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RESEARCH

The influence of mothers' oral health behaviour and perception thereof on the dental health of their children

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Abstract

Objective The study aims to investigate how mothers' oral health behaviour and perception thereof influence the dental health in their children.

Methods A total of 556 Vietnamese mother–child pairs participated in the current study. Mothers self-reported their oral status and oral health behaviour and perception. Dental caries of the children were examined using the index of decayed, missing, and filled teeth. The Dental Anxiety Scale instrument was used to assess the dental anxiety level in mothers and children.

Results Among mothers, 41.3% had gingival bleeding, 40% perceived their dentition and gingival status to be at a good level, 68% brushed their teeth more than twice a day, and 17% had never visited a dentist. Mothers' oral health behaviour and their perception thereof were positively correlated with their frequency of dental visits ($r = (0.105–0.221)$, $p < 0.001$) and negatively correlated with dental anxiety ($r = (-0.149– -0.105)$, $p < 0.05$).

Caries-free children were positively correlated with mothers having more than 20 teeth ($r = 0.085$, $p < 0.05$). Positive correlations between mothers and children were found in terms of frequency of fresh fruits consumption ($r = 0.090$, $p < 0.05$), drinking sweet beverages ($r = 0.072$, $p < 0.05$), and dental anxiety ($r = 0.183$, $p < 0.001$).

Conclusions Maternal oral health was significantly associated with dental health of their children. Not only did maternal dental anxiety influence oral health of mothers but it was also a concomitant factor in the development of children's dental anxiety. The education programme on mothers' oral health-related knowledge can be a target for improvement of the oral health of mothers and children.

Keywords Children · Dental anxiety · Mother · Predictive preventive personalised medicine · Prediction of high-risk caries · Prevention of dental caries · Oral behaviour and perception

Introduction

Oral healthcare systems have made efforts to achieve caries-free status in children in many countries. Caring for children's health is usually the task of mothers, and besides that, maternal factors can influence the oral health of children by sharing genetic and environmental factors in the course of daily activities. Therefore, maternal oral health knowledge, behaviour, and perception are significant for preventing dental diseases in children [1–4].

Children learn health behaviours from their parents. Those who brush their teeth more than twice a day often live in families that have high awareness with regard to oral healthcare [5, 6], whereas children of mothers with irregular tooth brushing were at twice the risk of dental caries [7]. Several risk factors for dental caries can be transmitted between family members. Children are most likely to develop caries if *Streptococcus Mutans* is acquired at an early age from their mother [8–11]. It also has been shown that dental fear and anxiety are hereditary; maternal dental fear can lead to avoiding visits to the dentist and ignoring routine dental checkups for their children [12, 13].

Increase in dental caries has been attributed to the accumulation of biological risk factors in early childhood [14, 15]. This can include the caregiving experience from mothers.

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Cultural factors can influence mothers' attitudes towards oral healthcare for children. In Vietnam, mothers spend most of their time caring for and educating their children since they are usually at home with them. One approach to reducing oral diseases in children may be the use of dental educational programmes for mothers [16, 17].

The 1999 national oral health survey in Vietnam indicated a high prevalence of caries among the adult population and that more than half of the population had poor oral hygiene and never received dental care [18]. This implies a threat of dental disease for the next generation as well. Our previous study indicated a high prevalence of oral problems among Vietnamese schoolchildren due to lack of oral health instructions from the School Oral Health Promotion Programme [19]. It is unknown whether oral health perception of mothers will influence oral health of their children in Vietnam. Therefore, the aim of present study was to investigate oral health behaviour and perception of mothers and its influence on dental health in their children.

Materials and methods

Informed consent letters with detailed descriptions of the study's aims and survey questionnaires about oral health behaviour were sent to 600 mothers whose 8–10-year-old schoolchildren were studying in five primary schools in Danang city, Vietnam. In total, 556 mothers (92.7%) agreed to participate in the current study and answered questionnaires on oral health behaviour and perceptions. Next, we invited their 556 schoolchildren to examine their dental status using the index of decayed, missing, and filled teeth for mixed dentition (dmft + DMFT). The examination procedure for the schoolchildren was carried out in the school's dental office. In our previous study, we found that the prevalences of low, moderate, and high caries experience levels among the 556 schoolchildren were 39.0, 22.3, and 38.7%, respectively. We divided schoolchildren according to their caries experience level into two groups, low caries (dmft + DMFT ≤ 4 = 61.3%) and high caries (dmft + DMFT > 4 = 38.7%) for statistical outcomes.

The survey questionnaires for the schoolchildren and mothers followed the Questionnaire of Oral Health for Children and Adults according to "Oral Health Surveys" by WHO (2013). The structured questionnaire consisted of items related to self-reported educational level, perception of dental and gingival status, oral health behaviour, and reported intake frequency of dietary sugars.

The Corah's Dental Anxiety Scale (DAS) was used to survey the dental anxiety among the mothers and their children [20]. The DAS includes four items asking about the anxiety feelings of the participant when (1) visiting the dental clinic for a checkup, (2) waiting in the dentist's office, (3) the dentist gets the drill ready, and (4) the dentist uses instruments to scrape teeth around the gums. Five Likert-scale response categories related to increasing levels of anxiety (1 = relaxed and 5 = anxiousness leading to physical sickness) were provided for replying to each item. Thus, total anxiety scores ranged from 4 to 20. A DAS score of < 9 represented no anxiety, 9–12 moderate anxiety, 13–14 high anxiety, and ≥ 15 severe anxiety. In the current study, the high anxiety for a mother was set at DAS scores above 9.

All questions were translated from English into Vietnamese and back to ensure agreement with the original form. This study was registered and approved by the Human Research Ethics Committee of the Danang University of Medical Technology and Pharmacy and performed in accordance with the World Medical Association's Helsinki Declaration.

Data entry and statistical analysis were performed in version 17.0 of the Statistical Package for Social Sciences (SPSS). Description and chi-square test were used to analyse the correlation between the categories of self-reported oral health, oral health behaviour, and dental anxiety of mothers. A confidence level of 95% and two-side p value of 0.05 were used to determine significance.

Results

As shown in Table 1, approximately 90% of mothers had an average period of education longer than 5 years. Regarding perception of the oral health status of mothers, 87.2% self-reported retaining more than 20 teeth, 41.3% had gingival bleeding, and 51.2% complained of dental problems in the last 12 months. About 40% perceived their dentition and gingival status to be on a good level. Two-thirds brushed their teeth at least twice a day. Only 15.5% used dental floss for additional cleaning of teeth. About 17% had never visited a dentist, while 49.2% had visited a dentist during the last 12 months. The main reasons for visiting a dentist were pain (31.7%), routine checkup (20.0%), and consultation (19.6%). Fresh fruit (50.8%) and coffee with sugar (33.7%) were the most commonly consumed sweet products among mothers (Fig. 1).

Frequency of dental visits among mothers was positively correlated with frequency of tooth brushing ($r = 0.221$, $p < 0.001$), perception of good dentition ($r = 0.105$, $p < 0.001$), perception of good gingiva ($r = 0.087$, $p < 0.05$), and high level of education ($r = 0.213$, $p < 0.001$). Maternal dental anxiety was negatively correlated with perception of good dentition ($r = -0.151$, $p < 0.001$), perception of good gingiva ($r = -0.126$, $p < 0.001$), frequency of tooth brushing ($r = -0.149$, $p < 0.001$), and frequency of dental visits ($r = -0.105$, $p < 0.05$, Fig. 2).

A higher odds ratio for children with high caries levels was found in mothers with ≤ 5 years of education (OR = 1.22, 95%

Table 1 Mothers' self-reported oral behaviour and dental anxiety

Variable	Number	Percent	*p* value*
Educational level			
Primary school	53	9.6	< 0.001
Secondary school	292	52.8	
Higher education	208	37.6	
Residual teeth			
1–9	10	1.8	< 0.001
10–19	61	11.0	
≥ 20	483	87.2	
Gingival bleeding			
Yes	229	41.3	< 0.001
No	326	58.7	
Pain or discomfort during the last 12 months			
Yes	269	51.2	NS
No	256	48.8	
Teeth status			
Good	234	42.1	< 0.001
Average	213	38.3	
Poor	39	7.0	
Do not know	70	12.6	
Gingival status			
Good	216	38.8	< 0.001
Average	200	36.0	
Poor	24	4.3	
Do not know	116	20.9	
Tooth brushing frequency			
Less than once a day	22	4.0	< 0.001
Once a day	158	28.4	
Twice a day or more	376	67.6	
Oral hygiene aids used			
Toothbrush	540	97.1	< 0.001
Toothpick	235	42.3	
Tooth floss	86	15.5	
Other	133	23.1	
Last visit to a dentist			
≤ 1 year ago	273	49.2	< 0.001
1–2 years ago	107	19.3	
2–5 years ago	80	14.4	
Never	95	17.1	
Reason for last visit			
Consultation/advice	90	19.6	< 0.001
Pain or trouble	146	31.7	
Follow-up treatment	59	12.8	
Routine checkup	92	20.0	
Do not remember	73	15.9	
Dental anxiety			
No	395	71.0	< 0.001
Yes	197	29.0	

NS non-significant

*Chi-square test

CI = 0.69–2.16), mothers' perceptions of poor dentition (OR = 1.18, 95% CI = 0.84–1.67), and mothers with dental anxiety (OR = 1.23, 95% CI = 0.77–1.63). Nonetheless, none of the variables of mothers was significantly associated with high-caries children ($p > 0.05$, Table 2).

Spearman test indicated significant correlations of related oral health factors between mothers and children. Positive correlations were found with frequency of fresh fruit consumption ($r = 0.090$, $p < 0.05$) and drinking cola and sweet beverages ($r = 0.078$, $p < 0.05$, Table 3). Mothers with more than 20 teeth were positively correlated with caries-free children ($r = 0.085$, $p < 0.05$). Maternal dental anxiety was significantly correlated with children's anxiety ($r = 0.183$, $p < 0.001$) but had a non-significant correlation with children with high caries level ($r = 0.021$, $p > 0.05$, Fig. 3).

Discussion

The conceptual basis of dental health attitudes, dental health behaviour, and perceived oral health can differ culturally. The effect of mothers' oral health behaviour and perception of them on the oral status of themselves and their children is not fully acknowledged in Vietnam. Our results indicate that mothers who perceived a good dental status often visited dentists and had good oral hygiene. However, few Vietnamese mothers used dental floss as an oral hygiene aid. These circumstances are similar to findings in China, where 96% of the adult population did not use dental floss [21]. Brushing and flossing of teeth after eating have been recommended for effective oral hygiene. In developed countries, mothers often receive information about oral hygiene from mass media in parallel with professional advice; therefore, these mothers might be more conscious of dental health for themselves and their families [22].

In the current study, more than half of mothers had self-perceived dental problems, especially problems related to gingival status. Lack of interventions to realise the early signs of periodontal disease could be a reason for this. A similar situation was reported among mothers in Kuwait, where approximately 25% of mothers did not know the signs of periodontal diseases [23]. The poor gingival condition of mothers contributes to the severity of dental caries of their children. Periodontal bacteria of mothers can transmit between family members through daily activities [8, 11, 24]; Pähkla et al. and Tamura et al. have found periodontal bacteria in saliva samples of children to be strongly associated with that of their mothers [25, 26].

Our sample of mothers consisted of young adults, but more than 10% of mothers had fewer than 20 teeth, which is high compared to the 3.3% of the same group in Thailand [27]. However, we found that mothers retaining more than 20 teeth had a good perception of their teeth and gingiva and brushed

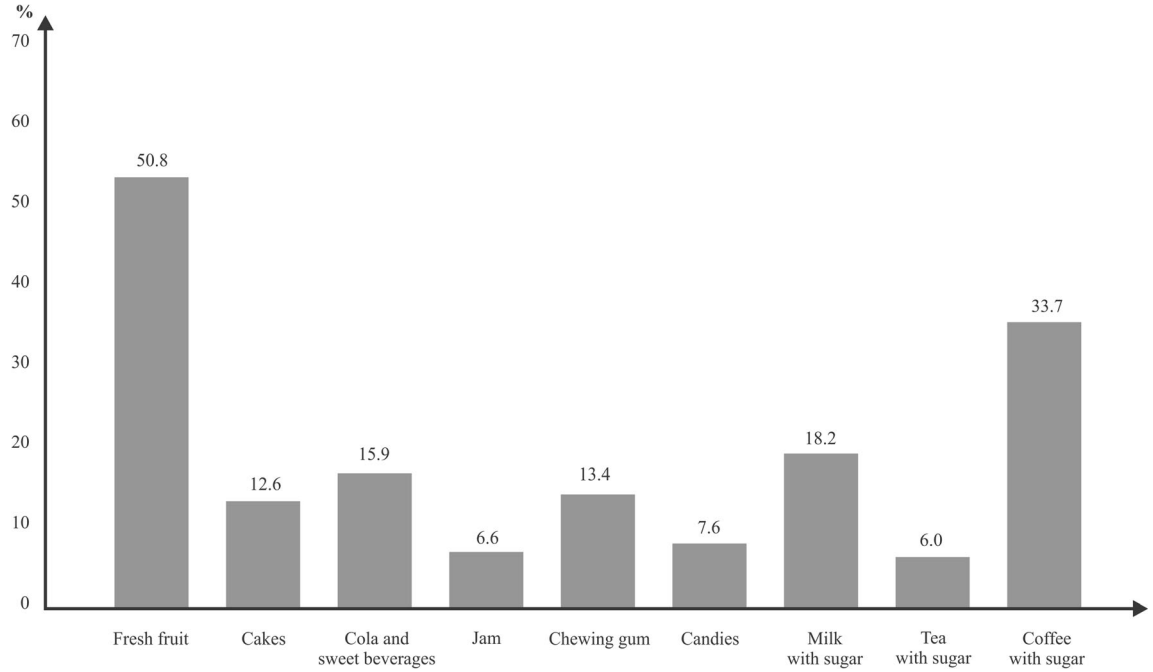

Fig. 1 Daily consumption of fresh fruits and sugary food and drink among Vietnamese mothers

their teeth at least twice a day. This suggests that public oral health programmes should emphasise the importance of frequency of tooth brushing, an effective and cheap method of oral healthcare.

We examined seven related oral health variables in mothers in our preliminary study to analyse their interactions. We found a positive correlation between high levels of education and frequency of tooth brushing as well as visiting a dentist. Conversely, the low level of education in 10% of Vietnamese mothers adversely affected oral health behaviours. Low education level is often significantly related to impaired understanding of the value of health and poor access to oral health. In addition, mothers with less education often spend more time doing manual labour in Vietnam; therefore, they may not have enough time for dental checkups.

Frequency of dental visits was significantly correlated with healthy dentition. Approximately 40% of mothers had routine dental checkups and dental advice. Although this is fewer than in other studies in different countries, it is significant in Vietnam, where the latest national oral health survey reported

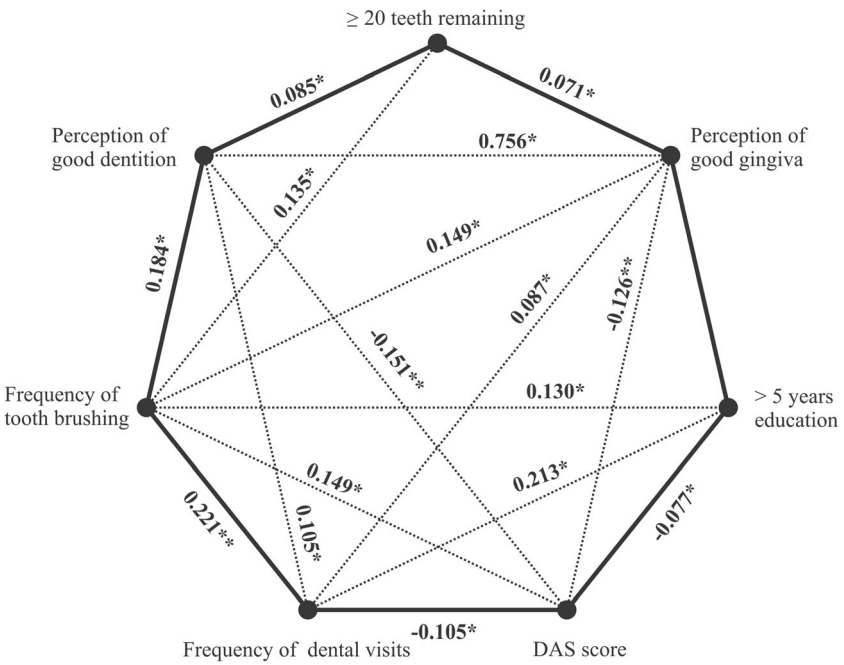

Fig. 2 Spearman correlations between behaviour, perception, and attitude towards oral health among the mothers. *$p < 0.05$, **$p < 0.001$

Table 2 Binary logistic regression analysis of behaviour variables of mothers related to high-caries children in Vietnam

Variables	Caries level in children (%)		Odds ratio (95% CI)	*p* value
	Low	High		
Length of education				
> 5 years	55.5	34.9	1.00	0.372
≤ 5 years	5.4	4.2	1.22 (0.69–2.16)	
Number of teeth				
≥ 20 teeth	52.7	34.5	1.00	0.449
< 20 teeth	8.3	4.5	0.83 (0.49–1.39)	
Perception of good dentition				
Yes	26.6	15.5	1.00	0.333
No	34.4	23.6	1.18 (0.84–1.67)	
Perception of good gingiva				
Yes	24.3	14.6	1.00	0.776
No	36.7	24.5	1.11 (0.78–1.58)	
Tooth brushing frequency				
≥ 2 times/day	41.0	26.6	1.00	0.634
< 2 times/day	20.0	12.4	0.96 (0.66–1.38)	
Last visit to a dentist				
≤ 1 year ago	29.5	19.6	1.00	0.507
> 1 year ago	31.5	19.4	0.93 (0.66–1.30)	
Dental Anxiety				
No	43.6	27.2	1.00	0.534
Yes	17.1	11.9	1.23 (0.77–1.63)	

Outcome: high caries level in children with dmft + DMFT > 4

that nearly 75% of the adult population had never visited a dentist or had done so most recently over 2 years ago; as a consequence, most adults had untreated dental caries [18].

The prevalence of maternal dental anxiety in our study (29%) was equal to that in Brazil (27.8%) [28] but lower than in India (53.5%) [29] and higher than in Estonia (16.8%) [13]. This suggests that maternal dental anxiety is influenced by ethnic and cultural aspects. The higher mothers' DAS scores, the poorer their oral health will be. Vietnamese mothers with dental anxiety brushed their teeth and visited dentists less frequently. It is possible that they had dental problems and were afraid of undergoing dental treatment; therefore, dental pain can influence on their brushing of teeth.

Concerning the fact that dental anxiety among Vietnamese mothers was positively associated with their children's dental anxiety, our study was consistent with previous studies indicating that dental anxiety of children was influenced by maternal dental anxiety [13, 28, 30]. There are multiple possible explanations for this. One is that when children underwent dental treatment, they did not receive psychological preparation from their mothers, who rarely visit dentists due to fear of dental treatment. Therefore, the children's anxiety increases during their first dental treatment, and unpleasant experiences during treatment procedures may linger in the children's minds. Another explanation is that conversation between mothers and children about unpleasant experiences concerning dental treatment could affect children's psychology [30].

Numerous investigations have demonstrated that mothers' dental anxiety is a risk factor for dental caries in their children

Table 3 The correlation of frequency of consuming sweets between mother and children

Mother Children	Fresh fruit	Cola or sweet beverages	Cake or biscuits	Sweet candy
Fresh fruit	0.090*	0.021	− 0.004	0.025
Cola or sweet beverages	0.072*	0.078*	0.054	0.021
Cake or biscuits	0.017	− 0.048	0.045	0.047
Sweet candy	0.032	0.072*	0.102**	0.027

Spearman correlation: *$p < 0.05$; **$p < 0.001$

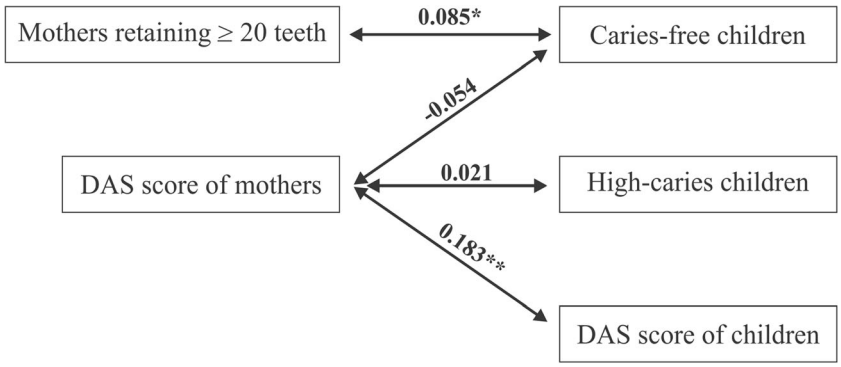

Fig. 3 Spearman correlations of dental health and dental anxiety between mothers and children. *$p < 0.05$, **$p < 0.001$

[4–6]. Our study's results conflict with these, indicating no positive correlation between maternal dental anxiety and high caries level among schoolchildren. It is possible that high caries level among children was influenced by other risk factors that could be stronger than maternal factors. The children of our sample were 8–10 years of age, and dental caries might occur more often in primary teeth due to early childhood caries. In addition, children's dental anxiety has a stronger influence on their caries than maternal anxiety. Therefore, the anxiety of mothers was weakly correlated with children's caries in our study.

The management of sugar intake in daily diet is important for oral health and prevention of dental caries. In the current study, nearly half of mothers ate fresh fruit daily. Eating fresh fruit should be encouraged more among Vietnamese mothers because it supplies rich vitamin sources that can prevent dental diseases [31]. However, up to 34% of Vietnamese mothers drink coffee with milk every day. Vietnamese coffee traditionally uses condensed milk with a high sugar content, which poses a risk of maternal dental caries. A study conducted in Iran revealed that 80% of mothers did not know that using sweet food and beverages could cause tooth decay [5].

Our study found that the oral health behaviour of mothers had a significant effect on that of their children. For instance, frequency of eating fresh fruit was positively correlated between mothers and their children. On the other hand, children whose mothers consumed cola, sweet beverages, or cake daily also shared similar behaviours with their mothers. This suggests that maternal behaviour has an indirect effect on children's dental caries.

The current study has demonstrated that two factors, dental anxiety and frequency of sugary consumption of mothers, are predictive of dental caries in children. Dental education attended by mothers promotes prevention of early childhood caries, and mothers are recommended to assume the role of dental care tutors for their children [16, 17]. Mothers' oral health knowledge and attitudes are both positively correlated with their children's sound dentition, and this might also be the target for oral healthcare programmes in Vietnam.

The WHO questionnaires on oral health behaviour and perception and the Corah's Dental Anxiety Scale were used to identify dental health and anxiety in mothers and children. However, dental caries experience and anxiety of mothers were not measured on clinical examination due to the large sample; these could be regarded as the shortcoming of the current study.

Conclusions and expert recommendations

Recently, the multifactorial aetiology of high dental caries in children has been proposed; therefore, the construction of children's caries-predictive model is important in paediatric dentistry. The current study highlights that maternal behaviours and perceptions in oral healthcare are significantly related to dental health in children; therefore, dental educational programme towards mothers can be necessary not only for maternal oral health but also for preventing dental disease in their children [32]. It is worthy of note that dental anxiety of mother is positive association with their poor oral health and as concomitant factor in the development of dental anxiety among children. The consequence of dental anxiety can have an adverse impact on quality of life, psychological function, and social communication because of the increased high-risk caries. In this regard, evaluation of maternal dental anxiety level should be carried out before starting dental treatment, so that the dentist can give advice on dental prevention for mothers as well as predict high-risk dental caries in their children.

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Compliance with ethical standards

This study was registered and approved by the Human Research Ethics Committee of the Da Nang University of Medical Technology and Pharmacy and performed in accordance with the World Medical Association's Helsinki Declaration. All procedures performed in studies involving human participants were in accordance with these ethical

standards. Informed consent letter with detailed descriptions of the aims and procedures of the study was obtained from all individual participants included in the study.

Conflicts of interest The authors declare that they have no conflict of interest.

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