

## Correlation between predictions to get a new dental caries with residence area and parental socio-economic conditions in adolescents in Sleman DIY

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### ABSTRACT

**Background:** Adolescence is a period when an individual experiences physical and psychological growth, thus requiring higher energy intake. As a result, they have a high appetite, but at the same time the supervision of parents on their oral hygiene behavior is decreases. They become free to choose their preferred food, sometimes containing high carbohydrates that may increase risks of dental caries and overweight. Sleman is one of districts in Yogyakarta, also considered as an agglomeration area of Yogyakarta town, which still has urban and rural areas. **Purpose:** This study aimed to examine the correlation between residence area and parental socio-economic conditions with prediction to get a new dental caries. **Method:** This study was an analytic survey study conducted on 275 adolescents in Sleman. Samples were selected by using stratified cluster random sampling technique. Prediction to get a new dental caries was measured by using cariogram, involving 10 variables. Residence area was observed based on territorial characteristics, such as urban and rural areas matched to their ID card. Meanwhile, parental socio-economic condition was measured on daily expenses of their parents. A multiple regression analysis with dummy variables was used to analyses the correlation between the independent and dependent variables at a confidence level of 95%. **Result:** The results showed that the prevalence of caries in those adolescents in urban areas was 70.7%, while 81.95% in rural areas. The DMFT index in urban areas was 2.27, while 2.65 in rural areas. The mean percentage of prediction to get a new dental caries in urban areas was  $47.83 \pm 23.63$ , while  $53.61 \pm 24.68$  in rural areas. The results of the statistical analysis then showed that there was no significant correlation of residence area and parental socio-economic conditions with prediction to get a new dental caries. **Conclusion:** In conclusion, residence areas, rural and urban areas, and parental socio-economic conditions, from low to high economic status were not correlated with prediction to get a new dental caries in adolescents.

**Keywords:** prediction to get a new dental caries; residence area; parental socio-economic conditions

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### INTRODUCTION

Adolescents are very specific individuals because of their physical and psychological growth states. Their body, including their face and jaw, changes, and their dental occlusion reaches perfection, except their last molars. As a result, in this phase their lower face profile will reach

the final development. They also have biological changes, known as puberty, a human reproduction development marked with changes in genital organ.<sup>1</sup>

Along with the physical growth, there are also enormous cognitive, psychological, and emotional changes. Consequently, those changes often trigger overreactions in them, such as complaining, arguing, and being prejudiced

on new information received. In late adolescence, those problems are slowly coming to a close, thus, they are more sociable and enthusiastic in communication.<sup>2</sup>

The growth of their body requires higher intake of carbohydrates and protein, thus increasing their appetite. As a result, the frequency of their meals and snacks will indirectly increase. Unfortunately, at the same time the direct supervision of their parents on their oral hygiene pattern is getting low. They become free to choose their preferred food, sometimes containing high carbohydrates that may increase risks of dental caries and overweight.<sup>3</sup> The prevalence of caries in adolescents aged 12 years in Indonesia 29.8%, and the average of DMFT at age 12 and 15 years when new permanent teeth begin to function was 1.4 and 1.5 respectively whereas thus permanent teeth begin to function.<sup>4</sup>

Dental caries commonly occurs in adolescents and other age groups due to the activity of microorganisms fermenting food debris, especially carbohydrates in dental plaque, producing lactic acid, which makes a drop in pH of plaque on tooth surface leading to demineralization of tooth enamel.<sup>5</sup> Susceptibility to dental and oral diseases is generally due to inadequate dental health maintenance and lots of sugary food consumption. Individuals with poor dental and oral health are likely to have problems in their activities, including being absent from school, suffering from pain, having difficulties in sleeping and eating, and experiencing weight loss ultimately affecting their quality life.<sup>5,6</sup>

Dental caries is a multifactorial disease in hard tissue of teeth caused by several factors, such as low salivary flow, the number and composition of cariogenic bacteria, inadequate utilization of fluoride, gingival recession, immunological factors, and genetic factors. The disease is also influenced by lifestyle behaviors, including oral hygiene maintenance as well as eating habits that can increase the risk of caries, such as high consumption of refined carbohydrates and sweet snacks.<sup>7,8</sup> There are also other risk factors indirectly contributing to the occurrence of caries, namely poverty or social status, education level, health insurance participation, orthodontic appliance use, and poor or unfit conditions of partial denture.<sup>7-9</sup>

Those risk factors of dental caries will also affect oral health in adolescents since the frequency of their meal intake and their habit of eating snacks increase. If this condition is not accompanied with good knowledge about health, it can trigger obesity and dental caries. In other words, behavioral factors play an important role in the occurrence of dental caries in adolescents.<sup>8</sup>

Urban adolescents generally have easier access to reach places of entertainment providing meals/ snacks than rural ones. Support from their family-owned good economic condition also trigger the urban adolescents to reach the required entertainment more easily. Socio-economic conditions can usually be observed on their phases of life, namely the transition from childhood to adulthood and later

at the time they start to work.<sup>1</sup> Some study have shown that oral health of adolescents and people in rural areas is lower than those in urban areas.<sup>10</sup>

Some researchers even have developed a computer software used to quantify risk of caries, for example Cambra and Cariogram.<sup>11,12</sup> Cariogram is used to measure the contribution of the risk factors playing a direct role in the occurrence of dental caries in the future. The result is in the form of percentage of prediction to avoid dental caries. Therefore, to gain a percentage of prediction to get a new dental caries is subtraction of 100% with the result of Cariogram output. Cariogram can also be used to analyze the indirect influence of socio-economic conditions in dental caries.

Sleman is one of regencies in Yogyakarta located in the northern part of Yogyakarta with a wide range of geographical areas. Sleman is located on the slopes of Mount Merapi, an area of water resources and eco-tourism oriented to activities of Mount Merapi and its ecosystem. The eastern area of Sleman includes Prambanan, Kalasan, and Berbah districts, where ancient heritages are located as the center of cultural tourism. The central area of Sleman is an agglomeration area of Yogyakarta city, a center of education, trade and services. Meanwhile, the western area of Sleman is an agricultural area of wetlands providing enough water and sources of raw materials used for craft industry activities, such as rushes, bamboo, and pottery.<sup>13</sup> In other words, Sleman is a developing place, but still have urban and rural areas in accordance with the research design.

The attitudes of adolescents still unstable, on the other hand, they have a high appetite due to their growth. This study aimed to analyze the correlation of residence area, urban and rural areas, and low-high parental socio-economic conditions with prediction to get a new dental caries in adolescents in Sleman.

## MATERIALS AND METHOD

This research was an analytic survey study with cross sectional design. The subjects in this research were junior high school students aged 13-15 years, who live in both of urban and rural areas in Sleman in Yogyakarta. The samples in this research then were selected by using stratified cluster random sampling technique<sup>14</sup> (census block) on some districts in those urban and rural areas.

Of 216 clusters (census block) in Sleman, there were 874 teenagers (736 people in the urban areas and 138 people in the rural areas).<sup>15</sup> The proportion of those adolescents who live in the urban and rural areas was 5.33: 1.

The total of samples in this research was determined through a calculation using the results of a previous research conducted by Amalia *et al.*<sup>16</sup> on children aged over 12 years in Yogyakarta in 2011. Based on the results of this previous research, the index of dental caries in children aged over 12

years is  $3.4 \pm 3.0$ . The sample size used for single adolescent population in Sleman was determined as follows:

$$n = \frac{Z_{1-\alpha/2}^2 \sigma^2}{d^2}$$

- n = minimum sample size
- $Z_{1-\alpha/2}$  = standard normal distribution value (Table Z) at  $\alpha = 0.05$
- $s^2$  = population variant values approximated by the sample variance (= 3)
- d = expected difference from the real mean (0.5)

$$n = \frac{3.7416 \times 3^2}{0.5^2} = 134.697$$

n = 135 people

Due to design effects derived from the cluster sampling type, the number of samples became  $2 \times n$ .<sup>17</sup> As a result, the minimum number of samples in this research was 270. However, the number of samples used in this research was 275.

Measurement of the prediction to get a new dental caries as a dependent variable was performed by using Cariogram program, involving 10 variables measured from each sample, namely caries experience (the number of caries in the mouth of a subject as measured by DMFT index), diseases inhibiting tooth cleaning e.g paralysis observed in the examination of samples, frequency and composition of the diet measured by food diary for 3 days, the amount of plaque as measured by Loe and Silness's plaque index, the number of plaque bacterial colonies measured by cariostat, saliva volume and buffer saliva capacity by measuring the pH of saliva 1-2 hours after eating, exposure to fluoride orally or through toothpastes, as well as clinic assessment when checking the subject's condition. On the other hand, independent variables in this research were parental socio-economic conditions of the samples measured by the costs of daily expenses, as well as residence areas obtained based on residential address inhabited for at least 2 years and then adapted to the characteristics of the subdistrict areas.

Chi-square test, was carried out to differentiate between the prediction to get a new dental caries and the parental socio-economic conditions in those adolescents in both urban and rural areas. A multiple regression analysis with dummy variables at a confidence level of 95% then was performed to analyze the correlation between the parental socio-economic conditions and the residence areas.

**RESULTS**

In this research, the number of samples used was 275 people selected by using *random stratified cluster* technique on 6 districts out of 17 districts (Table 1). Based on Table 1, the number of samples in the urban area was 180 people, while 95 people in the rural areas. Dental caries prevalence in the urban areas was lower than that in the rural areas. Similarly, the DMFT in the urban areas was lower than that in the rural areas. The results of the correlation measurement between the prediction to get a new dental caries and the residence areas are shown in Table 2. Criteria used in the prediction to get a new dental caries was modified from the criteria set by Bratthall, then adopted in a research performed by Kemparaj *et al.*<sup>18</sup>

Table 2 shows that the percentage in the low category of the prediction to get a new dental caries in the urban areas (24.4%) was higher than that in the rural areas (18.9%). In the high and very high categories, the percentages of the prediction to get a new dental caries were higher in the rural areas than those in the urban areas. These results

**Table 1.** Results of research variable measurement

The number of samples	Urban areas	Rural areas
Males	69 individuals	34 individuals
Females	111 individuals	61 individuals
Prevalence of dental caries	70.7%	81.05%
DMFT/individual	2.27	2.65

**Table 2.** Distribution of samples based on the prediction to get a new dental caries and the residence areas

		Prediction to get a new dental caries				Total
		Low 7 – 28.5	Medium 29 – 50.5	High 51 – 72.5	Very high 73 - 94	
Urban	Total	44	60	38	38	180
	%	24.4	33.3	21.1	21.1	100
Rural	Total	18	26	24	27	95
	%	18.9	27.4	25.3	28.4	100
Total		62	86	62	65	275
% (Urban/Rural)		22.5	31.3	22.5	23.6	100

$X^2 = 3.422$        $p = 0.331$

**Table 3.** Distribution of samples based on the prediction to get a new dental caries and the parental socio-economic conditions

		Prediction to get a new dental caries				Total
		Low 7 – 28.5	Medium 29 – 50.5	High 51 – 72.5	Very High 73 - 94	
Parental Socio-Economic Conditions	Low 300 hundreds -2.8	38 20.7	62 33.7	38 20.7	46 25	184 100.
	Medium 2.9 – 5.4	19 27.1	20 28.6	19 27.1	12 17.1	70 100
	High 5.5 – 7.2	3 25	2 16.7	3 25	4 33.3	12 100
	Very High 7.3 – 9.5	2 22.2	2 22.2	2 22.2	3 33.3	9 100
	Total	62 22.5	86 31.3	62 22.5	65 23.6	275 100

 $\chi^2 = 5.755$ 

p = 0.764

suggest that adolescents in the urban areas had lower value of the prediction to get a new dental caries than those in the rural teens. However, the results of the chi square analysis showed that there was no significant difference (p = 0.331) between those urban and rural adolescents.

The measurement of the prediction to get a new dental caries correlated with the parental socio-economic conditions are shown in Table 3. Table 3 shows that the majority of the samples had a relatively low parental socio-economic conditions. In the group of samples with the low parental socio-economic conditions, the highest percentage of the prediction to get a new dental caries was in the category of medium (33.7%).

The next highest number of samples was in the group of samples with the medium parental socio-economic conditions. In this group, the percentages of the prediction to get a new dental caries in the categories of low, medium, and high were the same. Nevertheless, the results of the chi square analysis showed that there was no significant difference. The results of the multiple regression analysis also showed that there was no significant correlation of the parental socio-economic conditions and the residence areas as independent variables with the prediction to get a new dental caries (F = 1.898 at p: 0.152).

## DISCUSSION

Prediction to get a new dental caries is a percentage reflecting that a person will suffer from dental caries in the future if their oral hygiene condition is still poor. The predictive value is obtained by using a computer program, called Cariogram.<sup>11</sup> This program is used to analyze risk factors that play a direct role in the occurrence of dental caries, such as dental caries experience, saliva volume, saliva buffer ability, and so forth. The results of the analysis

using this program illustrate the interaction of risk factors causing dental caries in individuals examined.<sup>12</sup>

In this research, the percentage values of the prediction to get a new dental caries in adolescents in Sleman were between 7-93%. The value of 7% means that there was only a small chance (7%) for the adolescents to suffer from dental caries in the future. It was probably due to small caries risk factors, such as good oral hygiene patterns, suffering no disease that weakens their teeth, and having no snack between meal times.

Moreover, the results of this research also showed that the prediction to get a new dental caries in the urban areas was almost comparable in every category with the one in the rural areas. In the low category, the percentage of the prediction to get a new dental caries in the urban areas (24.4%) was higher than the one in the rural areas (18.9%). Meanwhile, in the high and very high categories, the percentages of the prediction to get a new dental caries in the rural areas were higher than the ones in the urban areas. These results suggest that the adolescents in the urban areas had lower prediction to get a new dental caries than those in the rural areas. In other words, it demonstrates that the risk factors, such as dental caries experience, eating habit, snack consumption, and oral health maintainance, in those adolescents in the urban areas were better than those in the adolescents in the rural areas in Sleman.

Furthermore, the percentages obtained above 20% in the high and very high categories indicate high risk factors that could endanger their dental health.<sup>11</sup> The amount of plaque on the tooth surface is a problem that needs more attention in caries prevention. Biofilm behavior on the tooth surfaces that is difficult to be reached by purifier, will develop into plaques damaging the teeth with the presence of bacteria and food waste, derived from carbohydrates, especially if the subject does not use fluorine, playing a major role in preventing dental caries.<sup>8,9</sup>

The results of this research indicate that adolescents in both urban and rural areas had the same access to food centers since Yogyakarta is considered as both of a tourist town and a student city. Yogyakarta has many food centers easily reached, also providing internet access, therefore making them very attractive for young people.<sup>13</sup>

In addition, the results of this research could not show how the parental socio-economic conditions influenced the prediction to get a new dental caries since all the categories of the parental socio-economic conditions, either low, medium, or high, were evenly distributed on all the categories of the prediction to get a new dental caries. The results of the multiple regression analysis even also showed that there was no significant correlation of the residence areas and the parental socio-economic conditions with the prediction to get a new dental caries in those adolescents in Sleman. In contrast, a research conducted in Ibadan Nigeria shows that adolescents with higher parental socio-economic conditions have poor oral hygiene since they often consume biscuits.<sup>18</sup>

Based on the results of this research, the prediction to get a new dental caries could be caused by several risk factors. It means that the parental socio-economic conditions of the families do not directly affect the prediction to get a new dental caries. But, it more directly plays a role in nutrition intake strengthening their teeth, the use of toothpastes containing fluoride, and their health care behavior in visiting to dentist. This finding is in line with a research conducted in Pennsylvania demonstrating that the parental socio-economic conditions do not directly affect oral health, but through oral health care behavior and preventive intervention.<sup>20</sup>

A previous study on rural areas shows that rural communities with limited funds they still have to spend money for health services and for transportation to reach health care facilities, so the health conditions of those communities are bad. Nevertheless, the effect of access to health care in this research was not significant since those adolescents in both urban and rural areas still had the same prediction to get a new dental caries.<sup>19</sup>

Many factors must be involved in measuring health behaviors that affect prediction to get a new dental caries, in addition to socio-economic conditions, such as knowledge, lifestyle, access to health care, and health insurance.<sup>5</sup> It may be concluded that there was no correlation of residence area, namely urban and rural areas, as well as low and high parental socio-economic conditions with prediction to get a new dental caries in adolescents.

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