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**GEOGRAPHIC TONGUE PREVALENCE AND NUTRITIONAL STATUS AMONG  
 FIRST GRADE SCHOOL CHILDREN AT TANJUNGSARI SUBDISTRICT OF  
 SUMEDANG**

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**ABSTRACT**

**Background:** Geographic tongue (GT) is a state of the tongue surface which is characterized by an atrophic filiform papillary, a rising in surrounding borderline with yellowish white appearance, and presentations in varying locations and shapes. One of the predicting factors of GT is nutritional deficiency. **Objective:** to determine the prevalence of GT and nutritional status among first grade school children at Tanjungsari Subdistrict of Sumedang. **Methods:** It was a descriptive research with the implementation of survey method. The sampling was obtained according to inclusion criteria. The research locations comprised of three elementary school representatives in Tanjungsari sub-district, Sumedang. Nutritional status was assessed using Food Frequency Questionnaire (FFQ) **Results:** There were 200 children with a prevalence of geographic tongue in a total of 4.5%. Nutritional status obtained a result of 11.11% student included in the above-normal criteria, 22.22% students included in normal criteria, 11.11% student included in low deficiency criteria, 33.33% students included in moderate deficiency criteria, and 22.22% students included in high deficiency criteria. **Conclusion:** The prevalence of geographic tongue among first grade school children at Tanjungsari District of Sumedang is 4.5% with the highest nutritional status in moderate deficiency category.

**Keyword:** Children, elementary school, first grade, geographic tongue; nutritional status

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**INTRODUCTION**

Tongue is an organ with an important role in the process of food digestion and speech, yet certain abnormalities may interfere with its functions. Tongue abnormalities that occur can be both congenital and hereditary<sup>1</sup>. Research on tongue abnormalities has been conducted in various countries and resulted in several tongue abnormalities, such as fissured tongue, geographic tongue, macroglossia, ankyloglossia, hairy tongue, and microglossia. A research conducted in Yaman obtained 87 patients or 17.4% samples with the presentation of tongue abnormalities. In detail, the results were comprised of fissured tongue (6.8%), geographic tongue (4.6%), macroglossia (2.6%), ankyloglossia (2.2%), hairy tongue (0.8%), and

microglossia (0.4%)<sup>2</sup>. This data indicates that geographic tongue was reserved as one of tongue abnormalities with high prevalence. This significantly high prevalence may be due to the lack of awareness upon this aberration.

The prevalence of geographic tongue in pediatric population ranges from 0.37% to 14.3% with unknown aetiology<sup>3</sup>. In India, geographic tongue prevalence reached 0.89% among its population<sup>4</sup>. Geographic tongue is more frequently reported in adults than in children<sup>5</sup> while others believe it to be common in younger individuals<sup>6</sup>. A research in Indonesia was conducted on 100 patients who visited Dental and Oral Hospital Faculty of Dentistry Sumatera Utara University where it was found that 11 patients or 11% suffered from geographic tongue<sup>1</sup>. Another research conducted on 61 atopic patients

who visited Hasan Sadikin Hospital Bandung found one patient with geographic tongue (3.3%) and two patients (6.7%) experienced geographic tongue combine with recurrent aphthous stomatitis (RAS)<sup>7</sup>. Based on the description above, geographic tongue is depicted as one of tongue abnormalities with a fairly high prevalence.

The high prevalence of geographic tongue can be found almost in all ages, even in children aged two years old. Geographic tongue is a benign and common inflammatory phenomenon. Atrophy of the filiform papillae leaves an erythematous area with a white, yellow or slightly gray elevated peripheral zone, and irregular jagged pattern (like a geographic map) of the tongue. This condition usually involves the dorsal surface and the lateral borders of the tongue<sup>8</sup>. Geographic tongue is generally asymptomatic, but some may be accompanied by symptoms such as burning sensation and sensitivity to hot and spicy foods<sup>9</sup>. The etiology of geographic tongue has yet been identified, but some study mentions that geographic tongue may be caused by several predisposing factors including systemic abnormalities, psychosomatic factors or emotional stress, hormonal factors, drug consumption, and nutritional deficiencies<sup>10</sup>. Emotional stress and nutritional deficiency factor are one of the factors that can trigger the occurrence of geographic tongue among children; therefore a research should be conducted on the first-grade students of elementary school.

First-grade students are elementary school's new students so that they need adaptation with their new environment. The process of adaptation to the environment can trigger the emergence of stress in children<sup>11</sup>. Nutritional deficiency factor is one of the predisposing factors that cause the geographic tongue to occur due to dietary changes with the availability of various snacks at schools. The emergence of stress and lack of good nutrition in children can trigger the occurrence of geographic tongue. There are many types of snacks available that became one of the primary school children's food intakes during their stay in school. Snacks availability at school is not necessarily a good food intake for them. A good intake of food will have a good effect on health, while poor food intake can be bad as well. Type of food intake consumed regularly can determine the nutritional description of individuals who consume them.

Based on the research background, the research will be conducted at SDN Tanjungsari 1, SDN Tanjungsari 2, and SDN Kebonhui because the location is near to our almamater Universitas Padjadjaran campus thus we want to increase the

health quality for people around us first. The aim of this research is to know the prevalence of geographic tongue and nutritional status among first grade school children at Tanjungsari 1, Tanjungsari 2, and Kebonhui elementary schools.

## MATERIAL AND METHODS

The sample in this research is all first grade school children at Tanjungsari 1, Tanjungsari 2, and Kebonhui elementary schools. The data used are primary data by clinically or visually examining the subjects using the basic tools and light. The research was done by obtaining a research permit and letter of research ethical clearance No.456/UN6.C10/PN/2017. After that the samples was determined at the chosen research sites by operator while providing informed consent and preparing the tools, materials, inspection sheets and questionnaires form. The samples was measured for weight and height. The researcher identify the presence of geographic tongue and measured the nutritional status for sample who was detected with geographic tongue. The parents of children who were diagnosed with geographic tongue were interviewed with Food Frequency Questionnaire (FFQ). The data was collected, processed and analyzed using statistical analysis. The result was presented in table of frequency and descriptive statistics.

Nutritional description was obtained by distributing FFQ (Food Frequency Questionnaire) to the parents whose children experienced geographic tongue. The questionnaire was used to obtain the frequency of food daily consumption, the size of food portion and the amount of food obtained as a source of nutrients. Respondents were asked to mark the list of available food items in the questionnaire which was then recapitulated to identify the frequency of food consumption<sup>12</sup>. The next step was to calculate the energy, protein, fat and carbohydrate intake of each food contained in the questionnaire, by the formula as follows<sup>13</sup>:

$$\text{Nutrients} = \frac{\text{Weight of food intake}}{100} \times \text{Weight in DKBM}$$

The energy, protein, fat and carbohydrate intake can be determined by calculating the formula above toward each food contained in the questionnaire in which each type of food are elucidated to contain respective energy and nutrients (protein, fat and carbohydrates). Then the amount of energy in all foods contained in the questionnaires was summed and compared with the nutritional

adequacy rate (Angka Kecukupan Gizi/AKG). The energy requirement based on the nutritional adequacy ratio (Angka Kecukupan Gizi/AKG) was calculated by the following formula<sup>13</sup>.

$$E = \text{BBI} \times \text{Energy requirements based on age} - \text{appropriate AKG}$$

Information:

E : Energy

BBI : Ideal weight, which can be calculated by the following formula:

$$\text{BBI} = \text{Age (in years)} \times 2 + 8$$

The last step was to calculate the percentage of nutritional intake level with the following formula<sup>7</sup>.

$$\text{Level of Nutritional Intake (\%)} = \frac{\text{Nutritional intake}}{\text{Nutritional needs}} \times 100\%$$

Information:

Nutritional intake : the amount of energy all the food contained in the questionnaire

Nutritional needs : the number of nutritional needs based on age

**RESULTS**

As many as 200 children were obtained as the samples. Nine children (4.5%) were found to have geographic tongue lesions, while 191 other respondents 95,5% had no geographic tongue lesions. Children with geographic tongue are more likely found in male than female, by 2% difference. Children with geographic tongue at the age of 6 have a percentage of 2.5%, and at the age of 7 has a percentage of 2% (Table 1).

**Table 1.** Frequency Distribution of Students with Geographic Tongue

Category	Amount	%	
Yes	9	4,5	
No	191	95,5	
Total	200	100	

  

Gender	Yes		No	
	Amount	%	Amount	%
Male	7	3,5	85	42,5
Female	2	1	106	53
Total	9	4,5	191	95,5

  

Age	Yes		No	
	Amount	%	Amount	%
6 years	5	2,5	119	59,5
7 years	4	2	72	36
Total	9	4,5	191	95,5

**Table 2.** Nutritional Status in Students with Geographic Tongue

Consumption Criteria	Rate	
	Amount	%
Above Normal	1	11,11
Normal	2	22,22
Low Level Deficiency	1	11,11
Medium Level Deficiency	3	33,33
High Level Deficiency	2	22,22
Total	9	100

Table 2 shows the nutritional description of students with geographic tongue, where the nutrition description is obtained from the calculation of food material consumed per day with the calculation of FFQ (Food Frequency Questionnaire). The above table shows 11.11% student included in the above-normal criteria, 22.22% students included in normal criteria, 11.11% student included in low deficiency criteria, 33.33% students included in moderate deficiency criteria, and 22.22% students included in high deficiency criteria.

## DISCUSSION

The prevalence of students with geographic tongue in first-grade students at SDN Tanjungsari 1, SDN Tanjungsari 2, and SDN Kebonhui is 4.5%. The high prevalence of geographic tongue has been widely reported. As in previous studies, it is found that the high prevalence of geographic tongue in patients at Dental and Orthodontic Dental Faculty of Universitas North Sumatera is 11%<sup>1</sup>. Previous research also said that 3.2% of the research subjects had geographic tongue lesion. Another research conducted on first-grade students in the Tanjungsari Community Health Center obtained 2.5% of students with geographic tongue lesion<sup>14</sup>. The frequency of first graders in SDN Tanjungsari 1, SDN Tanjungsari 2, and SDN Kebonhui with geographic tongue based on gender was 3.5% lesion found in males and 1% in females. The results of this research are in accordance with previous research results which found that the ratio of geographic tongue based on gender among the students of Faculty of Dentistry Gadjah Mada University of Yogyakarta are more commonly identified in males (6.25%) than in females (1.06%)<sup>15</sup>. Other research also showed the same result, where the ratio of geographic tongue is more common in males by 8.94%, whereas in females by 6.78%<sup>10</sup>. The frequency of children who have geographic tongue is also related by age. This study attained first-grade elementary school children as the subject. The results of this study show that geographic tongue is more common in elementary students. It can occur because geographic tongue can appear as early as possible, including in children<sup>9</sup>.

One of the predisposing factors for geographic tongue is hereditary factor and nutritional deficiency, where both factors can cause child to experience geographic tongue<sup>15</sup>. Hereditary factors allow children to suffer from geographic tongue because their parents or family have also experienced geographic tongue<sup>16</sup>. Other predisposing factor is nutritional deficiency.<sup>15</sup>

Nutritional deficiency factors can also be a contributing factor to this condition. Nutritional deficiency can inhibit the differentiation and the growth of epithelial cells. Consequently, the process of differentiating the terminal epithelial cells towards the stratum corneum is inhibited and oral mucosa becomes thinner due to loss of normal keratinization thus it is presented with atrophy, and more easily ulcerated condition. Folic acid and vitamin B12 deficiency can also cause damage to cellular immunity that reduce bactericidal activity of polymorphonuclear leukocytes and antibody responses resulted in the abnormalities of epithelial

tissues.<sup>17</sup> Folic acid and vitamin B12 deficiency can occur because child don't like to consume vegetable. Due to dietary changes with the availability of snacks in school, folic acid and vitamin B12 deficiency can result in lingual depapillation and ulcerative conditions<sup>13</sup>. Fe deficiency will manifest in the mouth. These manifestations may be presented in oral mucosal atrophy, glossitis atrophy which is the loss of the tongue papilla, inflammation and pain, and burning sensation. This situation causes the patient to feel uncomfortable and difficult to eat, so that it can cause nutritional deficiency in the patient which is a predisposing factor that triggers the emergence of geographic tongue<sup>18</sup>. Therefore, in this research we also examined the description of nutrition in children who experience geographic tongue.

These results can portray the nutritional description in students with geographic tongue. One student included in the above-normal criteria, two were included in normal criteria, one in low deficiency criteria, three in moderate deficiency criteria, and two students in high deficiency criteria. It means that 6 from 9 students were under the normal nutrition status. It is suspected that the child diet is not good, such as food choice, consumed snack and lack of balanced nutrition knowledge in parents.

Differential diagnosis of geographic tongue is oral candidiasis, median rhomboid glossitis, and leukoplakia. Oral candidiasis is an opportunistic infection in the oral cavity and *C. albicans* is the primary causative agent in oral candidiasis. Having the same predisposing factors as the geographic tongue, namely nutritional disorders, differences in oral candidiasis can be caused by endocrine disorders, malignancy, hematological disorders, immune disorders, xerostomia, drugs (corticosteroids, or long-term broad-spectrum antibiotics), dentures, smoking. The most common forms of candidiasis lesions found in the oral cavity are pseudo-membranes and erythematous lesion. Pseudo-membranes have manifestations in the form of white patches or plaque lesions, then if scraped they will be detached and it leaves red mucosal surface accompanied by mild bleeding. Candidiasis erythematous is clinically characterized by the presence of a red area and usually accompanied by constant pain or burning sensation<sup>19</sup>. It is different from the geographic tongue which is an abnormality on the surface of the tongue in the form of a non-patchy reddish area which is usually surrounded by a narrow zone of regenerated papilla, whiter in color than the area around it<sup>9</sup>. This disorder is generally asymptomatic but burning or irritation of the tongue

may frequently occur, mainly due to hot or spicy foods<sup>20</sup>.

Median rhomboid glossitis can be red, white or yellow. This lesion is in the median dorsum of the tongue area, just anteriorly to the circumvallate papillae, and has no filiform papillae. No symptom is reported in this disease. The difference with geographic tongue is that these lesions are often associated with the presence of *Candida*<sup>21</sup>. Leukoplakia is a white lesion on the tongue, where the etiology of most cases of leukoplakia is unknown (idiopathic). But several studies have shown that the factors most often associated with leukoplakia are smoking, alcohol consumption, chronic irritation, candidiasis, vitamin deficiencies, endocrine disorders, and because of certain virus attacks. Studies that have been conducted also link some vitamin deficiencies to the occurrence of leukoplakia. Decreased serum levels of vitamins A, B12, C, beta carotene and folic acid can significantly increase the likelihood of leukoplakia. The initial lesion can be gray or slightly white which is rather transparent, fissured and typically soft and flat. Usually the boundary is firm but can also be limited by irregular line. The difference with geographic tongue is that hyperplasia occurs as the earliest sign that appears and the epithelium will show a form of cellular degeneration when the irritant lasts longer so that atrophy occurs. When the reversible phase of adaptation and cell damage is complete, the cell will enter an irreversible stage of damage, which is in the form of apoptosis or malignant transformation<sup>22</sup>.

Based on the research, it can be concluded that the prevalence of geographic tongue among first grade school children at Tanjungsari 1, Tanjungsari 2, and Kebonhui elementary schools is 4.5%. The research also demonstrated the nutrition status of children with geographic tongue which was mostly under normal condition, and mostly included in the category of moderate-level deficiency. The limitation of this study is carried out in one sub-district with the same economic level so that further research is needed on the varied population. In addition, it should be suggested that nutrition education for primary school children be given as a preventive measure.

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