

# Relationship between family characteristics and children's regular toothbrushing with fluoride toothpaste

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**Objective:** To examine the association between toothbrushing habits of 8-9 year-olds and maternal behaviours and attitudes towards oral health in a sample of Japanese population. **Methods:** Cross-sectional data on mothers' behaviours and attitudes towards oral health and children's toothbrushing habits were collected from 378 mother-child pairs by self-administered questionnaires. Logistic regression examined the association of children's daily brushing with fluoride toothpaste with family characteristics, mother's behaviour (toothbrushing frequency, use of interdental aids and supervision of children's toothbrushing), and mother's attitudes towards oral health (priority for toothbrushing and dental fear). **Results:** Children's favourable brushing habits were positively associated with child's gender (female) (OR 1.29; 95%CI:1.09,1.53), child's order of birth (first) (OR 1.53; 95%CI:1.05,2.23), maternal brushing habits (OR 2.42; 95%CI:1.73,3.40), and maternal dental fear (OR 1.45; 95%CI:1.10,1.90). None of the other examined factors were significantly associated with child toothbrushing behaviour. **Conclusions:** Maternal oral hygiene practice and attitude towards dentists appear to be important predictors of children's toothbrushing habits in this Japanese community sample.

**Key words:** child, toothbrushing, toothpastes, fluorides, maternal behaviour, Japan

## Introduction

Behavioural habits established early in life can endure until adolescence, which necessitates establishing favourable oral health-related behaviours early in life (Alm, 2008). In childhood, the most prevalent oral disease is dental caries (Marcenes *et al.*, 2013). Earlier studies suggested that toothbrushing with fluoride toothpaste at least once a day can help prevent dental caries in children and adolescents (Twetman *et al.*, 2003). Therefore, acquiring proper toothbrushing behaviour such as brushing with fluoride toothpaste daily in childhood may contribute to reducing the prevalence of dental caries not only in childhood but also later life.

Dental behaviour has strong correlations with social factors, living circumstances and lifestyles (Löe, 2000). Furthermore, children's oral health behaviour is affected by mothers' preventive behaviours and attitude towards oral health (Vallejos-Sánchez *et al.*, 2008). The role and lifestyle of the family is an important factor in influencing children's health. Child health-related behaviour is affected by families' norms, values, goals and behaviours (Christensen, 2004). Furthermore, children whose mothers prioritise their own health are more likely to exhibit health promoting behaviour (Hoghugh, 1998). However, there are few studies which examined the influence of parental behaviours on children's toothbrushing with fluoride toothpaste (Åstrøm and Jakobsen, 1996; Fukuda *et al.*, 2007; Okada *et al.*, 2002).

In a Japanese survey, it was suggested that parental dental behaviours affected children's dental behaviour

and oral health status (frequency of toothbrushing, use of dental floss, regular dental check-ups, eating snacks, gingival health and the development of dental caries) (Okada *et al.*, 2002). However, no study in Japan to date has explored the aforementioned association with daily brushing with fluoride toothpaste.

The aim of this study was to examine whether regular toothbrushing with fluoride toothpaste among Japanese 8-9 year-olds is associated with maternal oral health related behaviour and attitude towards oral health.

## Methods

This study was based on secondary analysis of data from a school-based survey which aimed to investigate dental behaviours and attitudes of children and their guardians in some specific areas in Japan in 2010 (Kino *et al.*, 2011). The target population was third grade children aged 8-9 years in Japanese elementary schools and their mothers or guardians (hereafter simply mothers). In the original study, 590 child/mother pairs participated across ten schools in Chiba and Kanagawa prefectures (populations 6,195,000 and 9,067,000 respectively). All six schools in Sakae-machi (a town in Chiba) and two schools in both Shiroy-shi and Zama-shi (cities in Chiba and Kanagawa) were selected by local community officers. All selected schools participated. All third grade children in the ten schools were approached. Children's age was considered a good indicator of their ability to answer written questions (Booth *et al.*, 2001).

A 77.6% response rate was achieved for the original study (458 child/mother pairs; Kino, 2011), which was completed with approval by the ethical committee in Juntendo University in Japan (22-52). Mothers gave written consent for children's participation.

It has been noted that mothers spend more time in childrearing and interacting with their children in functional activities than fathers (McBride and Mills, 1993). In addition, maternal oral health is related to children's oral health (Dye *et al.*, 2011), and mother's positive attitude toward oral health is related to more frequent children's toothbrushing (Vallejos-Sánchez *et al.*, 2008). So respondents who were fathers were excluded from this analysis.

The current analysis included data on 378 child/mother pairs who had no missing data on the mother's and child's questionnaires representing 64.1% of the original sample. The *post-hoc* power calculation was conducted to estimate whether the sample size was adequate for the study with 0.05 for type I error, and setting the prevalence of toothbrushing at 54.1% for this population (Fukuda, *et al.*, 2007). *Post-hoc* power for the selected sample was 97.9%.

The questionnaires for children and mothers were distributed and collected between July and October 2010. The original questionnaire for children had 21 questions on dental behaviour, perception of own oral health, attitudes towards oral health, lifestyle and family's attitudes towards oral health. This study used only two outcome variables (toothbrushing frequency and use of fluoride toothpaste). The children's questionnaire was checked by school teachers and revised accordingly to improve children's understanding (i.e. face validity).

The original questionnaire for mothers included 29 questions about dental behaviour, perceptions of own oral health, attitudes towards oral health, lifestyle, supervision of children oral hygiene and family characteristics. Seven of those questions were used in the analysis; two on dental behaviours (toothbrushing frequency and use of interdental aids), two on attitudes towards oral health (priority for toothbrushing

and fear of visiting a dentist), two on family characteristics (number of children in the family and child's order of birth) and one on supervision of child toothbrushing.

To match child and the mother questionnaires, they were coded in pairs and handed together in envelopes to school teachers, who took responsibility for dispensing and collecting both sets of questionnaires. To avoid any parental influence, children completed their questionnaires first before taking their mother's questionnaires home for completion and return.

For the analysis, children were divided into two groups based on their responses to questions on toothbrushing frequency and use of fluoride toothpaste. The group with favourable behaviour were children reporting brushing their teeth every day with fluoride toothpaste whereas the group with unfavourable behaviour were those reporting irregular use of fluoride toothpaste and/or irregular brushing.

First logistic regression was used to assess the binary association between children's toothbrushing habits with each of child's gender, birth order, number of children in the family, mothers' toothbrushing, use of interdental aids, supervision of child toothbrushing, priority for toothbrushing and fear of visiting a dentist. The regression was clustered for area of residence (prefecture). Finally, a logistic regression model was constructed adjusted for all the aforementioned variables and clustered for prefectures. All analyses used Stata 12.

## Results

The characteristics of the sample are shown in Table 1. Chiba and Kanagawa prefectures had 230 and 148 child/mother pairs respectively. There were no differences between the prefectures in terms of mothers' and their children's characteristics. The sample included slightly more girls than boys (55.3% vs 44.7%) and 55.0% were first children. Most (57.4%) had two children in the family. In addition, 67.2% of mothers brushed their teeth every day and 47.6% used interdental aids. Furthermore, 23.8% of mothers supervised children's toothbrushing daily, 70.6% thought that toothbrushing was a priority, and 67.5% did not fear dental visits.

**Table 1.** Description of the analytical sample (n=378 child/mother pairs)

Variables		Overall		Chiba		Kanagawa		p value
		n	%	n	%	n	%	
Child's gender	Boys	169	44.7	99	43.0	70	47.3	0.417
	Girls	209	55.3	131	57.0	78	52.7	
Number of children in the family	1 child	57	15.1	35	15.2	22	14.9	0.214
	2 children	217	57.4	139	60.4	78	52.7	
	3 or more children	104	27.5	56	24.3	48	32.4	
Child's order of birth	First	208	55.0	124	53.9	84	56.8	0.095
	Second	127	33.6	85	37.0	42	28.4	
	Third or more	43	11.4	21	9.1	22	14.9	
Mother's toothbrushing frequency	Daily	254	67.2	152	66.1	102	68.9	0.567
	Less often	124	32.8	78	33.9	46	31.1	
Mother's use of interdental aids	Yes	180	47.6	103	44.8	77	52.0	0.169
	No	198	52.4	127	55.2	71	48.0	
Mother's supervision of child toothbrushing	Everyday	90	23.8	58	25.2	32	21.6	0.598
	Sometimes	155	41.0	90	39.1	65	43.9	
	Almost never	133	35.2	82	35.7	51	34.5	
Mother's priority for toothbrushing	Is a priority	267	70.6	166	72.2	101	68.2	0.413
	Not a priority	111	29.4	64	27.8	47	31.8	
Mother's fear of visiting the dentist	No	255	67.5	154	67.0	101	68.2	0.794
	Yes	123	32.5	76	33.0	47	31.8	

**Table 2.** Binary association between child toothbrushing and child/mother characteristics, adjusted for cluster of prefectures

<i>Variables</i>	<i>Categories</i>	<i>Favourable toothbrushing</i>		<i>OR</i>	<i>95%CI</i>	<i>p value</i>
		<i>n</i>	<i>%</i>			
Child's gender	Boys	68	40.2	1.00	Reference	
	Girls	98	46.9	1.31	1.08, 1.59	<b>&lt;0.01</b>
Number of children in the family	1 child	25	43.9	1.00	Reference	
	2 children	97	44.7	1.03	0.87, 1.23	0.702
	3 or more children	44	42.3	0.94	0.58, 1.52	0.798
Child's order of birth	Third or more	15	34.9	1.00	Reference	
	Second	55	43.3	1.43	0.96, 2.12	0.080
	First	96	46.2	1.60	1.27, 2.02	<b>&lt;0.001</b>
Mother's toothbrushing frequency	Less often	36	29.0	1.00	Reference	
	Daily	130	51.2	2.56	1.55, 4.23	<b>&lt;0.001</b>
Mother's use of interdental aids	No	86	43.4	1.00	Reference	
	Yes	80	44.4	1.04	0.67, 1.61	0.854
Mother's supervision of child toothbrushing	Almost never	58	43.6	1.00	Reference	
	Sometimes	61	39.4	0.84	0.33, 2.15	0.715
	Everyday	47	52.2	1.41	0.37, 5.36	0.611
Mother's priority for toothbrushing	Not a priority	46	41.4	1.00	Reference	
	Is a priority	120	44.9	1.15	0.67, 1.97	0.602
Mother's fear of visiting the dentist	No	104	40.8	1.00	Reference	
	Yes	62	50.4	1.48	1.32, 1.66	<b>&lt;0.001</b>

Logistic regression was used and odds ratio (OR) reported

**Table 3.** Fully adjusted model for child toothbrushing, clustered for prefectures

<i>Variables</i>	<i>Categories</i>	<i>OR</i>	<i>95%CI</i>	<i>p value</i>
Child's gender	Boys	1.00	Reference	
	Girls	1.29	1.09, 1.53	<b>&lt;0.01</b>
Number of children in the family	1 child	1.00	Reference	
	2 children	1.09	0.69, 1.72	0.725
	3 or more children	1.14	0.61, 2.12	0.691
Child's order of birth	Third or more	1.00	Reference	
	Second	1.42	1.17, 1.73	<b>&lt;0.001</b>
	First	1.53	1.05, 2.23	<b>&lt;0.05</b>
Mother's toothbrushing frequency	Less often	1.00	Reference	
	Daily	2.42	1.73, 3.40	<b>&lt;0.001</b>
Mother's use of interdental aids	No	1.00	Reference	
	Yes	1.04	0.75, 1.44	0.808
Mother's supervision of child toothbrushing	Almost never	1.00	Reference	
	Sometimes	0.89	0.26, 3.10	0.860
	Everyday	1.38	0.33, 5.79	0.662
Mother's priority for toothbrushing	Not a priority	1.00	Reference	
	Is a priority	1.09	0.76, 1.58	0.641
Mother's fear of visiting the dentist	No	1.00	Reference	
	Yes	1.45	1.10, 1.90	<b>&lt;0.01</b>

Logistic regression was used and odds ratio (OR) reported

Table 2 shows the distribution of children's toothbrushing behaviour according to children and mothers' characteristics, all results were adjusted for cluster of prefectures. Girls were more likely to brush their teeth daily with fluoride toothpaste than boys. Eldest children were significantly more likely to brush their teeth daily with fluoride toothpaste than later children.

Maternal regular brushing with fluoride toothpaste and fear of dentists were positively and significantly

associated with children's brushing habits (Table 2). No other explanatory variables were significantly associated with children's toothbrushing.

Table 3 shows the result of fully adjusted logistic regression model, clustered for prefectures. In this model, children's gender, order of birth, mothers' toothbrushing behaviour and mothers' dental fear remained significantly related to children's toothbrushing behaviour.

## Discussion

The results of this study showed that children whose mothers use fluoride toothpaste regularly had the habit of regular use of fluoride toothpaste. The findings of this study on a sample of Japanese mother/children pairs confirm those from earlier studies elsewhere (Fukuda *et al.*, 2007; Okada *et al.*, 2002). Given that children emulate their parents' behaviour, it was not surprising that maternal daily brushing with fluoride toothpaste was the strongest predictor.

In this study, 43.9% of children brushed daily with fluoride toothpaste, slightly less than the 54.1% reported in an earlier Japanese study (Fukuda *et al.*, 2007), which, however, reported use of fluoride toothpaste but not necessarily daily. Others have reported that parental dental behaviours were associated with a number of child behaviours including frequency of toothbrushing, use of dental floss, regular dental check-up and eating snacks (Åstrøm and Jakobsen, 1996; Okada *et al.*, 2002). These observations from repeated studies in different populations imply that children are inclined to emulate their parents' behaviours.

Regarding mother's supervision of children's toothbrushing, it was reported that supervised toothbrushing either with or without fluoride toothpaste was more effective than non-supervised toothbrushing in reducing dental caries in children (Curnow *et al.*, 2002; Twetman *et al.*, 2003). In the current study, supervision had no apparent effect on the observed outcomes. It is possible that at this age, some children had acquired the habit of brushing and would brush without supervision, while others are dependent on their mother's supervision and would not brush if unsupervised. A number of previous studies have shown a relationship between parental attitudes and their children's dental behaviours (Vallejos-Sánchez *et al.*, 2008). In the current study, the association of priority of toothbrushing as perceived by mother was not significantly associated with children toothbrushing with fluoride toothpaste. This finding about priority of toothbrushing was in line with some previous studies (Poutanen *et al.*, 2006). On the other hand, maternal fear of the dentist was significantly associated with child's toothbrushing. This finding is particularly important as it could interfere with accessing dental preventive care and treatment. It is possible that mothers who fear dental visits are more inclined to encourage their children to adopt oral health promoting behaviours to avoid undesirable dental visits. At the same time, mothers' fear of the dentist might delay preventive visits and treatment when their children needed. Therefore, any intervention targeting parents to improve children's oral health behaviours, should also include a component that addresses parental dental anxiety and fear of dental visits.

In terms of demographic characteristics, some studies reported differences in dental behaviours by number of children in the family, gender, the child's order of birth and their living areas (Mak and Day, 2011; Nicolau *et al.*, 2003; Poutanen *et al.*, 2006; Zhu *et al.*, 2003). Although the difference by gender and child's order of birth was statistically significant in this study, number of children in the family was not, probably because of the composition of the study sample. In addition, young

families in Japan are relatively small (with only one or two children), which may have restricted variation in the related variable and the corresponding association with children toothbrushing behaviour.

This study has a few limitations worth mentioning. First, the cross-sectional nature of the data does not allow conclusion about causality. Second, the reliability of dental behaviours reported by children might be questionable, however, other studies confirmed the reliability and validity of brief self-reported questions by boys and girls aged 8 and 10 years (Booth *et al.*, 2001). The questions included were simply worded and used in previous surveys (Åstrøm and Jakobsen, 1996; Curnow *et al.*, 2002; Okada *et al.*, 2002; Poutanen *et al.*, 2006; Twetman *et al.*, 2003) or without a pilot study (Petersen, 1992). In addition, the questions for children were revised to improve children's understanding following recommendations by school teachers. Third, there were some possible mother's lifestyle behaviours and attitudes which may be related to children's toothbrushing behaviour such as smoking habits, alcohol consumption and sugar intake. However, in this study they were not included because these factors were considered less likely to affect children's toothbrushing behaviour directly. Finally, aside from area of residence the study did not adjust for socioeconomic status which could have affected children's toothbrushing behaviour.

This study showed an association of Japanese children's toothbrushing using fluoride toothpaste with maternal toothbrushing habits, child's gender, order of birth, mothers' supervision and mothers' dental fear. This finding has some similarity with earlier studies (Åstrøm and Jakobsen, 1996; Curnow *et al.*, 2002; Fukuda *et al.*, 2007; Nicolau *et al.*, 2003; Okada *et al.*, 2002; Poutanen *et al.*, 2006; Twetman *et al.*, 2003). However, to the best of our knowledge, there is no study in Japan that examined this association with children daily brushing with fluoride toothpaste. The findings emphasise the importance of maternal dental behaviours in shaping that of their offspring in Japan.

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