Korean National Oral Health Survey Data on the Symmetry of Primary Dentition Surface Caries

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Objectives: *This study evaluated the intraoral symmetry of dental caries in primary teeth as part of a study of caries patterns in primary dentition.* ***Study design:*** *The data for 4,800 5-year-old and 4,379 8-year-old children in this study were from the 2012 Korean national oral health survey. Pearson correlation coefficients of the decayed and filled surface (dfs) values ranged from 0.436 (lower primary canines) to 0.835 (upper primary central incisors) for the right and left primary teeth and from 0.084 (right primary central incisor) to 0.457 (left primary second molar) for the upper and lower primary dentition (P< 0.01).* ***Results:*** *The upper and lower dfs values differed significantly (P< 0.05) when the right and left primary second molars were excluded. The left or right primary data without caries ranged from 56.4% (lower of first and second primary molars) to 99.7% (lower primary central incisors). The bilateral caries among cases with one or more in the right or left primary teeth ranged from 25.0% (lower lateral primary incisor) to 72.7% (upper primary central incisors).* ***Conclusions:*** *These results suggested that dental caries in primary teeth show bilateral symmetry and differences in the degree of symmetry according to the teeth set or surface set of the homologous teeth.*

Key words*: Caries pattern, Primary dentition, Symmetry*

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INTRODUCTION

Historically, the management of dental caries has been based on the notion that it is a progressive disease that will eventually destroy the tooth unless there is a surgical/restorative intervention[1]. However, the surgical intervention of dental caries alone does not stop the disease process. Therefore, the modern management of dental caries should be more conservative and include the detection of early lesions, the identification of an individual's risk for caries progression, an understanding of the disease process for that individual, and active surveillance that involves the application of preventive measures and careful monitoring for the signs of arrest or progression[2]. The understanding of the pattern of dental caries is an important first step in identifying the factors that are key for promoting dental caries, especially those with early onset.

Although dental caries have a high prevalence, they occur in a minority of the population with a pattern of frequency on certain surfaces of teeth[3,4]with most disease now found in a small number of children; and 3. Studies of caries patterns can be helpful in the effective prevention and treatment of dental caries. In pediatric dentistry, caries patterns in primary teeth have been continuously studied mainly in infants with severe dental caries of the primary upper incisors[5–7]. Recently, a study of the spatial relationships between primary teeth and between the surfaces of primary teeth has been reported[8]especially concerning the distribution and spatial correlation of lesions. Data were obtained from two surveys. In the Signal-Tandmobiel project 4,468 7-year-old children in Flanders (Belgium). Shaffer et al.[9] used a hierarchical clustering analysis to

group tooth surfaces into categories that were based on the co-occurrence of caries lesions. Psoter *et al* [10,11] studied dental caries patterns in primary teeth with multidimensional scaling and a cluster analysis. In Korea, Lee et al.[12] studied this issue with a cluster analysis, and Jeong *et al* [13] used a cluster analysis and multidimensional scaling of primary dentition. Recently, Lee *et al* [14] conducted a frequency analysis, correlation analysis, cluster analysis, and multiple correspondence analysis of these patterns.

Symmetry is one of the basic patterns in nature[15]. Twenty teeth and 88 tooth surfaces are bilaterally symmetric in a set of primary teeth with a midline as the center. The upper and lower half arches are partially symmetric because of the arrangement of the homonymous teeth. Thus, the question arises as to whether the occurrence of dental caries follows this same symmetry. This study aimed to evaluate the intraoral symmetry of dental caries in primary teeth as part of studies of the caries patterns in primary dentition.

MATERIALS AND METHOD

This study utilized data from part of the 2012 Korean National Oral Health Survey(2012-01EXP-01-2C)[16] for the representative sampling. The Korean National Oral Health Survey of 2012 was conducted in 190 national locations between June 2012 and November 2012. A complex sampling design was used for the random sampling. The data that was used in this study were the data for 5-year-olds and 8-year-olds. Consequently, the subjects in this study totaled 9,179, with 4,800 5-year-olds and 4,379 8-year-olds. The average dfs values by age were 6.94 in the 5-year-old group, 6.39 in the 8-year-old group, and 6.68 in the total groups. In this study, the PASW 19.0K program (IBM Corporation, Armonk, NY, USA) was used for the analysis of the intraoral symmetry of caries patterns in primary dentition. The numbers of caries resulting in decay or filled surfaces (dfs) by age, the Pearson correlation coefficients of the data from the right and left arches and from the upper and lower sides of the teeth, the differences in significance according to paired- samples t-tests, the frequency of bilateral caries in each primary tooth, and the frequency of bilateral caries in each tooth surface were calculated. The total average values that included or excluded the decayed, missing, and filled surface values, values of the mean, median, skewness, kurtosis, and the distributions of the maximum and minimum were also calculated.

RESULTS

The Pearson correlation coefficients ranged from 0.436 (lower primary canines) to 0.835 (upper primary central incisors) for the dfs values of the right and left primary teeth and from 0.084 (right primary central incisor) to 0.457 (left primary second molar) for the dfs values of the upper and lower primary dentition. The coefficient values differed significantly for both comparisons ($P < 0.01$). However, the difference of the dfs values of the right and left primary teeth that was assessed by the paired-sample t-test was not significant, except for the upper primary second molar ($P > 0.05$). The difference between the upper and lower teeth was significant, except for the right and left primary second molar ($P < 0.05$), (Table. 1).

As shown in Table 2, the Pearson correlation coefficient values were distributed from 0.084 (right central incisor) to 0.457 (left second molar) for the dfs values of the upper and lower primary teeth. The coefficients values differed significantly for all ($P < 0.01$). However, the differences of the right and left dfs values that were assessed by a paired-sample t-test were statistically significant, except for right and left primary second molar ($P < 0.05$), (Table. 2).

As shown in Table 3, the percentages of left or right primary teeth without caries ranged from 56.4% (lower second primary molars and lower first primary molars) to 99.7% (lower primary central incisors). The percentages of bilateral caries among cases with one or more caries in the right or left primary teeth ranged from 25.0% (lower lateral primary incisor) to 72.7% (upper primary central incisors), (Table. 3).

Table 1. Pearson correlation coefficients and paired-samples *t*-tests of the dfs values of the right and left primary teeth

	dfs (mean±SD)	R†	P‡
Upper second molar	(R) 0.74±1.31	0.569**	*
	(L) 0.77±1.34		
Upper first molar	(R) 0.65±1.41	0.555**	NS
	(L) 0.68±1.44		
Upper canine	(R) 0.06±0.35	0.457**	NS
	(L) 0.06± 0.363		
Upper lateral incisor	(R) 0.08±0.46	0.659**	NS
	(L) 0.08±0.46		
Upper central incisor	(R) 0.17±0.64	0.835**	NS
	(L) 0.17±0.65		
Lower second molar	(R) 0.75±1.35	0.607**	NS
	(L) 0.74±1.32		
Lower first molar	(R) 0.81±1.52	0.559**	NS
	(L) 0.81±1.50		
Lower canine	(R) 0.04±0.28	0.436**	NS
	(L) 0.04±0.29		
Lower lateral incisor	(R) 0.01±0.12	0.486**	NS
	(L) 0.01±0.11		
Lower central incisor	(R) 0.00±0.07	0.697**	NS
	(L) 0.00±0.10		

†: Pearson correlation coefficient; ‡: Paired-sample *t*-test; dfs: average decayed and filled surface; SD: standard deviation; R: Right; L: Left; NS: No significance; *: $P < 0.05$; **: $P < 0.01$

Table 2. Pearson correlation coefficients and paired-samples *t*-tests between the dfs values of the upper and lower primary teeth

	dfs (mean±SD)	R†	P‡
Right second molar	(U) 0.74±1.31	0.435**	NS
	(L) 0.74±1.32		
Right first molar	(U) 0.65±1.41	0.419**	*
	(L) 0.81±1.50		
Right canine	(U) 0.06±0.35	0.275**	*
	(L) 0.04±0.29		
Right lateral incisor	(U) 0.08±0.46	0.141**	*
	(L) 0.01±0.11		
Right central incisor	(U) 0.17±0.64	0.084**	*
	(L) 0.00±0.10		
Left second molar	(U) 0.77±1.34	0.457**	NS
	(L) 0.75±1.35		
Left first molar	(U) 0.68±1.44	0.431**	*
	(L) 0.81±1.52		
Left canine	(U) 0.06±0.36	0.260**	*
	(L) 0.04±0.28		
Left lateral incisor	(U) 0.08±0.46	0.184**	*
	(L) 0.01±0.12		
Left central incisor	(U) 0.17±0.65	0.085**	*
	(L) 0.00±0.74		

†: Pearson correlation coefficient; ‡: Paired-sample *t*-test; dfs: average decayed and filled surface; SD: standard deviation; U: Upper; L: Lower; NS: No significance; *: P < 0.05; **: P < 0.01

Table 3. Symmetry of caries of primary teeth

Unit (%)				
Tooth	No Caries	Unilateral caries	Bilateral caries	Bilateral × 100/(Unilateral+Bilateral)
Upper second molar	58.4	18.8	22.9	54.9
Upper first molar	67.9	17.7	14.4	45.0
Upper canine	94.6	3.9	1.5	27.8
Upper lateral incisor	94.2	3.4	2.4	42.0
Upper central incisor	89.8	2.8	7.4	72.7
Lower central incisor	99.7	0.1	0.1	48.0
Lower lateral incisor	99.5	0.4	0.1	25.0
Lower canine	96.4	2.6	1.0	27.1
Lower molar	56.4	19.5	21.0	51.9
Lower second molar	56.4	16.8	26.8	61.5

DISCUSSION

Berman and Slack[17] reported that the dental caries of school-aged children showed bilateral symmetry. Batchelor and Sheiham[18] reported that groups sharing similar caries sensitivities showed symmetry, although there was no exact symmetry observed between the homologous surfaces of the teeth of the right and left arches. The problem in the analysis of the symmetry of caries is that the data is zero-inflated. Zero-inflated data is difficult to analyze statistically, and special statistical methods or modifiable computer programs have been developed to analyze zero-inflated data with more validity[19-21]. In addition, another problem is whether 0 caries on both sides of the teeth set can be interpreted as symmetry. Because the object of this study was to research the symmetry of the incidences of caries, cases without dental caries should be excluded. If a certain teeth set has bilateral caries and another set has no caries in an individual, the latter indicates a lower caries sensitivity. Similarly, if certain surfaces have bilateral caries in a certain teeth set and another surfaces has no caries, the latter indicates a lower caries sensitivity. If no caries are due to a low caries sensitivity rather than the teeth not being unexposed to an attack of caries, it might be appropriate to include the 0 data for the analysis of the incidences of caries. In this study, 0 data were included in the calculation of the Pearson correlation coefficients and the paired-samples t-tests (Tables 1 and 2) of the dfs of the right and left and upper and lower primary teeth. In the frequency analysis of the incidence of bilateral caries of the primary teeth and surfaces of the teeth, the percentages of bilateral caries were calculated for cases with one or more caries on both sides. If the data are limited to the cases with caries, the degree of symmetry will decrease because the 0 data are excluded. In addition, the opposite side can have caries as time passes in cases with unilateral caries because the incidences of caries increase with age. In particular, the symmetry of primary molars is thought to greatly increase until it is observed to stop at 10–11 years of age. Therefore, the symmetry calculations in this study were limited to the 5- and 8-year age groups. In addition, Pearson correlation coefficients and paired-samples t-tests do not directly assess the degree of symmetry but indirectly evaluate the degree of symmetry according to the significance level of the differences and correlations between the two data sets. Thus, these calculations cannot be used as direct markers of the degree of symmetry. The study results showed that dental caries in primary teeth tended to show bilateral symmetry, and differences in the degree of symmetry were observed according to the teeth set or surface set of the homologous teeth.

CONCLUSION

These results suggested that dental caries in primary teeth show bilateral symmetry and differences in the degree of symmetry according to the teeth set or surface set of the homologous teeth.

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