THE KOREAN SOCIETY OF
DENTAL HYGIENE SCIENCE

Relationship among Maternal Sociodemographics, Oral Health Behavior, and the Prevalence of Early Childhood Caries

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The purpose of this study was to examine the influence of maternal socioeconomic status, maternal oral health behaviors, and oral health behaviors of children, on the prevalence of early childhood caries in children aged 5 years. The Korean National Health and Nutrition Examination Survey data collected between 2007 and 2014 were applied to this study, and the study sample included 824 children who received oral examinations and participated in the health behavior survey. The factor that affected the prevalence of early childhood caries were confirmed by maternal and child factors. The data were analyzed using multiple linear regression. The mothers' age, income level, and job status affected the prevalence of early childhood caries. There was a significant difference in the analysis considering the factors of motherhood and children in the prevalence of early childhood caries according to mother's age, education level, income level, and the child's oral examination. The prevalence of early childhood caries was higher in children who received oral examinations than in those who did not. When the mother's educational level was higher than college education, it was found that the index of child, i.e., there was a difference in the prevalence of early childhood caries according to the mother's educational and income levels. These results indicate that maternal socioeconomic characteristics are correlated with the oral health of children. Therefore, oral health education programs that include mothers for the prevention of early dental caries in children may improve the dental health of children. In addition, specific oral health policies are necessary to address the differences in the oral health between the income groups.

Key Words: Early dental caries, Oral health behaviors, Socioeconomic status

Introduction

Dental caries is a major global health problem. Dental caries not only causes suffering and requires expensive treatment but is also responsible for chewing difficulties, speech problems, and aesthetic impairment[1,2]. According to age groups, dental caries is more prevalent in preschool childhood, primary school childhood, and adolescence[3]. Among preschool children, dental caries in those aged 5 years or younger is referred to as early childhood caries[4,5]. Early childhood caries is a cause of early loss of primary teeth and is strongly associated with permanent tooth caries, which may eventually lead to malocclusion[6,7]. The

prevalence of dental caries in 5-year-old American children is approximately 28%[8] whereas the prevalence in 3-year-old Japanese children is 25.9%[5]. Moreover, the prevalence of dental caries in 5-year-old children belonging to low-income groups in developing countries reaches 85%[9,10]. In Korea, approximately 53.96% of 5-year-old children developed early childhood caries between 2007 and 2014[11].

The incidence of dental caries in preschool children is high because these children often consume sugar-containing foods but lack the ability for self-oral care[1,6]. In this context, the role of the parents or legal guardians is critical in maintaining and improving the oral health of children, and several studies indicated that oral health-re-

lated practices in children are not achieved by the intentions and attitudes of children alone and that the parents or guardians play a major role in ensuring these practices[1,12-15]. Factors such as the low education of the mother, high age, living in rural areas, occasional tooth brushing, and high sugar consumption are associated with poor oral health in children[12,13,16,17]. Sufia et al.[3] reported that the mother's attitude played an important role in implementing and modifying oral health practices in children. Similarly, Mattila et al.[16] showed that the higher education of them other reduced the probability of dental caries in children and that regular tooth brushing by the parents or guardians decreased the incidence of dental caries in children.

Some studies reported that the mother's socioeconomic status and oral health awareness have effect on the oral health of children. Oral health awareness during childhood influences oral health over one's lifetime, and thus, good oral habits should be encouraged in childhood. Considering the important role of the mother in achieving this goal, the joint participation of mothers and children in oral health education programs is essential. However, the studies conducted in Korea to date have been limited to some geographical areas, which limits the evaluation of the association between early childhood caries and the socioeconomic status of the mother[1,6,14,18-20]. Therefore, this study used representative data to assess the prevalence of early childhood caries in 5-year-old children according to the socioeconomic characteristics and oral health behaviors of the mothers and to provide reference data needed for improving the oral health education of mothers of preschool children and implementing policies for enhancing the oral health of children.

Materials and Methods

1. Subjects

The present study used data from the Korean National Health and Nutrition Examination Survey (KNHANES) collected from 2007 to 2014. These complex sample survey data were obtained using a stratified cluster sampling strategy, and the enumeration districts in the population and housing census were used as the sampling frame; this strategy allowed the calculation of statistical data at the national level. KNHANES data included a health questionnaire, health examination, and nutrition survey. However, the present study used only data from the health questionnaire and oral examination survey. Because the objective of the present study was to determine the association between early childhood caries in 5-year-old children and the socioeconomic characteristics and oral health behaviors of the mothers, 824 children among all 5-year-old children who completed the oral examination and health questionnaire were included in the analysis. The study was approved by the Institutional Review Board of our Institution (P01-201703-22-009).

2. Study variables

The dependent variable used in the analysis was the decayed, missing, and filled teeth (DMFT) index for primary teeth whereas the independent variables were selected by the characteristics of the children and mothers. The characteristics of the study children were sex, type of health insurance, performance of oral examination, and number of tooth brushings. The characteristics of the evaluated mothers were age, education level, income level, job status, performance of oral examination, number of tooth brushings, and subjective oral health status. These

Table 1. Definition of Variables

Variable	Description
Dependent variable	Number of early childhood caries
Independent variable	
Sex	Male=1, female=2
Oral exam	No=1, yes=2
Tooth brushing	None=1, 1~2 times=2, above 3 times=3
Maternal age (y)	20=1, 30=2, 40=3
Maternal educational level	Below high school=1, above college=2
Maternal income	Lower=1, middle lower=2, middle higher=3, higher=4
Maternal job position	Employee=1, employer=2, housekeeper=3
Maternal oral exam	No=1, yes=2
Maternal tooth brushing	None=1, 1~2 times=2, above 3 times=3
Maternal subjective oral health	1~5 Likert scales

variables are shown in Table 1.

3. Analysis methods

Regression analysis was used to identify the influencing factors of early childhood caries. Fig. 1 shows the
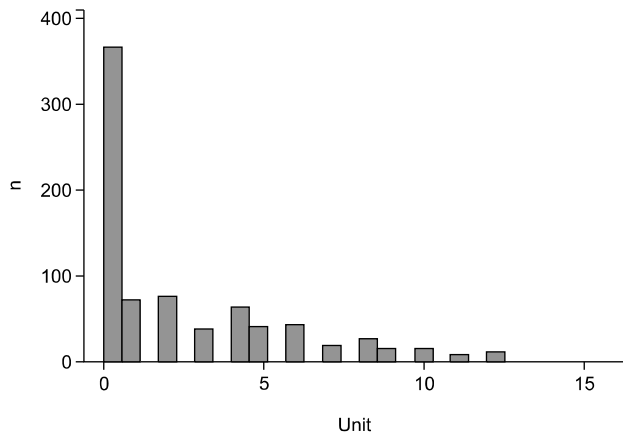

Fig. 1. Distribution of number of early childhood caries.

distribution of the number of carious primary teeth, which was the dependent variable used in the analysis. The dependent variable deviated from normal and showed a long-tail distribution to the right, and thus, exponentially transformed values of the dmft index for primary teeth were used. For the identification of the influencing factors of the dmft index, an analysis was conducted using multiple linear regression separately for the characteristics of the children and mothers. STATA software version 14.0 (Stata Corp, College Station, TX, USA) was used in all analyses, and the significance level was set to 0.05.

Results

1. General characteristics of children and mothers

The general characteristics of the children and mothers included in the study are shown in Table 2. The evaluated children included 446 boys (54.13%) and 378 girls (45.87%). A total of 411 children (53.10%) received an

Table 2. Characteristic Variable of Children and Mother

Classification		Frequency	Percent	Cumulative percent
Sex	Male	446	54.13	54.13
	Female	378	45.87	100.00
Oral exam	No	363	46.90	46.90
	Yes	411	53.10	100.00
Tooth brushing	None	81	9.83	9.83
	1~2 times	508	61.65	71.48
	Above 3 times	235	28.52	100.00
Maternal age (y)	20~29	46	5.58	5.58
	30~39	653	79.25	84.83
	40~49	125	15.17	100.00
Maternal educational level	Below high school	362	46.17	46.17
	Above college	422	53.83	100.00
Maternal income	Lower	210	25.61	25.61
	Middle lower	238	29.02	54.63
	Middle higher	213	25.98	80.61
	Higher	159	19.39	100.00
Maternal job position	Employee	222	28.28	28.28
	Employer	62	7.90	36.18
	Housekeeper	501	63.82	100.00
Maternal oral exam	No	552	70.59	70.59
	Yes	230	29.41	100.00
Maternal tooth brushing	None	46	5.58	5.58
	1~2 times	473	57.40	62.99
	Above 3 times	305	37.01	100.00

Maternal subjective oral health status: mean±standard deviaton (range)=3.47±0.76 (1.00~5.00).

oral examination. One to two tooth brushings per day was the most common, corresponding to 61.65% of the total sample. The age distribution of the mothers was 30~39 years (79.25%), 40~49 years (15.17%), and 20~29 years (5.58%). With regard to the education level, college or higher education levels were the most common, corresponding to 53.83% of the total sample.

2. Influencing factors of early childhood caries in 5-year-old children

Table 3 shows the results of linear regression analysis using models 1 and 2 for the identification of the influencing factors of early childhood caries in 5-year-old children. In model 1, in which only the characteristics of the mothers were taken into account, the mother's age, income level, and job status had a statistically significant influence on the dmft index. There was a decrease in the number of early childhood caries by 0.358 in children of mothers in the age group 30~39 years compared with mothers in the age group 20~29 years, whereas the prevalence of caries decreased by 0.210 in children of mothers in the middle-to-low income group compared with mothers in the low-income group.

In model 2, linear regression analysis was performed taking into account the characteristics of both the children and mothers. Our results indicated that the oral examination of the child, along with age, education level, income level, and job status of the mother had a statistically significant influence on the dmft index. Therefore, the dmft index for primary teeth of children of mothers belonging to the middle-to-low income group were lower by 0.226 compared with children of mothers belonging to the low-income group. The dmft index of children who received an oral examination was higher by 0.218

Table 3. Factors on Early Childhood Caries of Children

Factor		Model 1	Model 2
Sex	Male		
	Female		0.017±0.061 (−0.102~0.137)
Oral exam	No		
	Yes		0.218±0.062 (0.096~0.339)
Tooth brushing	None		
	1~2 times		0.105±0.131 (−0.153~0.363)
	Above 3 times		0.061±0.140 (−0.215~0.336)
Maternal age (y)	20~29		
	30~39	−0.358±0.134 (−0.621~−0.094)	−0.339±0.135 (−0.603~−0.075)
	40~49	−0.163±0.150 (−0.458~0.132)	−0.143±0.151 (−0.440~0.153)
Maternal educational level	Below high school		
	Above college	−0.109±0.064 (−0.234~0.017)	−0.146±0.066 (−0.275~−0.017)
Maternal income	Lower		
	Middle lower	−0.210±0.081 (−0.368~−0.051)	−0.226±0.082 (−0.388~−0.065)
	Middle higher	−0.091±0.084 (−0.256~0.073)	−0.092±0.085 (−0.259~0.076)
	Higher	−0.023±0.092 (−0.204~0.159)	−0.015±0.095 (−0.201~0.170)
Maternal job position	Employee		
	Employer	0.329±0.119 (0.096~0.562)	0.342±0.123 (0.101~0.582)
	Housekeeper	0.067±0.067 (−0.065~0.199)	0.062±0.069 (−0.073~0.198)
Maternal oral exam	No		
	Yes	0.045±0.067 (−0.086~0.175)	0.005±0.069 (−0.131~0.141)
Maternal tooth brushing	None		
	1~2 times	0.169±0.338 (−0.495~0.833)	0.019±0.372 (−0.712~0.749)
	Above 3 times	0.161±0.339 (−0.504~0.827)	0.048±0.375 (−0.688~0.783)
Maternal subjective oral health status		0.028±0.040 (−0.050~0.106)	0.034±0.040 (−0.045~0.113)
Constant		0.877±0.393 (0.106~1.648)	0.841±0.438 (−0.020~1.701)

Values are presented as coefficient±standard error (95% confidence inverval).
Using multiple linear regression model.

compared with children who did not receive an oral examination. Moreover, the dmft index of children of mothers with college or higher education was lower by 0.146 compared with the index of children of mothers with a high school or lower education.

Discussion

Early childhood caries is one of the most prevalent oral diseases among children aged 5 years or younger. This study used highly representative data from KNHANES (2007 to 2014) to examine early childhood caries in 5-year-old children and the effects of demographic characteristics and oral health behavior of children and mothers on early childhood caries. The analysis used the dmft index. However, because the data showed a long-tail distribution to the right, exponentially transformed values were used in the linear regression analysis. Different models were used to determine the degree of influence by the characteristics of the mothers versus those of the children.

In model 1, only the characteristics of the mothers were taken into account for the identification of the influencing factors of early childhood caries. Our results revealed that age, income level, and job status of the mother strongly affected the number of caries. The dmft index of children in the age group 30～39 years of mother was lower than that of mothers in the age group 20～29 years. The dmft index of children in mothers belonging to the middle-to-low income group was higher than that of mothers from the low-income group. The dmft index of children who were maternal self-employed or were employers was higher by 0.329 than that of mothers who were wage workers. The pattern of prevalence of dental caries changed according to the socioeconomic status[1,2,17,21,22]. Furthermore, the number of carious primary teeth decreased as the mother's income level, which indicates the socioeconomic status, increased. Baggio et al.[21] observed that the higher job status of them other decreased the incidence of early childhood caries. These results appear to contradict the findings of the present study; however, the limitations in the ranking of the job status (wage worker versus self-employed or employer as having a higher or lower status)

prevented the comparison with other studies. Therefore, more in-depth studies are needed to determine the influencing factors of early childhood caries according to the job status of the mother.

In model 2, the characteristics of both the mothers and children were taken into account for the identification of the influencing factors of early childhood caries. The identified factors were oral examination of the child as well as the age, education level, income level, and job status of the mother. Several studies reported that the differences in early childhood caries according to the age and education level of the mother showed a lower dmft index with lower age and higher education level[12,13,21,23,24], and this result was supported by our findings. Children who contract oral diseases or require treatment for pain usually have a high probability of visiting a dental clinic[25]. The oral status of children was assessed by asking the question, "Have you had an oral examination in the past year?" As a result, the incidence of early childhood caries may have been higher among children who received an oral examination. The limitations of the dmft index should also be considered. Although the dmft index is commonly used to assess the oral health status, the in ability of this index to properly indicate the health status of oral tissues based on oral disorders has been considered a limitation[26,27]. Marcenes and Sheiham[27] observed that because the dmft index is calculated by assigning one point to each carious, filled, or extracted tooth, the weighted values that reflect the health status of the oral tissues should be considered. These results may be because individuals who receive regularly scheduled oral examinations have higher oral health awareness, and the number of dental treatments should increase for the prevention and early treatment of oral diseases. Notwithstanding, future studies should use and compare other indices other than dmft index for evaluating oral health.

The strength of the present study is the use of samples that represent the entire Korean population and the consideration of the socioeconomic characteristics and oral health behavior of mothers and the characteristics of children for the identification of these influencing factors from multiple perspectives. However, the limitation of the study was the inability to determine whether the mother

was the primary caregiver.

In conclusion, our findings indicated that the socioeconomic status of the mother affected the number of carious primary teeth in 5-year-old children. Furthermore, the pattern of occurrence of early childhood caries differed according to the age, education level, and income level of the mother, demonstrating the strong differences in oral health according to the socioeconomic status of the mothers. Therefore, water fluoridation programs need to be implemented to decrease the prevalence of caries among the social classes, and health intervention measures should be established for the health promotion of high-priority populations.

Acknowledgements

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