

The correlation analysis of dental caries, general health conditions and daily performance in children aged 2–5 years

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ABSTRACT

Background: Oral health is important for general health and quality of life. One of the oral diseases with a high prevalence in Indonesia is dental caries. Dental caries can cause limiting disturbances of daily activities such as biting, chewing, smiling and talking, and of psychosocial well-being, including development and general health of children. **Purpose:** This study aims to analyse the correlation of dental caries incidence rate with general health conditions and daily performance of children aged 2–5 years. **Methods:** This was an analytical observational cross-sectional study. The study sample was 103 pairs of children and their mothers, selected using cluster random sampling technique. Intra-oral examination was conducted on the children to obtain decay, missing, filled-teeth (DMF-T) index score. Information about oral impacts on daily performance (OIDP) of the children was collected through a questionnaire distributed to the mothers. The data obtained were statistically analysed with a regression test ($p < 0.05$). **Results:** It was found that dental caries had a significant correlation with general health ($p = 0.00$) and daily performance, including chewing function disorder ($p = 0.00$), difficulties in maintaining oral health ($p = 0.039$), sleep disorders ($p = 0.00$), and emotional instability ($p = 0.00$). **Conclusion:** The incidence rate of dental caries has a significant effect on the general health conditions and daily performance of children aged 2–5 years.

Keywords: child health; daily performance; dental caries; oral impact on daily performance

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INTRODUCTION

Oral and dental health is important for general health. Unfortunately, children seem to be vulnerable to oral and dental diseases because they generally have poor oral and dental care habits. Eating sweet food and drinking sweet drinks are some examples of their bad habits.¹ Based on the 2018 Basic Health Research data, dental caries prevalence in Indonesia was 81.5% in children aged 3–4 years and as high as 92.6% in those aged 5–9 years. Indonesia's decay, missing, filled-teeth (DMF-T) index in 2018 was 7.1, an increase of 54% from RISKESDAS 2018.²

Oral health is also considered fundamental to public health since a healthy mouth allows individuals to talk,

eat, and socialise without experiencing pain, discomfort, or embarrassment.³ However, without adequate care, dental caries may occur and eventually lead to tooth decay. Dental caries is the main cause of toothache and tooth loss. Everyone is susceptible to dental caries throughout their lives.⁴ Nonetheless, dental caries is one of the many childhood diseases that can be prevented.

Dental caries can also interfere with the chewing system in general or become a focal infection, thus affecting the health and development of children.⁵ For instance, dental caries greatly affects the quality of life of children in America, Canada and England. In Aboriginal children in Western Australia, dental caries is the fifth most common disease causing preschool children to be hospitalised (ages

1–4 years).⁶ Toothache caused by dental caries causes a loss of 50 million school hours per year, affecting school attendance and future adult life.

In Indonesia, toothache has caused 62.4% of the population to experience discomfort at work/in school for an average of 3.86 days per year. This condition indicates that dental disease, although not fatal, reduces work productivity. A research in Medan even reveals the impact of dental caries on four dimensions of quality of life, namely, limited function, pain, psychological discomfort and physical disability. In addition, Sheiham⁷ highlights three effects of untreated dental caries on the growth and development of preschool children. First, pain caused by dental caries can interfere with children's food intake. Second, pain caused by dental caries can trigger sleep disturbances and subsequently leads to glucocorticoid production and growth disturbances. Third, chronic inflammation caused by dental caries can suppress haemoglobin and lead to anaemia, since the production of erythrocytes in the bone marrow is reduced. Thus, it is essential to treat dental caries in preschool children to improve not only their growth and development but also their quality of life.^{8–10}

A preliminary survey of 30 respondents conducted in pre-kindergarten schools in Kenjeran Health Center working area found a 50% incidence rate of caries severity. For the problems outlined earlier, this study is focused on the dental caries incidence rate and the general health conditions of children aged 2–5 years in some pre-kindergarten and kindergarten schools around the Kenjeran Health Center, Surabaya City. This study aims to analyse the correlation of the dental caries incidence rate with the general health conditions and the daily performance of children aged 2–5 years.

MATERIALS AND METHODS

This was an analytical observational cross-sectional study. The DMF-T index of children aged 2–5 years was collected along with questionnaire results distributed to their mothers. The study sample was 103 pairs of pre-kindergarten and kindergarten school children and their mothers, around Kenjeran Health Center, Surabaya, selected using the cluster random sampling method. This research has received a certificate (628/HRECC.FODM/X/2019) from the Ethics Commission of the Faculty of Dental Medicine, Universitas Airlangga. Each respondent's parent was asked to provide informed consent before participating in this study.

The severity of children's caries was observed through direct primary tooth examination (intra oral). Next, DMF-T index measurement was conducted to observe the dental health conditions of children by observing cavities (decay), teeth lost due to caries (missed), and teeth that had been filled. Based on the data collected, the DMF-T score was obtained and analysed statistically to find any correlation with the general health conditions and the daily performance

of the children collected through questionnaires distributed to their mothers.

The questionnaire used in this study was concerned with oral impact on daily performance (OIDP) of the children involving a) eating and enjoying food, b) talking and pronouncing clearly, c) cleaning teeth, d) sleeping and relaxing, e) smiling, laughing and showing teeth without embarrassment, f) keeping emotions so as not to be easily offended, g) performing main work or social roles, and h) being able to understand conversations with people around them. In addition, a question instrument was added to analyse the general health conditions of the participants. The data obtained were statistically analysed using a regression test with the Statistical Package for Social Science (SPSS, IBM corporation, Illinois, US) software version 22, with a p-value of 0.05%.

RESULTS

This research was conducted in pre-kindergarten and kindergarten schools in Surabaya on 103 pairs of children aged 2–5 years and their mothers. The dependent variable in this study is caries, while the independent variable is the general health conditions of children aged 2–5 years. The data were statistically analysed with a regression test to find correlation between these variables. The regression test results showed a significant correlation between the incidence rate of dental caries and the general health conditions of those children. The distribution of respondents in this study can be seen in Table 1.

Based on Table 1, the results show that 53.4% of the respondents had a high caries index of >6.6. Similarly, the data of the children's general health conditions indicate that 72.8% of the respondents had experienced illness in the last two months. The correlation of dental caries incidence rate with the children's daily performance was statistically analysed using the results of the OIDP questionnaire. The results of this analysis can be seen in Table 2. Table 2 also shows the correlation of the incidence rate of dental caries with OIDP of each respondent. The table also illustrates that there was a significant correlation between the incidence rate of dental caries and chewing function disorders, with a p-value of 0.000 ($p < 0.05$). However, there was no significant correlation between the incidence rate of dental caries and speech difficulties, with a p-value of 0.195 ($p > 0.05$).

The OIDP index scores indicate a significant correlation between the incidence rate of dental caries and difficulties in maintaining oral hygiene, with a p-value of 0.039 ($p < 0.05$). There was also a significant correlation between the incidence rate of dental caries and sleep disorders due to oral and dental health problems, with a p-value of 0.000 ($p < 0.05$). There was a significant correlation between the incidence rate of dental caries and emotional instability, with a p-value of 0.000 ($p < 0.05$). There was no significant correlation between the incidence rate of dental caries and

difficulties in smiling due to oral health problems, with a p-value of 0.078 ($p > 0.05$).

In other words, the incidence rate of dental caries had a significant correlation with the general health conditions of children aged 2–5 years, related to chewing function disorders, difficulties in maintaining oral hygiene, sleep disorders due to oral and dental health problems, and emotional instability due to oral and dental health problems. However, the incidence rate of dental caries had no significant correlation with speech difficulties, avoiding meeting people, and difficulties in smiling. However, the statistical test using a regression test shows that the incidence rate of dental caries has a significant effect on the general health conditions of children aged <5 years, with a p-value of 0.000 ($p < 0.05$).

DISCUSSION

This study shows a significant correlation between the incidence rate of dental caries and the general health conditions of children aged 2–5 years. This may be due to several factors that can increase the severity of dental caries, such as education level; thus, the higher the education level, the higher the awareness of maintaining one's own general health.⁵ In addition, it can also be assessed from how dental and oral health is maintained, such as not eating carcinogenic foods, use of toothbrushes, brushing teeth frequently, and using proper brushing technique.¹¹ Similarly, Wening *et al.*⁸ argue that although there is no significant correlation between the severity of dental caries and the nutritional status of children, a decrease in desire

Table 1. Distribution of respondents

Variables		N*	Percentage (%)
Sex	Male	49	47.6%
	Female	54	52.4%
Age	2–3 years old	18	17.5%
	4–5 years old	85	82.5%
Caries severity	Low (0-6.6)	48	46.6%
	High (>6.6)	55	53.4%
Toothache	Never experienced	53	51.5%
	Had experience	50	48.5%
Daily brushing habit	1x a day	17	16.5%
	2x a day	79	76.7%
	3x a day	7	6.8%
General health conditions in the last two months	Never sick	28	27.2%
	Ever sick	75	72.8%
Having toothache	Often	62	60.2%
	Never	41	39.8%
Chewing function disorders	No	38	36.9%
	Yes	65	63.1%
Sleep disorders	No	71	68.9%
	Yes	32	31.1%
Difficulties in maintaining oral hygiene	No	71	68.9%
	Yes	32	31.1%
Avoid meeting people due to oral and dental health problems	No	93	90.3%
	Yes	10	9.7%
Emotional instability due to oral and dental health problems	No	80	77.7%
	Yes	23	22.3%
Difficulties in smiling due to oral and dental health problems	No	93	90.3%
	Yes	10	9.7%

* number of respondents

Table 2. Regression test results on the correlation of the dental caries incidence rate with the children's daily performance using the oral impact on daily performance (OIDP) questionnaire

Risk Factor	N	Sig.
Chewing function disorders	103	*0.000
Speech difficulties	103	0.195
Difficulties in maintaining of oral hygiene	103	*0.039
Avoiding meeting people due to oral and dental health problems	103	0.077
Sleep disorders due to oral and dental health problems	103	*0.000
Difficulties in smiling due to oral and dental health problems	103	0.078
Emotional instability due to oral and dental health problems	103	*0.000

* significant at p-value <0.05

to eat still can be triggered by discomfort felt when eating when having a toothache. Decreased appetite can also have an impact on children's general health as nutrient intake decreases and causes decreased endurance. Ramayani *et al.*⁹ state that children suffering from dental caries are lighter in weight than those without dental caries. The findings of the previous studies strengthen the results of this study, which revealed a significant correlation between dental caries and children's general health.

This study also evaluates the severity of dental caries in children aged <5 years, using the DMF-T index and OIDP. It is known that severe dental caries can affect quality of life intrinsically and extrinsically. Intrinsically, a severe dental cavity can penetrate the pulp chamber and cause inflammation of the pulp tissue, causing pain and discomfort leading to sleep disorders, which can also reduce immune function. Extrinsically, dental caries can cause poor oral hygiene (OH) and tooth morphology, which can interfere with chewing function, leading to reduced nutrient intake, which can also reduce immune function. The decline in immune function can cause general health problems in toddlers. Dental health is one of several oral health factors that are important for child development especially. Dental caries is the most common dental health problem found in children, which is caused by food residue that sticks to the teeth. Calcification of teeth causes teeth to become porous, hollow, and even fractured (broken). Dental caries can also cause children to experience loss of chewing power and disruption of digestion, which results in less optimal growth.^{12,13}

This study found that age and gender of children aged <5 years had no significant effect on the incidence rate of dental caries. The OIDP questionnaire results consists of eight items evaluating the impacts of oral health on children's ability to perform their daily activities, including the measurement of physical, psychological and social dimensions. This questionnaire instrument focuses on ten basic daily activities, namely, eating, talking, cleaning the mouth, performing light physical activities, sleeping, relaxing, smiling, having emotional states, going out, and enjoying interacting with others.^{14–16}

In addition, the influence of daily life performance on oral caries aims to provide alternative sociodental indicators, focusing on measuring a person's ability to carry out the indicated daily activities with the condition of the oral caries. The results of the OIDP questions concerned with the general health conditions of children aged <5 years who often have toothache and dental caries indicated a significant correlation between the incidence rate of dental caries and the frequency of having toothache. There was a significant correlation between the incidence rate of dental caries and the behaviour of avoiding meeting people due to oral and dental health problems. There was also a significant correlation between the incidence rate of dental caries and emotional instability due to oral and dental health problems. In other words, the incidence rate of dental caries had a significant effect on the emotions of children.

While the OIDP focuses on ten basic daily activities, it does not mean that all of those ten basic daily activities necessarily affect dental caries in children.^{17–19} Finally, it can be concluded that the incidence rate of dental caries has a significant effect on the general health conditions and the daily performance of children aged 2–5 years.

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