent mandibular first molar obtained that 53.7% of children had caries. **Conclusion:** The results of the Chi-Square test showed a value of 0.036 which means that there is a significant relationship between nutritional status and the incidence of caries in the permanent mandibular first molar in children aged 7 years in Plalangan Village, Jember.

Keywords: nutritional status, dental caries, permanent mandibular first molar, children aged 7 years

INTRODUCTION

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2
3 Nutritional status is a condition which is the result of a balance between nutrient intake from
4 food and the nutritional needs for body metabolism (1). Nutrients are needed by the body as a
5 source of energy, maintenance of body tissues, growth, and regulator of body processes.
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7 Inadequate intake of nutrients in children can lead to impaired child development (2).
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9 Nutritional status can be measured through anthropometric assessment. Body Mass Index for
10 age (BMI-for-age) can be used to determine the prevalence of nutritional status of school
11 children and adolescents (3). Riskesdas 2018 shows the national prevalence of nutritional
12 status of children aged 5-12 years, including 2.4% severe thinness, 6.8% underweight, 10.8%
13 overweight, and 9.2% obesity (4).
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26 The nutritional needs of children are relatively greater than adults because children are still
27 experiencing a period of growth and doing high physical activity. The level of nutrient
28 consumption is not only related to nutritional status but also related to the severity of dental
29 caries (5). Aulia, et al. (2019) states that there is a relationship between nutritional status and
30 dental caries which is indicated by obese children suffering from dental caries higher than
31 children with normal weight (3).
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42 Riskesdas 2018 shows that the prevalence of caries in children aged 5-9 years is quite high at
43 92.6% (4). The common cause of dental caries is the fermentation process of food residues in
44 the oral cavity. The fermentation process is caused by bacteria that convert sugar into organic
45 acids that can cause caries or cavities in the long term (6).
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53 The incidence of caries in permanent teeth mostly occurs in the mandibular first molars.
54 Aulia, et al. (2019) stated that the highest percentage of dental caries was 65.77%, in the
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3 permanent mandibular first molars. The anatomical shape of the permanent mandibular first
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5 molar is easy to be a place for food retention so that it is at risk for dental caries (3).
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10 Nutrition plays a role in the development of teeth. Lack of nutrients can result in tooth decay,
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12 especially enamel so that it can encourage dental caries in children (7-9). Children who
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14 consume excessive amounts of food, especially cariogenic foods such as carbohydrates and
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16 sugar, also make it easier for children to get dental caries. Cariogenic food consumed by
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18 children will be fermented by bacteria into lactic acid which can demineralize enamel and
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20 dentin (3, 10).
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26 Children aged 7 years are usually not able to make efforts to maintain their health
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28 independently. The level of knowledge and awareness of children about oral health is also
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30 still lacking, besides that food intake is still strongly influenced by the family and school
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32 environment. Uncontrolled food intake will facilitate the occurrence of dental caries in
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34 children (11).
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40 Kalisat District (2019) has a fairly high prevalence of underweight and severe thinness of
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42 toddlers in Jember Regency, 17% underweight and 10.2% severe thinness, and this district
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44 has a prevalence of overweight of 6.1%. Data from the Kalisat Health Center 2020 shows that
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46 Plalangan Village has many underweight and severe thinness under-fives with a total of 31
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48 toddlers, and 32 overweight children (12). This description is the basis for the author to
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50 examine the relationship between nutritional status and the incidence of caries in the
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52 permanent mandibular first molar in children aged 7 years in Plalangan Village, which is a
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54 village with quite high malnutrition problems in Jember Regency.
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MATERIALS AND METHODS

This research is an analytic observational study with a Cross-Sectional approach. Cross-Sectional is a type of study that emphasizes the time of observation or measurement of data at one time conducted on independent and the dependent variable. This approach is used to see the relationship between one variable and another (13).

This research was conducted in Plalangan Village, Kalisat District, Jember Regency in March 2021. The population was all children aged 7 years in Plalangan Village, Kalisat District, Jember Regency, totaling 54 children. The sampling technique of this research is Total Sampling. Total Sampling is taking the entire population to be used as a sample, so the research sample is 54 children (14).

Parents/guardians fill out informed consent before the examination is held. Data was collected by direct measurement of the child's weight and height to determine their nutritional status. Measurement of body weight using a digital weight scale. Weighing the child is done by taking off his footwear, then positioning the child on the scale with a straight face and looking straight ahead. The measurement results will be visible in the scale reading window. Measurement of children's height using a microtoise measuring instrument. Children are not allowed to wear footwear and hair ornaments when measuring their height. The measurement of the child's height is done by positioning the child to stand upright, sticking to the wall, and looking straight ahead. The head of the microtoise is pulled straight until it touches the child's head, then record the measurement results printed on the head of the microtoise.

The calculation of the nutritional status of BMI-for-age is done by entering data on the child's weight and height in the formula below:

$$BMI = \frac{\text{Weight (kg)}}{\text{Height (m}^2\text{)}}$$

The results of the BMI measurement are compared with the BMI-for-age table from the Minister of Health of the Republic of Indonesia Number 2 of 2020 according to the age and gender of the child.

The dental caries examination of the permanent mandibular first molar used a mouth mirror to see whether there is caries or not. Recording the results of the examination by selecting one of the first permanent mandibular first molars right or left with caries. Dental caries is the condition of cavities and/or teeth having white spots.

Data processing uses the Statistical Package for the Social Sciences (SPSS). Data analysis is presented in a frequency table to get an overview of each variable. Bivariate analysis used the Chi-Square Statistical Test to examine the relationship between nutritional status and the incidence of caries in the permanent mandibular first molar of children aged 7 years.

RESULTS

This research was conducted on children aged 7 years in Plalangan Village, Kalisat District, Jember Regency, totaling 54 children. Table I shows the distribution of the sample by gender.

Table I: The distribution of the sample by gender

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6 The results of quantitative data of children aged 7 years based on gender obtained from the
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8 table above indicate that the number of boys is equal to the number of girls. Each of the
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10 numbers of boys and girls is 27 children (50%). Each child who came later was measured for
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12 weight and height to calculate Body Mass Index (BMI). The results of grouping the
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14 nutritional status of the sample are presented in Table II below.
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19 **Table II: The distribution of sample nutritional status**

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23 Table II shows the results of measuring the nutritional status of 7-year-old children in
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25 Plalangan Village, consisting of no severe thinness children, 5 thinness children (9.3%), 43
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27 normal children (79.6%), 6 overweight children (11.1%), and no obese children. The
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29 grouping of the number of children aged 7 years in each category of nutritional status based
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31 on gender is presented in Table III.
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37 **Table III: The distribution of samples in each category of nutritional status by gender**

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41 Table III shows the distribution of the number of boys aged 7 years in Plalangan Village,
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43 consisting of no severe thinness children, 2 thinness children (7.4%), 22 normal children
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45 (81.5%), 3 overweight children (11.1%), and no obese children. The number of girls consists
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47 of no severe thinness children, 3 thinness children (11.1%), 21 normal children (77.8%), 3
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49 overweight children (11.1%), and no obese children.
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55 Children whose weight and height had been measured to determine their nutritional status
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57 were then examined for caries on the permanent mandibular first molars. The distribution of
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3 the number of children based on the presence or absence of caries in the permanent
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5 mandibular first molars is shown in Table IV below.
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10 **Table IV: The distribution of the number of samples based on the presence and absence of caries in the**
11 **permanent mandibular first molar**
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16 The results of the quantitative data obtained in table IV above are 29 children (53.7%) who
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18 have caries on the permanent mandibular first molar and 25 children (46.3%) who do not
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20 have caries on these teeth. The table above shows the number of children who have caries on
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22 the permanent mandibular first molars is greater than children who do not have caries on
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24 these teeth. The distribution of the number of children with caries in the mandibular
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26 permanent first molars by gender is shown in Table V as follows.
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32 **Table V: The distribution of the number of samples with the presence or absence of caries in the**
33 **permanent mandibular first molar by gender**
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38 The results of the quantitative data obtained in Table V above show the number of boys who
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40 have caries on the permanent mandibular first molars as many as 15 children (51.7%) and
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42 girls who have caries on these teeth as many as 14 children (48.3%). The number of boys
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44 who do not have caries on the mandibular permanent first molars was 12 children (48%) and
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46 girls who do not have caries on these teeth were 13 children (52%). The table above shows
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48 that the number of boys who have caries in the lower permanent mandibular first molars is
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50 higher than in girls, while children who mostly do not have caries on that teeth are girls. The
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52 distribution of the number of children with caries in the mandibular permanent first molars
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54 based on their nutritional status is shown in Table VI as follows.
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Table VI: The distribution of the number of samples in each category of nutritional status based on the presence or absence of caries in the permanent mandibular first molar

Table VI shows the distribution of the number of children who have caries in the permanent mandibular first molar consisting of no severe thinness children, 4 thinness children (13.8%), 20 normal children (69%), 5 overweight children (17.2%), and no obese children. The number of children who do not have caries on these teeth consists of no severe thinness children, 1 thinness child (4%), 23 normal children (92%), 1 overweight child (4%), and no obese children.

The data from the measurement of nutritional status and caries examination of the mandibular first molar were tested for correlation using the Chi-Square Statistical Test to test whether there was a relationship between the two variables or not. The nutritional status variable was compressed into two categories to qualify the statistical test. The nutritional status variable consisted of 5 categories, but only three categories represented the nutritional status of the sample, thinness, normal, and overweight. These variables were compressed into two categories, normal category for normal nutritional status and abnormal category for thinness and overweight (15). The results of the Chi-Square Statistical Test can be seen in table VII below.

Table VII: The data analysis of nutritional status and caries of the permanent mandibular first molar using Chi-Square Statistic Test

Table VII shows that the significance value resulting from the Chi-Square correlation test is 0.036. This value is less than 0.05 ($p < 0.05$), which means that there is a significant relationship between nutritional status (BMI-for-age) and the caries incidence of the

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3 permanent mandibular first molar in children aged 7 years in Plalangan Village, Kalisat
4 District, Jember Regency.
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10 **DISCUSSION**

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15 The purpose of this research is to determine the relationship between nutritional status and
16 the incidence of caries in the permanent mandibular first molars of 7-year-old children in
17 Plalangan Village, Jember, consisting of 27 boys (50%) and 27 girls (50%). This data is not
18 much different from the results of the 2020 population census in Jember Regency which
19 shows the percentage of the male population is 49.87% and the female population is 50.13%
20 (16). This condition shows that population growth between males and females is balanced in
21 Jember Regency, especially in Plalangan Village, Kalisat District for children aged 7 years.
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33 Table II shows that there are no severe thinness and obese children aged 7 years in Plalangan
34 Village. This condition is good compared to the national prevalence of severe thinness
35 nutritional status according to Riskesdas 2018 which is 2.4% and obesity is 9.2%. The
36 percentage of thinness children in Table II is higher than the data of Riskesdas 2018 which
37 shows the national prevalence of thinness children aged 5-12 years of 6.8% and is also higher
38 than the prevalence of thinness nutritional status in East Java which is 5.8% (4). This
39 condition shows that the problem of thinness nutritional status in school-age children,
40 especially 7 years old in Plalangan Village, is still quite high because it is above the national
41 and East Java province prevalence in 2018.
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56 The number of normal children is 43 children or 79.6% of the total sample. This condition is
57 very good because this percentage is higher than the national prevalence of normal nutritional
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3 status according to Riskesdas 2018, which is 70.8%. This prevalence is also much higher than
4 the number and percentage of thinness and overweight children in Plalangan Village. The
5 percentage of overweight children aged 7 years in Plalangan Village is 11.1%. This
6 percentage is higher than the national prevalence according to Riskesdas 2018 data, which is
7 10.8% but lower than the prevalence in East Java which is 13.2% (4).
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17 Nutritional problems in children cannot be underestimated. Malnutrition in children is caused
18 by many factors. The direct factors that cause children to experience malnutrition are poor
19 nutritional intake and infectious diseases. Lack of nutritional intake can cause the nutritional
20 elements needed in the body not to be fulfilled, while infectious diseases cause impaired
21 function in body organs so that the absorption of food substances in the body is disturbed.
22 Indirect factors that cause malnutrition in children can be caused by poor parenting, poor
23 sanitation, and inadequate basic health services (2).
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35 BPS 2020 data shows as many as 2,660 households in Plalangan Village work in agriculture
36 and as many as 2,870 households do not master the internet (16). This condition can illustrate
37 that the people in Plalangan Village have a low socio-economic level. The socio-economic
38 level includes education, employment, and income (17). Utami (2018) states that family
39 income affects the adequacy and quality of food for children. Families with low incomes will
40 tend to buy any food and do not pay attention to the quality of food so that it will affect the
41 child's nutrition to be abnormal (18).
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53 The problem of overweight in children should not be ignored. Overweight in children is
54 caused by the number of calories consumed more than calories expended for activity. One of
55 the factors causing overweight in children is physiological factors. Physiological factors can
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3 be hereditary or non-hereditary. Hereditary factors are heredity factors, while non-hereditary
4 factors include diet, level of nutritional intake, level of physical activity, and socio-economic
5 conditions (19).
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12 Table III shows the distribution of the number of children aged 7 years in each category of
13 nutritional status by gender. There is one more thin girl than boys. Girls will usually try to
14 maintain an ideal body shape by limiting food intake. This condition has an impact on the
15 nutritional status of children to be less (20). However, the number of thinness boys is not
16 much different from the number of thinness girls. Boys more often have high physical
17 activity and drain a lot of energy so that there is usually an imbalance between the energy that
18 comes in from food and the energy that goes out for activities (20, 21).
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31 The data of normal children are also not much difference between boys and girls. The number
32 of normal children consisted of 22 boys and 21 girls. This condition is quite good when
33 compared to another nutritional status, the number of normal nutritional status is 43 children.
34 Good nutrition is very important for a child. Normal nutritional status in children is the
35 foundation of health that can affect immunity, susceptibility to disease, as well as physical
36 and mental growth and development to improve the quality of human resources (22).
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47 The number of overweight children is the same between boys and girls, namely 3 children
48 each. Anita (2018) states that females have thicker fat tissue and skin folds than males so that
49 females look fatter (20). Boys are at the same risk of being overweight as girls. Intake of
50 energy, fat, and carbohydrates in boys is quite a lot because boys pay less attention to
51 appearance than girls (23). Males and females have equal opportunities in food consumption
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3 and there is no relationship between nutritional status and gender, so both males and females
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5 have the same risk of experiencing overweight nutrition (24).
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10 The fulfillment of nutrition in children is very important. Nutrients such as protein, calcium,
11
12 phosphate, vitamin C, and vitamin D are nutrients needed in the formation of a healthy and
13
14 perfect tooth structure. The level of consumption of macronutrients and micronutrients is not
15
16 only related to nutritional status but also related to the severity of dental caries (5).
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21 The national dental caries prevalence according to Riskesdas 2018 for children aged 5-9
22
23 years is 92.6% (4). Aulia, et al. (2019) stated that the highest percentage of dental caries was
24
25 in the permanent mandibular first molar with a percentage of 65.77% (3). This percentage is
26
27 not much different from the data from the caries measurement of the permanent mandibular
28
29 first molar in children aged 7 years in Plalangan Village which is shown in Table IV. The
30
31 number of children who have caries in their permanent mandibular first molar shows that the
32
33 problem of dental caries is still quite high for children aged 7 years in Plalangan Village. The
34
35 data of BPS 2020 shows that there are no hospitals or clinics in this village (16). This
36
37 condition makes it difficult for the people of Plalangan Village to look for treatment because
38
39 of the unavailability of these health facilities in their village. The low awareness of children
40
41 and lack of attention from parents to children's dental and oral health can also be a factor
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43 causing the high prevalence of caries in children (6).
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51 Caries can occur because food is easily attached to or retention in the anatomical shape of the
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53 permanent mandibular first molar which has pits and fissures. The accumulation and
54
55 retention of plaque that is formed allow the process of carbohydrate fermentation by bacteria
56
57 to become acids that can destroy dental apatite crystals (3). Caries in the sample molars was
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3 indicated by the presence of small holes and blackish-brown color. Small holes or blackish
4 brown color found in the first permanent mandibular molars in the carious samples were
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6 mostly found in the pits and fissures of these teeth.
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12 Table V shows the distribution of the number of children with caries in the permanent
13 mandibular first molars by gender. The number of boys who had caries in their molars
14 consisted of 15 children (51.7%). These data are not much different from girls who have
15 caries on the teeth, namely as many as 14 children (48.3%). The number of children who do
16 not have caries on the molars was not much difference between boys and girls, namely 12
17 boys (48%) and 13 girls (52%). These data indicate that both boys and girls have a risk that is
18 not much different from the occurrence of dental caries (3). Factors such as the economic
19 level and education of parents, the habit of maintaining oral health, the food consumed, and
20 the frequency of visit to dental and oral health services varies greatly in each individual, both
21 male and female, so that it can affect the possibility of caries (26).
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38 Table VI shows the distribution of the number of children with caries in the permanent
39 mandibular first molars based on nutritional status. Thinness children who have caries in the
40 permanent mandibular first molars are more than those who do not have caries on these teeth.
41 Hamid & Yauri (2019) stated in their journal that nutritional deficiencies such as
42 carbohydrates, protein, iron, zinc, calcium, phosphorus, folic acid, vitamin D, and vitamin C
43 can cause abnormalities in the teeth and jaw (5). Lack of these nutrients during the formation
44 of teeth can cause imperfect enamel formation or hypoplasia so that it affects the caries
45 susceptibility of the teeth (8). Children under 12 years old are prone to have tooth decay
46 problems. Lack of vitamins and minerals, especially calcium and fluoride, encourage dental
47 caries in children (7).
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5 Normal children who do not have caries in the permanent mandibular first molars are more
6 than children who have caries on these teeth. Normal children have adequate nutritional
7 intake, especially protein, calcium, phosphate, vitamin C, and vitamin D, which support the
8 formation of perfect tooth structure in children (5). The number of children with caries is also
9 not small. This condition is caused by multifactorial dental caries which can be influenced by
10 socioeconomic status, diet, tooth brushing habits, and others (25). These factors can also
11 affect children's dental caries even though their nutritional status is normal.
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24 The number of overweight children who have caries on the permanent mandibular first
25 molars is higher than the number of children who do not have caries on these teeth. This
26 condition is following the theory which states that the frequency of excessive carbohydrate
27 consumption is generally the cause of overweight and obese children having caries in their
28 teeth. The high consumption of cariogenic foods in a long time in overweight and obese
29 children can cause bacteria to ferment a lot of sucrose (sugar) into lactic acid which will
30 lower the oral pH to a critical pH (5.5). This condition causes demineralization of enamel and
31 dentin (10). Zakiyah, et al. (2017) stated that nutritional intake also affects the growth and
32 development of teeth. Overweight children show faster growth and development of teeth than
33 normal children so that tooth eruption is also faster (9). This condition allows the permanent
34 mandibular first molar teeth to be exposed to caries factors longer than children with normal
35 nutrition (25).
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54 The relationship of nutritional status (BMI-for-age) with the incidence of caries in the
55 permanent mandibular first molar in children aged 7 years in Plalangan Village, Jember, is
56 shown in Table VII of data analysis. The significance value shown in the table is 0.036
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3 (p<0.05), which means that there is a significant relationship between nutritional status (BMI-
4 for-age) and the caries incidence of permanent mandibular first molars in children aged 7
5 years in Plalangan Village, Jember. This result is following the theory which states that
6 nutrition plays a role in tooth growth and maintaining the balance of the oral environment.
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8 Nutrition for optimal growth of teeth is the same as the nutrients needed by the body because
9 the period of tooth growth is in line with the period of growth of the body as a whole (5).
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19 Nutrition plays a role in every stage of tooth development from the early 6-7th week of
20 intrauterine to several postnatal years (9). Lack of nutrients can result in enamel hypoplasia
21 so that the teeth are susceptible to caries after the eruption (8). Lack of calcium and fluoride,
22 especially in children under 12 years of age, also encourages caries in children's teeth (7).
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30 Overweight nutritional status can also affect the severity of dental caries. Excess nutrients
31 cause the growth and development of teeth to be faster so that the teeth are exposed to caries
32 factors for a longer time (9, 26). Children who are overweight and obese generally consume
33 excess sugar and carbohydrates so they have a lot of caries in their teeth (3). This condition is
34 caused by the cariogenic food is fermented by bacteria into lactic acid which can
35 demineralize enamel and dentin (10). If the frequency of the cariogenic food is high, the
36 possibility of dental caries is also high.
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49 Hendaro (2015) states that oral health and body health influence each other. They both
50 influence each other. Proper nutrition can maintain optimal oral health and good oral health
51 can also maintain adequate nutritional intake for the body (27).
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3 Children who had thinness or severe thinness nutritional status can be caused by dental
4 caries. Dental caries that is left untreated will result in a toothache (28). Pain caused by dental
5 caries, especially in the permanent mandibular first molar which is the key to occlusion,
6 results in disruption of the masticatory system thereby reducing food intake in children. The
7 lack of nutritional intake consumed by children affects the nutritional status of children
8 becoming thin or severe thinness (29). Alkarimi, et al. (2014) stated that infected dental pulp
9 can affect immunity and erythropoiesis which can cause anemia, affect bone formation, sleep
10 patterns, and food intake. These data are supported by the results of a trial of treatment of
11 severe caries in children ages 6 to 7 which significantly increased their appetite. Sleep
12 disturbances caused by pain and infection of the teeth also affect the imbalance of growth
13 hormone secretion and disruption of the absorption of nutrients in the body (30).
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31 Parental control is closely related to food consumption and children's dental and oral health
32 behavior. If parents do not take preventive action on dental health behavior and control food
33 consumption, then the child tends to experience dental caries along with being overweight or
34 obese (31). Fankari (2018) states that diet greatly affects the child's growth and development
35 patterns in meeting the nutrients in their bodies (28).
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45 CONCLUSION

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49 The results showed that there was a significant relationship between nutritional status and the
50 incidence of caries in the permanent mandibular first molar in children aged 7 years in
51 Plalangan Village, Jember, which was indicated by thinness and overweight children having a
52 higher level of dental caries compared to the normal children.
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Ethical Approval

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UNIVERSITAS JEMBER

(THE ETHICAL COMMITTEE OF MEDICAL RESEARCH FACULTY OF DENTISTRY

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