

Oral health status of elementary-school children varied according to school they attended

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ABSTRACT

Background: Oral health has been promoted in elementary school. Oral health status is worsening among children aged 12 in Indonesia. Schools are an ideal social environment where dental health promotion strategies could be implemented to improve children's oral health and to develop lasting good oral health behavior. **Purpose:** This study aimed to determine the association of sex, age, oral health behavior (tooth brushing practice, eating sweets and snacks, and routine dental health care visit) and family support, with oral health status among elementary school-children. **Method:** A school-based survey was carried out in 45 public elementary schools served by 15 community health centers in Sleman, Yogyakarta. All fifth grade students (a total of 1191 students) in the schools were recruited as study participants after informed consent being given to parents. Questionnaires on health behavior and family support were administered to students, and examinations for OHIS and DMF-T were conducted by trained research assistants. Regression analyses (with R) were performed to identify whether sex, age, oral health behavior, family support and schools were significant determinants of oral health. **Result:** Females had higher DMF-T compared to males (1.93 vs 1.56), older children showed higher DMF-T. Effects oral health behavior and family support on OHIS and DMF-T were not significant after adjusting for school. School was significantly associated with OHIS and DMF-T. **Conclusion:** Sex and age were determinants of DMF-T. Oral health behavior and family support were not associated with OHIS and DMF-T. School was a consistent predictor of OHIS and DMF-T. School-based programs, especially targeted to certain schools with worse oral health, should be strengthened.

Keywords: oral health behavior; family support; OHIS, DMF-T; elementary school-children

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INTRODUCTION

Oral health is an essential component of general health and wellbeing. School-based oral health program was started in 1951 in Indonesia. Children attended health promoting schools enjoyed better oral health quality of life.¹ Poorer oral health status was associated with dental pain, school absenteeism, and poor school performance.² If untreated, poor oral health may compromise the children's quality of life.³ Oral health behavior, including tooth-brushing practices, habitual eating of sweets and snacks, using tooth-paste and routine dental health care visit, is known to influence oral hygiene and the incidence of dental caries among school children.^{4,5}

According to the Indonesian Basic Health Surveys,^{6,7} 25.9% of respondents experienced oral health problems in 2013, an increase from 23.4% in 2007. A high percentage (93.8%) of the respondents brushed their teeth everyday in 2013, an increase from 91.1% in 2007. Decayed, Missing and Filled Teeth (DMF-T) index in children 12 years of age became worse from 0.9 in 2007 to 1.4 in 2013.

Schools are an ideal social environment where dental health promotion strategies could be implemented to improve children's oral health and to develop lasting good oral health behavior. Healthy life style has been promoted in schools as an essential determinant of oral and dental health.⁸ School age children are subject to behavioral change through intervention at schools⁹ and improvement

in family environment.¹⁰ School-based oral health preventive programs have shown significant effects on oral and dental health status after program implementation.¹¹ Poorly performing school-based dental programs are associated with worse quality of life of participating school-children.¹²

Variations in oral and dental health outcomes among children attending different schools may possibly arise due to school related programs or other social determinants associated to the students and their families. Certain social characteristics of students may lead to their attendance in particular schools. School-based oral health education in West Java, Indonesia, does not significantly improve self-reported oral health behavior and levels of dental caries.¹³ Social factors are more strongly associated with dental caries, while direct association between school-based health programs and DMF-T is not found.¹⁴

The purpose of this study was to determine the association of sex, age, oral health behavior (tooth brushing practice, eating sweets and snacks, and routine dental health care visit) and family support, with oral health status among elementary school-children.

MATERIAL AND METHODS

A survey (cross-sectional study) was carried out among children attending elementary schools in Sleman District Yogyakarta. Participants of this study were children, at fifth grade of public elementary schools. Three schools were randomly selected from each of service areas of 15 community health centers (puskesmas), giving a total of 45 schools. All fifth grade students attending the selected schools became the study subjects after informed consent was obtained from their parents or guardians.

Questionnaires asking for frequency of tooth brushing, habitual eating of sweet and snacks, visits to dentists or dental nurses (oral health behavior) were completed by the students in the classrooms (oral health behavior measures). Questions about family support to own a toothbrush, regular tooth-brushing, to refrain from consumption of sweet and snacks, and to regularly visits dentists or dental nurses were also being asked to the school-children (family support measures). Sex and age of study participants were recorded and taken into account as potential confounding factors. Anonymity of the answers to the questionnaires was assured, so the students were expected to express their real situations.

Examinations of oral hygiene were based on the scoring of debris and calculus (Oral Hygiene Index–Simplified or OHIS) according to Greene and Vermillion.¹⁶ Dental caries was measured as DMF-T according to methods developed by World Health Organization (WHO).¹⁷ Regression analyses on OHIS and DMF-T (dependent variables) of sex, age, oral health behavior, family support and school attended by the children were carried out. This study was approved by the ethical committee (internal review board)

at the School of Dentistry, Universitas Gadjah Mada. Data analyses used multiple regression (general linear model) available in R version 3.3.1 (open source statistical software).

RESULTS

There were 45 elementary schools with 1191 schoolchildren participated in this study. Demographic characteristics of the study participants indicated that most children were 11 years of age (fifth grade), and the number of boys was higher than girls (Table 1). The mean and standard deviation of OHIS and DMF-T, both are dependent variables in this study, showed that girls had a slightly better OHIS, but worse DMF-T (Table 2). The proportion of caries-free children was 34.8%. The average score of oral health behavior was 41.1 Standard Deviation (SD) = 5 with a range of 25 to 56, and family support was 63.6 (SD = 7) with a range of 33 to 80.

The average OHIS in each school varied from 0.67 Sekolah Dasar (SD) Mlesen to 2.38 (SD Banyurejo), and the average of DMF-T varied from 0.609 (SD Semarang) to 3.1 (SD Banyurejo). A regression analysis was conducted to identify factors (sex, age, oral health behavior and family support) associated with each of oral health indicators OHIS and DMF-T (Table 3). Oral health behavior and family support were significantly associated with OHIS, not with DMF-T. No association between oral health behavior and DMF-T was found ($p = 0.083$). Sex was not associated with OHIS, but female showed higher level of caries experience

Table 1. Sex and age of the study participants

Sex	Frequency (%)
Female	572 (48%)
Male	619 (52%)
Age	
10 years	146 (12%)
11 years	759 (64%)
12 years	238 (20%)
13 years	38 (3%)
14 years	10 (1%)

Table 2. Mean and standard deviation of OHIS and DMF-T

Oral health status	Mean (Standard Deviation)	Median (Minimum - Maximum)
OHIS (total)	1.24 (0.9)	1.17 (0 – 5.67)
Female	1.19 (0.9)	1 (0 – 4.67)
Male	1.27 (0.9)	1 (0 – 5.67)
DMF-T (total)	1.74 (1.9)	1 (0 – 13)
Female	1.93 (2)	1 (0 – 6)
Male	1.56 (1.8)	1 (0 – 13)

Table 3. Multiple regression analyses on OHIS and DMFT

Determinants	OHIS *		DMF-T **	
	(regression coefficient and p-value)		(regression coefficient and p-value)	
	Regression model 1	Regression model 2	Regression model 1	Regression model 2
Intercept	2.20 (0.001)	2.21 (0.001)	0.17 (0.890)	0.69 (0.546)
Sex	-0.01 (0.838)	-	0.44 (0.001)	0.46 (0.001)
Age	0.070 (0.06)	0.071 (0.053)	0.27 (0.001)	0.27 (0.001)
Behavior	-0.012 (0.039)	-0.012 (0.038)	-0.021 (0.083)	-0.015 (0.175)
Family Support	-0.010 (0.016)	-0.011 (0.012)	0.01 (0.247)	-

Note:

*Regression model 1: OHIS = 2.20 - 0.01 Sex (Female = 1, Male = 0) + 0.070 Age - 0.012 Behavior - 0.01 Family Support

Regression model 2: OHIS = 2.21 + 0.071 Age - 0.012 Behavior - 0.011 Family Support

**Regression model 1: DMFT = 0.17 + 0.44 Sex (Female = 1, Male = 0) + 0.27 Age - 0.021 Behavior + 0.01 Family Support

Regression model 2: 0.69 + 0.46 Sex (Female = 1, Male = 0) + 0.27 Age - 0.015 Behavior

Table 4. Determinants of OHIS (oral hygiene status) including schools

Determinants	*OHIS		
	(regression coefficient and p-value)		
	Regression model 1	Regression model 2	Regression model 3
Intercept	2.08 (0.001)	2.21 (0.001)	2.36 (0.001)
Age		0.071 (0.053)	0.027 (0.438)
Behavior		-0.012 (0.038)	-0.001 (0.821)
Family Support		-0.011 (0.012)	-0.004 (0.346)
School**	-0.86 (<0.001)		-0.85 (<0.001)

Note:

*Regression Model 1: OHIS = 2.08 - 0.86 School (SD Semarang = 0)

Regression Model 2: OHIS = 2.21 + 0.071 Age - 0.012 Behavior - 0.011 Family Support

Regression Model 3: OHIS = 2.36 + 0.027 Age - 0.001 Behavior - 0.004 Family Support - 0.85 School

**SD Semarang (with the lowest average DMF-T) as the reference school

Table 5. Determinants of DMF-T (caries status) including schools

Determinants	*DMF-T		
	(regression coefficient and p-value)		
	Regression Model 1	Regression Model 2	Regression Model 3
Intercept	2.38 (0.001)	0.69 (0.546)	0.82 (0.413)
Sex		0.46 (0.001)	0.46 (0.001)
Age		0.27 (0.001)	0.30 (0.001)
Behavior		-0.015 (0.175)	-0.007 (0.545)
School**	1.40 (0.006)		1.41 (0.005)

Note:

*Regression model 1: DMF-T = 2.38 + 1.40 School

Regression model 2: DMF-T = 0.69 + 0.46 Sex + 0.27 Age - 0.015 Behavior

Regression model 3: DMF-T = 0.82 + 0.46 Sex + 0.30 Age - 0.007 Behavior + 1.41 School

**SD Semarang (with the lowest average DMF-T) as the reference school

or DMF-T. Age was associated with DMF-T, and associated with OHIS ($p = 0.053$).

Schools attended by the study participants were consistently associated with OHIS (Table 4) and DMF-T (Table 5). School attended by the children was a confounding factor for the association between all other variables (demographic, oral health behavior and family support) with OHIS. Sex and age of the study participants remained significant determinants of DMF-T, even if the school was entered in the regression model. Girls had higher caries experience than boys. Higher caries prevalence was also found as the children got older.

The findings in this study revealed that the average of DMF-T among the study participants (1.74) was higher than national average, especially in girls. This is consistent with the national data (Riskesdas 2013) indicating that caries prevalence is higher among women than men. Higher prevalence of caries in women could be due to earlier eruption of teeth in girls and frequent snacking during food preparation.¹⁸

DISCUSSION

The proportion of caries free children (34.8%) in this study was similar to that of the low prevalence group of children in Campinas, Brazil (32.4%),¹⁹ and in Vadodara, India (30.9%).²⁰ Children of the same age in Italy have better caries free prevalence (64.2%),²¹ while the figure is worse, only 15% in Qatar.²² Caries experiences among children in developed countries have decreased significantly in the past few decades, due to improved oral hygiene practices, dietary habit with less sugar intake, and regular visits to dental clinics. However, caries levels increase with age, and becomes health related burdens in adults.²³

In this study, significant variation of DMF-T among children attending different schools was found. Children attending public schools in Bharatpur, India, show higher prevalence of caries compared to children from private schools in the same city.²⁴ All students who participated in this study attended public schools. OHIS was different among children attending different schools, while no other variables were significantly associated with OHIS (Table 4). DMF-T was only associated with sex and age. School remained to be the significant determinant of DMF-T.

Place of residence²⁵ or schools where children attended²⁶ may account for access to dental care and risks for dental health problems. Children with similar social background may attend the same school. Better schools may offer better dental health programs. In this study, all schools are owned by the government, and there is not much variation in the activities of school-based programs. Significant effects of schools on OHIS and DMF-T could be related to average social status of the neighborhood where the schools are located.²⁷

The lack of effectiveness of oral health behavior intervention may be responsible for the high level of OHIS

among children attending certain schools,²⁸ and in the long-term, caries level of these children may increase. Household support for oral health behavior of children plays significant role in caries prevention. DMF-T in children 12 years of age is predicted by caries level at the age of 6 years.²⁹

For OHIS and DMF-T, schools give contextual-level effects,³⁰ which confounded individual-level effects of oral health behavior and family support to oral health behavior. Type of school is also a significant determinant of caries experience in Brazil.³¹ School-based intervention focusing on tooth brushing and other preventive measures, however, may not be effective in preventing caries³² except in certain controlled trials, such as dental sealant programs.³³

This study also found that girls and students at older ages were at higher risk for developing caries, which might indicate dietary habits and direct biological effects as factors contributing to caries experiences. Differences in caries levels are attributed to social factors affecting schoolchildren, such as household food insecurity,³⁴ non-working parents,³⁵ and parental education status.³⁶

It can be concluded that sex and age were associated with DMF-T, suggesting the importance of biological factors as proximate determinants of caries. Oral health behavior was associated with oral hygiene (OHIS) but not with caries status (DMF-T). Family support to oral health behavior, similarly, was associated with OHIS and was not associated with DMF-T. School was a consistent determinant of OHIS (no other variables were associated with OHIS) and DMF-T (together with age and sex). Adjustment to school should be made when estimating predictors of oral health status.

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