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ORIGINAL ARTICLE

Awareness of and compliance with healthy oral habits reported by children and their parents in Democratic People's Republic of Korea after a preventive programme

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ABSTRACT

Objective: The study aimed to examine awareness of and compliance with healthy oral habits reported by children and their parents in Pyongyang, Democratic People's Republic of Korea (DPRK), after a preventive programme.

Materials and methods: The data were collected in 2013 with self-completed, partly structured questionnaires from 1994 children aged 10 and 13 years and from 200 parents. Association between awareness of and compliance with healthy oral habits reported by the children and their parents was evaluated using Chi square tests and multivariate logistic regression analyses, children's oral health habits according to themselves and their parents were analysed using McNemar's test.

Results: Both children and their parents seemed to be familiar with healthy oral habits, although the awareness was not directly related to the reports of the children's oral practices. Most of the children reported brushing their teeth at least twice a day, using fluoride toothpaste and drinking water for thirst but frequent sweet snacking was common. Children's and their parents' reports were consistent with regard to sweet snacking frequency ($p = 0.736$) and the main thirst quencher ($p = 0.349$).

Conclusions: Awareness of healthy oral habits appeared to be good among children and their parents. Unhealthy oral habits seemed to coincide with one another.

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Introduction

The focus of primary oral health care in developing countries should be on promotion of oral health by improving the understanding of the importance of oral hygiene, the roles of diet and nutrition, and the responsibility of the individuals themselves in the control of oral diseases.[1] When healthy oral habits are established at a young age, it has a lifelong positive effect on individuals' health and well-being.[2,3] A successful change in a young person's behaviour requires involvement of the family and the surrounding community, [2–4] as young persons' attitudes and behaviour are affected by parents, teachers and peers.[3–9] Most commonly the prevention targets to the high-risk individuals or groups. On the contrary, the whole population strategy of health education reduces inequities within the population by addressing the causes behind the diseases by influencing the environmental and social factors, opinions and attitudes related to dietary and hygiene patterns in the community.[1,10] The early years at school provide an ideal environment for the dissemination and implementation of oral health promotion in a rapid, efficient and cost-effective manner.[2,3,5,11,12] To achieve a permanent behavioural effect, both health education and training of the skills required for influential self-care need to be reinforced by repetition;[3,5,13] this may be easily achieved as part of school activities.[2,3]

In the Democratic People's Republic of Korea (DPRK), the prevalence of dental caries has been reported to be moderate to high among young generations.[11,14–17] Recognition of the rapidly increasing health burden prompted the launch of an oral health-promoting programme (Children's Oral Health Promoting Programme, COHPP) targeting kindergarten and primary school children as development collaboration between Korean authorities and a Finnish non-governmental organization (NGO) in 2007.[17,18] The COHPP aims to promote children's oral health in DPRK by supporting primary dental care services and oral health education for professionals and non-professionals according to the guidelines of the Health Promoting Schools by WHO.[2,3,11,17,18]

The aim of this study was to examine awareness of and compliance with healthy oral habits reported by the children and their parents in Pyongyang, DPRK, after six years' operations of the COHPP. Another aim was to describe the congruence between children's and their parents' reports of the children's compliance with healthy oral habits and the

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association between parents' awareness of healthy oral habits and their children's compliance with the corresponding healthy oral habit.

Materials and methods

Subjects

The research was performed in September 2013 in Pyongyang, the capital of DPRK. A convenience sample of 2000 primary and middle school children (837 females and 1163 males) was selected from Pyongyang city. The sample consisted of three groups: Group I ($n = 250$, 13 years old, 44% females), Group II ($n = 250$, 10 years old, 54% females) and Group III ($n = 1500$, 13 years old, 41% females). There were six drop-outs from Group I, i.e. the final number of participants in Group I was 244 children (46% females) the total number being 1994 children (836 females and 1158 males). Additionally, a sample of 200 parents of Group II children was selected as a convenience sample to represent the school children's parents in Pyongyang city (Subgroup II, Table 1).

Children's oral health promotion programme (COHPP)

The COHPP had been initiated in two districts of central Pyongyang (Central and Potonggang District) and gradually expanded to cover the whole capital area. The children in all three groups were exposed to oral health education by a trained dentist or teacher at kindergarten or primary school. The oral health education focused on caries prevention was organized once or twice a year during the years 2007–2013 as two-to-three day seminars for the personnel mentioned above. These trained community trainers in turn trained the children continuously as part of the curriculum of the schools and kindergartens, and the parents during the dental visits and in training sessions in their own sphere of action.[17,18]

The oral health education as well as all the education materials followed the same content: the structure of tooth, regular tooth brushing twice a day with fluoride toothpaste, healthy and unhealthy diet, water as recommended thirst quencher instead of sugary beverages, and infrequent sweet snacking. Education materials were designed in collaboration between Finnish and Korean parties taking part in the development co-operation. Attention was given to repeating the content and the pictures similarly throughout the education sessions and education materials to support the learning process. Education methods and materials were adjusted for each age group using different education materials and methods.[17,18]

Supervised tooth brushing was part of the daily schedule at the schools and kindergartens participating in the programme. Distribution of toothbrushes and toothpaste by the schools and kindergartens along with education of the personnel was included in the COHPP since, according to the local project partner, toothbrushes and fluoride toothpaste were not available to all children at the onset of the programme. In accordance with DPRK legislation, the concentration of fluoride in the toothpaste delivered to the children was 500 ppm.[17,18]

The groups of this study differed in terms of the age at which they were affiliated to the programme and the frequency of toothbrush and fluoride toothpaste delivery. The children in Group I came from Central and Potonggang districts and had joined the programme when starting first grade of primary school at the age of seven years. They had been provided with toothbrush and fluoride toothpaste twice a year during the entire programme (altogether 12 times). The children in Group II came from Potonggang district and had participated in the COHPP already at kindergarten at four years of age, but had been provided with toothbrush and fluoride toothpaste only twice during the first year of joining the programme. Group III consisted of a randomized sample of 13-year-old school children from different areas of Pyongyang city to represent the children in Pyongyang generally. They had joined the COHPP at different ages during primary school and had been provided with toothbrush and fluoride toothpaste twice during the year of affiliation to the programme.[17,18]

Table 1. Study sample consisting of children and their parents from different schools in Pyongyang, Democratic People's Republic of Korea, in 2013. The groups differed with regard to age and oral health promotion intervention.

Group I $n = 244$	Group II $n = 250$	Group III $n = 1500$
Age: 13 years *Gender*: Females 44.3% *School*: Ryonhwa Middle School and Potonggang Middle School *Intervention*: Oral health education with education materials by primary school teachers since 2007, toothbrush and fluoride toothpaste delivery twice a year during the six years of programme duration	*Age*: 10 years *Gender*: Females 46.0% *School*: Potonggang Primary School *Intervention*: Oral health education with education materials by kindergarten and primary school teachers since 2007, toothbrush and fluoride toothpaste delivery twice during the year of affiliation to the programme Subgroup II: Children ($n = 200$)+ Parents ($n = 200$)	*Age*: 13 years *Gender*: Females 40.9% *School*: Inhung Middle School, Janggyong Middle School, Kwangbok Middle School, Songhwa Middle School, Chongryu Middle School *Intervention*: Duration of oral health education with education materials by primary school teachers varied, toothbrush and fluoride toothpaste delivered once during the year of affiliation to the programme

Data collection

Separate, partly structured, self-completed questionnaires were administered to the children and the mothers or fathers of 200 children in Subgroup II to gather information on their awareness and children's compliance with healthy oral habits. The questionnaire was formulated both in English and Korean. The form was piloted and the translation was forward-/back-translated three months earlier during a training session arranged by COHPP for lecturers and dentists of Dental Faculty of Pyongyang Medical College, Kim Il Sung

University and collaboration hospitals. The teachers distributed the forms during the school day and they were to be filled in at home and to be returned on the following day. [18] The response rate among children was 99.7% and among parents 100%.

To gather information on awareness of healthy oral habits the children were asked to state the main points of the oral health education by COHPP with an open question:

- How can you keep your teeth healthy? Do you remember the important things?

Correspondingly, the parents were asked:

- How can you promote your child's good dental health? Do you remember any of the main points taught during the project?

The recommended healthy oral habits (tooth brushing twice a day, use of fluoride toothpaste, healthy diet including water as the main thirst quencher and infrequent sweet snacking) were searched and if mentioned in the answers, were recorded as being aware or not of the habit. In addition, the children were asked about their tooth brushing frequency, use of fluoride toothpaste and the frequency of sweet snacking (juice, ice cream, candy, biscuit, etc.) with multiple-choice questions and about their main thirst quencher with an open question as follows:

- In everyday life,
- How often do you brush your teeth? With options: __ times a day/__ times a week/more seldom/never.
- Do you use fluoride toothpaste? With options: yes/no.
- How often do you eat sweet snacks (juice, ice cream, candy, biscuit, etc.)? With options: __ times a day/__ times a week/more seldom/never.
- What do you usually drink when you are thirsty?

The parents were asked about their child's oral health habits as follows:

- In everyday life, how often does your child brush his/her teeth? With options: __ times a day/__ times a week/more seldom/never.
- Does he/she use fluoride toothpaste? With options: yes/no.
- How often does he/she eat sweet snacks (juice, ice cream, candy, biscuit, etc.)? With options: __ times a day/__ times a week/more seldom/never.
- What does he/she usually drink when feeling thirsty?

Both questionnaires included information about the use of the data to analyse the outcomes of the COHPP. In addition, details of the local contact person and institutes responsible for the research were included. The participants were informed that responding was totally voluntary; filling and returning the questionnaires would be taken as positive consent for the use of the data in this study.[18]

Statistical analysis

Children's healthy oral habits were dichotomized as follows: tooth brushing frequency: less than twice a day or at least twice a day, sweet snacking frequency: less than twice a day or at least twice a day, and the main drink: water or sugary beverages including juice, cider or tea (according to the local dentists, tea is commonly served sugar-sweetened to children). Chi square tests were used to evaluate the statistical significances of the associations of the children's awareness and compliance with healthy oral habits by gender, age and group status. Multivariate logistic regression analyses were used to evaluate separately the association of explanatory variables with each healthy oral habit (tooth brushing at least twice a day, use of fluoride toothpaste, sweet snacking less than twice a day and use of water as the main thirst quencher) reported by the children themselves. Explanatory variables included children's awareness and compliance with self-reported healthy oral habits other than the dependent variable (tooth brushing twice a day, use of fluoride toothpaste, sweet snacking less than twice a day and water as the main thirst quencher). Concerning other healthy oral habits except the use of fluoride toothpaste, confounding variables included gender and group, the latter also indicating age. Concerning the use of fluoride toothpaste, confounding variables included only gender since all children (100%) in groups I and II reported to use fluoride toothpaste. Prior to the multivariate regression analyses, the correlations between the explanatory variables were tested with Spearman rank-order correlation coefficient. No variables were excluded from the analysis due to high correlations (highest $c = 0.125$). In Subgroup II ($n = 200$), the children's and their parents' reports of the child's healthy oral habits (tooth brushing frequency, use of fluoride toothpaste, sweet snacking frequency and the main thirst quencher) were compared by McNemar's test. In all tests, the level of significance was set to $p < 0.05$. All statistical analyses were performed by SPSS 21.0 (SPSS Inc., Chicago, IL).

Our study is a human observational study and we have conformed to the STROBE guidelines. The research plan, including ethical issues, was approved by DPRK authorities from Pyongyang Medical College, Kim Il Sung University and Korea Education Fund (KEF).

Results

Awareness of the recommended healthy oral habits (all children, n = 1994)

Awareness and self-reported compliance with each healthy oral habit by group are presented in Table 2. At total, 88% of the children (87% of the females and 88% of the males, $p = 0.888$) reported being aware of all recommended healthy oral habits, lowest awareness was found in Group III ($p < 0.001$). Oral hygiene instructions (tooth brushing and use of fluoride tooth paste) were more familiar (99% for both genders) than the dietary recommendations (infrequent sweet snacking and healthy diet with water as the main thirst quencher, respectively, 94% and 94%). Awareness of

Table 2. Awareness of and self-reported compliance with healthy oral habits (p Values refer to Chi square tests between the groups) among 1994 children in Pyongyang, Democratic People's Republic of Korea in 2013.

	Group					
	Awareness			Self-reported compliance		
	I	II	III	I	II	III
All recommended healthy oral habits	98.8%	98.4% $p < 0.001$	83.9%	4.1%	3.2% $p < 0.001$	17.1%
Tooth brushing at least twice a day	100.0%	99.6% $p = 0.268$	99.1%	95.9%	92.0% $p = 0.011$	96.2%
Use of fluoride toothpaste	99.6%	99.6% $p = 0.459$	99.0%	100.0%	100.0% $p = 0.070$	98.9%
Sweet snacking less than twice a day	100.0%	99.6% $p < 0.001$	92.0%	11.9%	10.8% $p < 0.001$	22.3%
Healthy diet with water as the main thirst quencher	99.2%	99.6% $p < 0.001$	92.7%			
Water as the main thirst quencher				70.1%	71.6% $p = 0.056$	76.1%

the recommendations of infrequent sweet snacking and healthy diet with water as the main thirst quencher were lowest in Group III ($p < 0.001$ for both habits).

Compliance with healthy oral habits (all children, n = 1994)

Fourteen percent of the children (11% of the females and 16% of the males, $p = 0.002$) reported observing each recommended healthy oral habit. Tooth brushing at least twice a day was reported by 96% of the females and 95% of the males ($p = 0.582$) and by 92% of the 10-year-olds and 96% of the 13-year-olds ($p = 0.003$). Fluoride toothpaste was used by 99% of the females and by 99% of the males ($p = 0.385$), and by 100% of the 10-year-olds and 99% of the 13-year-olds ($p = 0.128$). Frequency of sweet snacks between meals varied from zero to seven times a day, and 80% of the children (83% of the females and 78% of the males, $p = 0.006$) reported a habit of sweet snacking between meals more than once a day (89% of the 10-year-olds and 79% of the 13-year-olds, $p < 0.001$). Water was the most commonly used thirst quencher (75% of the children, 77% of the females and 73% of the males, $p = 0.085$) while sugary beverages were used to lesser extent (juice 17%, cider 8% and tea 0.6%). Using water as thirst quencher was at the same level among 10-year-olds (71%) and 13-year-olds (75%, $p = 0.209$). The compliance with all recommended healthy oral habits was highest in Group III ($p < 0.001$): tooth brushing twice a day, sweet snacking less than twice a day and water as the main thirst quencher were reported most often in this group (respectively, $p = 0.011$, $p < 0.001$, $p = 0.056$).

Association between awareness and compliance with self-reported healthy oral habits (all children, n = 1994)

According to multivariate logistic regression analysis (Table 3), being aware of healthy diet with water as the recommended thirst quencher, and having the habit to use fluoride toothpaste and to drink water for thirst were independently associated with the habit to brush teeth at least twice a day. Additionally, belonging to Group II and having the habit to eat sweet snacks less often than twice a day were almost significantly associated with the habit to brush teeth twice a day.

Those being aware of the recommendation to use fluoride toothpaste, those who reported brushing their teeth at least twice a day, and those drinking water for thirst had higher probability of using fluoride toothpaste.

Less frequent sweet snacking (less than twice a day) was significantly higher among males and in Group III. Moreover, tooth brushing at least twice a day slightly increased, while the use of water for thirst slightly decreased the probability of less frequent sweet snacking.

Belonging to Group III, having the habit to brush teeth at least twice a day and using fluoride toothpaste statistically significantly increased the probability of using water for thirst. Additionally, being aware of the recommendation to avoid frequent sweet snacking slightly increased, while having the habit to eat sweet snacks less often than twice a day slightly decreased the probability to drink water for thirst.

Congruence between children's and their parents' awareness of healthy oral habits (n = 200, Subgroup II)

In Subgroup II, the awareness of each recommended healthy oral habit was slightly lower among the parents than among the children (94% and 98%, respectively). Children's awareness of the recommended healthy oral habit was 99.5% for each habit while the percentages among their parents varied between 97.5% and 98.5% (regular tooth brushing twice a day 97.5%, use of fluoride toothpaste 98.5%, infrequent sweet snacking 98.0% and healthy diet with water as the main thirst quencher 98.0%.

Congruence between children's and their parents' reports of children's compliance with healthy oral habits (n = 200, Subgroup II)

The child's tooth brushing frequency at least twice a day was reported by 78% of the parents and by 92% of the children

Table 3. Associations of explanatory variables with self-reported healthy oral habits among 1994 children in Pyongyang, Democratic People's Republic of Korea, in 2013 according to multivariate logistic regression analysis.

	OR (95% CI) *p*			
	Tooth brushing at least twice a day[a]	Fluoride toothpaste in use[b]	Sweet snacking at most once a day[c]	Water as the main thirst quencher[d]
Males (ref. females)	0.9 (0.6–1.5) $p = 0.764$	0.8 (0.3–2.3) $p = 0.615$	1.3 (1.1–1.7) $p = 0.012$	0.8 (0.7–1.0) $p = 0.106$
Group (ref. Group I)				
Group II	0.5 (0.2–1.0) $p = 0.059$	NA	0.9 (0.5–1.6) $p = 0.789$	1.1 (0.8–1.7) $p = 0.535$
Group III	1.1 (0.5–2.2) $p = 0.805$	NA	2.2 (1.4–3.3) $p < 0.001$	1.5 (1.1–2.0) $p = 0.010$
Aware of the recommendation to brush teeth ≥2/day (ref. not aware)	NA	NA	0.7 (0.2–2.3) $p = 0.548$	1.9 (0.7–5.9) $p = 0.236$
Aware of the recommendation to use fluoride toothpaste (ref. not aware)	NA	12.9 (1.4–119.0) $p = 0.024$	1.9 (0.4–8.7) $p = 0.380$	0.6 (0.2–2.3) $p = 0.483$
Aware of the recommendation to avoid sweet snacking (ref. not aware)	0.8 (0.3–2.3) $p = 0.676$	NA	1.3 (0.8–2.2) $p = 0.238$	1.5 (1.0–2.2) $p = 0.072$
Aware of healthy diet with water as recommended thirst quencher (not aware)	2.2 (1.0–4.9) $p = 0.047$	NA	0.8 (0.5–1.2) $p = 0.270$	1.1 (0.7–1.7) $p = 0.614$
Tooth brushing at least twice a day (ref. less than twice a day)	–	10.5 (3.2–33.8) $p < 0.001$	1.9 (1.0–3.8) $p = 0.063$	3.1 (2.0–4.8) $p < 0.001$
Fluoride toothpaste in use (ref. not in use)	10.2 (3.2–33.2) $p < 0.001$	–	1.8 (0.4–8.3) $p = 0.426$	3.5 (1.2–9.8) $p = 0.019$
Sweet snacking <2/day (ref. ≥2/day)	1.9 (1.0–3.8) $p = 0.056$	1.4 (0.3–6.6) $p = 0.648$	–	0.8 (0.6–1.0) $p = 0.063$
Water as the main thirst quencher (ref. sugary beverages)	3.1 (2.0–4.8) $p < 0.001$	3.1 (1.1–8.8) $p = 0.037$	0.8 (0.6–1.0) $p = 0.066$	–

[a]Hosmer and Lemeshow $\chi^2 = 12.21$, $p = 0.094$, 95.6% of cases classified correctly.
[b]Hosmer and Lemeshow $\chi^2 = 3.22$, $p = 0.864$, 99.2% of cases classified correctly.
[c]Hosmer and Lemeshow $\chi^2 = 10.63$, $p = 0.101$, 80.4% of cases classified correctly.
[d]Hosmer and Lemeshow $\chi^2 = 18.61$, $p = 0.005$, 74.8% of cases classified correctly.

($p < 0.001$). Similarly, 92% of the parents claimed that the child used fluoride toothpaste while according to the children's reports, the percentage was 100 ($p < 0.001$). Sweet snacking less than twice a day was reported by 10% of the children and 12% of the parents ($p = 0.736$) and use of water as the main thirst quencher by 78% of the children and 74% of the parents ($p = 0.349$), the differences being not significant.

Discussion

The results of this study indicated that the awareness of healthy oral habits is at relatively high level among school children and their parents in Pyongyang after six years of the COHPP as nine out of ten both among the children and among the parents were aware of the importance of the healthy oral habits in controlling dental caries. According to the children's own reports and those of their parents, most children brushed their teeth twice a day with fluoride toothpaste and used water as the main thirst quencher whereas frequent sweet snacking appeared to be extremely common. To be aware of the protective role of fluoride appeared to be important determinant for the use of fluoride toothpaste. Further, the habit to brush teeth twice a day or more often associated with awareness of healthy diet and the recommendation to drink water for thirst. Although the awareness of the recommendation of sweet snacking less than twice a day was least among children in Group III, most of them reported to have this habit. Further, unhealthy oral habits such as tooth brushing less than twice a day, not using fluoride toothpaste and drinking sugary beverages for thirst, appeared to accumulate to the same children. Parents' reports of the child's compliance with healthy oral habits differed from the corresponding child's report with regard to tooth brushing frequency and use of fluoride toothpaste, but the reports by the parents and the children themselves were consistent concerning the child's sweet snacking behaviour and the choice of the main thirst quencher.

It has become obvious during the oral health education for dentists and teachers by the COHPP that regular tooth brushing has traditionally been highly appreciated in DPRK. This may explain the high percentage of the children reporting to brush their teeth twice a day and the finding that the oral hygiene instructions appeared to be more familiar to the respondents than the dietary instructions. While fluoride toothpaste was not commonly available to children in DPRK before the onset of the COHPP,[18] it was encouraging to find that the children all around Pyongyang reported to have continued use of fluoride toothpaste even after the distribution by the COHPP had ended. The differences in the perceptions regarding the child's tooth brushing frequency and use of fluoride toothpaste between the children and their parents may be explained by the parents' incomplete awareness of the children's daily tooth brushing at school.

Emphasising oral hygiene instructions over the dietary component of combined oral health behavioural interventions is common, as shown by Cooper et al.[5] This may have been the case in the local trainings in DPRK as well, even

though the role of sugar in the development of dental caries had been in the focus of the education provided for the trainers by COHPP. Poorest awareness of healthy dietary habits was found among the children in Group III who had joined the programme at older age than among the children in Group I and II; however, the compliance with healthy oral habits was best in Group III. According to the local dentists, this contradictory finding may be explained by the change in oral health behaviour among youth in DPRK in general thanks to widespread dissemination of information during the COHPP implementation even though these children may not have been able to recall and list these habits when responding to the questionnaire.

Use of water for thirst was more common among girls than among boys, but the habit of snacking sweets between meals was more common among girls. These tendencies were partly opposite and partly parallel to the findings of previous studies which have shown more frequent use of sweet snacks and drinks among males than among females.[7,19–21] Interestingly, consumption of sweet snacks appeared to be double among the younger children compared to the older ones. This is opposite to the previous findings showing that the consumption of sugary foods and drinks tends to increase along with age in this phase of life.[7,19] Three children out of four reported drinking water for thirst, whereas others drank juice or cider, but the traditional drink, tea, was extremely rare. Use of sugary beverages for thirst appeared to be significantly associated with tooth brushing less than twice a day and not using fluoride toothpaste. Furthermore, frequent sweet snacking and rare tooth brushing as well as frequent sweet snacking and use of sugary beverages for thirst seemed to be nearly significantly associated. These findings confirm the previous reports showing that unhealthy habits often accumulate to the same persons.[20,23]

Use of sugary snacks and beverages has increased in DPRK during recent years as in several other countries and reflects changes in society. The transition has started in the capital area but is gradually spreading to other areas as well. During the operation of COHPP, kiosks selling sweet snacks and beverages have become common, and various leisure time facilities, such as amusement parks and sports grounds, have become popular, increasing the supply and use of sweet snacks and soft drinks especially among younger generations whereas adults still mostly follow traditional dietary habits. The findings of this study revealed that the dietary habits among youth in Pyongyang are similar to those of their counterparts in other countries.[18–23]

In the areas of the longest operation of the COHPP, also parents' awareness of healthy oral habits was good: the awareness of healthy oral habits was better among parents in Subgroup II than among the children in the randomized sample around Pyongyang city (Group III). However, these results may not be generalized to all families in Pyongyang as the children of the families in Subgroup II had joined the programme already at kindergarten, meaning that the families had been targeted by the oral health education for six years. However, comprehensive awareness among the parents did not appear to correlate with children's oral health habits. This conclusion is in line with Vanobbergen et al. [24] who concluded after six-year long oral health education programme for primary school children in Belgium that there are challenges when trying to explore the complexity and assumptions related to the interaction between children's behaviour and parental experience.

This study population was collected from different parts of the city of Pyongyang. The results may therefore only be generalized to the capital area and further studies are needed to evaluate children's oral health status and health challenges elsewhere in DPRK. Furthermore, these findings do not permit determination of the actual impact of COHPP as the oral health habits among school children prior to the study remain unknown. The questions about oral health habits were designed especially according to the oral health education provided by COHPP. However, it should be noted that the self-reported information about health habits may include an exaggerated portion, on the other hand, the reports of the frequent consumption of sweet snacks regardless of the common awareness of the detrimental effect of sugar suggest that the report correspond the reality rather well.[18] Assuming the ratio between the parents' and children's awareness of the main aspects of oral health education by COHPP gives any estimate of the reality in Pyongyang, the awareness of self-care means in control of dental caries among families of school children in Pyongyang would be even as high as 80%.

Considering the lack of information of the oral-health promoting habits at the time before the onset of COHPP, we can suggest that the oral health education by COHPP is well established among school children and their parents in Pyongyang. The Korean dentists and teachers who have been responsible for the implementation of the programme since 2012 have proved their capacity to spread the message. This encourages introducing the programme in other areas of the country. However, the discrepancy between awareness of healthy dietary choices and everyday habits is a strong indication that what has now been achieved is just a small beginning that needs to be boosted and strengthened in extensive collaboration between different sectors of the community targeting oral health education for all population groups. Like Tolvanen et al. [25] concluded after a three-year-long follow-up of middle school children in Finland, changing behaviours is a long-term process and therefore oral health promotion should be a continuous process.

Based on this study, it can he concluded that awareness of healthy oral habits is relatively high among both children and parents after the COHPP, although the knowledge was not directly related to the reports of the children's oral practices. With the exception of frequent use of sweet snacks, healthy oral practices were generally followed by the children in Pyongyang.

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Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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