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Original Article

Educational intervention can improve dental care knowledge in aboriginal tribal children

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ABSTRACT

Objective: The aim of this program was to assess tooth decay and dental care knowledge among children in aboriginal tribes. We wanted to both enhance dental care knowledge and reduce caries in aboriginal children through a series of educational activities.

Materials and Methods: The program included 67 of 80 (83.75%) Truku children between 3 years and 15 years of age in the Chongguang Tribe, Wenlan Village, Xiulin Township. The program lasted for the entire year in 2010. A questionnaire was administered to the children at the start of the year and then again at the end of the year. The questionnaire assessed the children's dental care knowledge before and after the intervention with educational activities. In addition, 48 children (60%) participated in oral health screening, and 16 of them, according to age-stratified sampling, had dental plaque tests done to compare the condition of their teeth before and after intervention.

Results: The prevalence of caries among the screened children was 68.75%. The average number of decayed teeth was 3.25 ± 3.46 . The restorative rate was 48.5%, and the index of decayed, extracted, missing, and filled teeth was 7.13 ± 4.57 . The correct response rate (%) on the dental care knowledge test improved from 68.15 ± 23.62 to 89.20 ± 6.70 ($p < 0.001$). The results indicated that the knowledge level improved. The plaque control record (%) was reduced from 41.13 ± 16.7 to 35.31 ± 13.11 , but was not statistically significant ($p = 0.118$).

Conclusion: There are still many remote aboriginal tribes in Hualien and Taitung where dental care resources are scarce and the prevalence of caries is high, particularly among preschool children. Intervention with educational activities can improve aboriginal children's dental care knowledge and is a feasible and effective approach to solve this problem.

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1. Introduction

The World Health Organization set a global oral health goal to have 50% of children 5–6 years old free of dental caries by 2000, with the hope that 90% of children 5–6 years old would be free of dental caries by 2010 [1]. In Asia, Japan had the lowest caries prevalence of 23.33% from 1999 to 2003 among children 5–6 years old. The prevalence in Taiwan was 88.43%, which made it one of the countries with the highest caries prevalence [2]. In 2008, statistics from the Taiwan Academy of Pediatric Dentistry also showed that 86% of children in Taiwan had carious teeth, and that each child had an average of five carious teeth with the severity increasing with age [3].

Many remote and mountainous areas in Taiwan are generally deprived of oral medical care resources, and as such, the oral health problems in these communities are serious. For example, a 2004 study by Sun and Chiang [4] in Dili Village showed that both the average number of decayed teeth and the caries prevalence among students in the mountains were higher than those among students in Taichung City. In 2001, Yu's [5] analysis of dental service utilization among aboriginal and non-aboriginal elementary school students in Hualien and Taitung showed that the distribution of dental care resources varied vastly between urban and rural areas. Townships in the mountains were seriously deprived of medical resources. Caries prevalence among aboriginal students was higher than that among Chinese students (3.15 vs. 2.87 teeth) and the restorative rate was lower (0.66 vs. 1.81 teeth). High caries prevalence and low restorative rate were observed among aboriginal children. The oral health problems of aboriginal children in these remote areas are critical issues that must be addressed.

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Chongguang Tribe is located in Wenlan Village, Xiulin Township, Hualien County, and is more than 20 km from Hualien City. Nearly all residents in Chongguang Tribe are Truku aboriginals, and there are more than 500 people in total. There are no medical resources or schools available nearby. Residents have to travel to other places for medical care.

The Tzu Chi General Hospital has been providing a mobile clinic on a weekly basis at Chongguang Tribe since 2009. During outpatient visits, it was observed that local children had more caries than the national average. According to a 2001 survey by Huang et al [6], the caries prevalence among children aged 6 years or younger in Xiulin Township was higher than that at townships in plains, with a lower rate of completion of follow-up treatment. Our research aimed to understand the oral health status of tribal children while improving their knowledge level about dental care and reducing caries through instruction with educational activities.

2. Materials and methods

Children 3–15 years old from Chongguang Tribe were studied. All were Truku aborigines. Household statistics at the Wenlan Health Office in 2009 showed that there were 80 residents 3–15 years old in the area. After consultation, with parents and their children, 67 children consented to participate in this program. The participation rate was 83.75%. The program, approved by Tzu Chi General Hospital Institutional Review Board, lasted for the entire year in 2010.

The research was divided into three parts.

1. Results of a questionnaire test on oral health knowledge before and after educational activities were compared.
2. Oral health screening for tribal children was conducted.
3. Plaque control records at the beginning of the year were compared with those at the end of the year.

The interviewer visited the children at home to complete the questionnaire. The parents or primary caregiver of children aged 6 years or younger answered on their behalf. Children aged 7 years or older answered on their own. The questionnaire comprised of 20 questions, including 13 yes/no questions and seven multiple-choice questions, as shown in Table 1. The contents covered five categories: tooth-cleaning habits (4, 8, 9, 11, 16, 20); knowledge of caries (5, 7, 10, 14, 15); dietary habits (3, 6, 12, 13); knowledge about changes in teeth (1, 17, 18); and periodic examination schedule (2, 19). Questions were pediatric oral health specific and were useful and closely related to carious teeth so that the children and their parents could gain helpful and useful knowledge while answering the questions.

After the pretest, a series of oral health education activities started, which included giving lectures for the children and their parents, showing teaching videos to the children, teaching the children how to brush their teeth correctly, giving out tooth-cleaning supplies, and handing out prepared dental care manuals to each of the children. These educational activities were completed in sequence. At the end of the program, the same test was given and the correct response rates for both tests were compared to examine if the overall oral health knowledge level had improved.

The oral health examination was performed by the same licensed clinical dentist. An oral examination checklist of the number and condition of teeth among the children was designed with reference to suggestions from the Association of Family Dentistry [7]. Decayed (d, D) referred to carious teeth. Extraction (e) indicated that baby teeth were severely decayed and needed extraction. Missing (M) indicated that permanent teeth were extracted. Filled (f, F) indicated that decayed teeth were filled. The

Table 1
Questionnaires about oral health knowledge test in this study

Questionnaire	Answer
1 Children's caries does not require treatment because they will be replaced by permanent teeth.	No
2 Like adults, children need to see a dentist regularly for routine examinations.	Yes
3 Milk and breast milk are not drinks, and hence, there is no need for cleaning teeth after drinking them.	No
4 Toothbrushes can be used for as long as they are not bent, deformed, or worn out.	No
5 Although caries is an oral problem, it can affect children's physical development.	Yes
6 Chewing gums and chocolate are sticky and can take away dirty stuff on the teeth so they are good for oral health.	No
7 Fluoride toothpastes and fluoride gels are both effective preventive methods against caries.	Yes
8 As long as I rinse my mouth after I eat, I don't need to brush my teeth.	No
9 Properly trained by their parents, children aged 6 y and younger can brush teeth on their own.	No
10 Brushing teeth is the most effective way to prevent against caries.	Yes
11 As long as I brush hard enough, it does not matter which brushing method I use.	No
12 Soda, coke, and milk tea can be used to rinse the mouth after eating.	No
13 Vegetables, fruits, and other fiber-rich foods are good for oral health.	Yes
14 What do you think is dental plaque?	Bacteria and their products
15 What do you think is the main cause for tooth decays (caries)?	Bacteria produce acidic substances
16 What do you think should be used to clean the proximal surface (gap) of a tooth?	Dental floss
17 What is the total number of deciduous teeth?	20
18 At what age does change of teeth usually start?	6 y
19 How often should children visit a dentist for routine oral examinations?	6 mo
20 How long can a toothbrush be used for and then replaced?	1 mo

deft index for baby teeth was $deft = d + e + f$, and the deft index for permanent teeth was $DMFT = D + M + F$. Forty-eight children received oral examinations in this study, accounting for 60% of the 80 children in the tribe. Twenty-five of them were boys and 23 of them were girls.

Because of the limited number of research participants, it was impossible to set up a control group. Also, follow-ups and comparisons could not be completed in the 1-year program. The number of dental plaques was used as the index to judge whether oral health status improved after intervention. Dental plaque pretest and posttest were performed 7 months apart in 16 of the 48 children according to age stratification.

O'Leary's plaque control record (1972), the most commonly used clinical tool for plaque calculation, was adopted in this study. Each tooth was divided into six surfaces to tally the percentage of the surface with plaque among the total number of surfaces examined, and the results were the plaque control scores.

2.1. Statistical analysis

Data were expressed as mean \pm standard deviation. Comparisons between the pretest and posttest were made using the paired *t* test for parametric data. Data were analyzed using SPSS for Windows (version 13.0; SPSS Inc., Chicago, IL, USA). A *p* value less than 0.05 was considered statistically significant.

Table 2
Basic data and correct rate of questionnaires about oral health knowledge of 67 Truku aboriginals before and after intervention

Item	No.	Preintervention	Postintervention	<i>p</i>
Sex				
Male	34	70.59 ± 11.16	92.65 ± 8.4	<0.001*
Female	33	65.00 ± 13.46	85.88 ± 12.90	<0.001*
Age (y)				
0–6	11	76.67 ± 9.68	87.22 ± 12.53	0.06
7–15	56	66.47 ± 11.98	89.59 ± 10.99	<0.001*
Total		68.15 ± 23.62	89.20 ± 6.70	<0.001*

Data are expressed as means ± standard deviations.

**p* < 0.05 was considered statistically significant after performing the paired *t* test.

3. Results

3.1. Oral health knowledge test

Sixty-seven children completed the questionnaire. The correct response rates are shown in Table 2. There was a similar improvement between male and female children, and the school children group was better than the preschool group. The total correct response rate significantly improved at the end of the year (*p* < 0.001), which suggests that intervention with educational activities does increase tribal children's overall knowledge of dental care.

Before intervention, the correct response rate for dietary habits was the highest among the five test categories. After educational intervention, the correct response rate for tooth-cleaning habits showed the maximum improvement and dietary habits the least (Table 3).

During this research period, there were no other oral health educational activities from the school, health offices, or community. Therefore, interference in the results could be excluded.

3.2. Oral health status

The total caries prevalence among the 48 examined children was 68.75%. The average number of decayed teeth was 3.25 ± 3.46 . The restorative rate was 48.5% and the deft index (deft + DMFT) was 7.13 ± 4.57 .

The caries prevalence and restorative rates were 81.82% and 20.93%, respectively, for preschool children (6 years and younger); 61.54% and 62.14%, respectively, for elementary students (7–12 years old); and 72.73% and 54.55%, respectively, for junior high students (13–15 years old). Preschool children had the worst oral health and elementary school students had the best oral health (Table 4).

3.3. Plaque control record

Comparison of 16 children showed that the plaque control record dropped from $41.13 \pm 16.77\%$ to $35.31 \pm 13.11\%$. Male and school-age children had better results than female and preschool

Table 3
Correct rate by categories of 20 questions about oral health knowledge test before and after intervention

Categories	Preintervention	Postintervention	<i>p</i>
Tooth-cleaning habits (4, 8, 9, 11, 16, 20)	52.45 ± 18.41	83.82 ± 19.46	<0.001*
Knowledge of caries (5, 7, 10, 14, 15)	77.65 ± 20.16	90.59 ± 14.96	<0.001*
Dietary habits (3, 6, 12, 13)	84.56 ± 18.48	91.91 ± 19.19	0.09
Knowledge about change of teeth (1, 17, 18)	56.86 ± 27.86	91.18 ± 20.61	<0.001*
Periodical examination schedule (2, 19)	70.06 ± 28.05	94.12 ± 16.35	<0.001*

**p* < 0.05 was considered statistically significant after performing the paired *t*-test.

Table 4
Tooth decays and restoration among children aged 15 years and younger at Chongguang Tribe

Age (y)	No. of children	No. of children with caries	Caries prevalence (%)	Total no. of carious teeth	Total no. of carious teeth filled	Restorative rate (%)
3–6	11	9	81.82	68	18	20.93
7–12	26	16	61.54	53	87	62.14
13–15	11	8	72.73	35	42	54.55
Total	48	33	68.75	156	147	48.50

children. The results showed improvement, but it was not statistically significant (*p* = 0.118) (Table 5).

4. Discussion

The results of this study suggest that intervention with educational activities, including promotion of dental care knowledge and proper brushing methods, can enhance aboriginal tribal children's overall knowledge of dental care; however, additional follow-up is necessary to determine if there are long-term improvements in oral health.

Previous studies have shown that oral health education can enhance oral health knowledge and change oral health behaviors. For example, a study by Kuo and Wang in a Taichung City nursery school showed that there was a significant effect on children's caregivers' knowledge, attitudes, and behaviors if they were given oral-hygiene education [8]. Another study by Lan et al [9] in Kaohsiung County showed that the knowledge, attitude, and behavior of school children in primary school improved after intervention. The aforementioned studies were all performed in schools and focused on similar age groups. Our study was performed in a remote aboriginal tribe on children ranging from 3–15 years in age. In our study, educational intervention also improved the level of oral health care knowledge.

It seems that the educational intervention did not work very well for preschool children, as shown by the questionnaire results and plaque control scores. This may be because of their sweet-eating habit and parents' incorrect concepts about deciduous teeth care. First, we also used a diet habit questionnaire in our program. A higher rate of consumption of sweets was found for preschool children than that for school-age children. Second, preschool children were too young and powerless to care for their own teeth, and their parents did not have correct knowledge about the care of deciduous teeth. For example, only 2 of 11 parents of preschool children answered Question 9 correctly (properly trained by their parents, children aged 6 years and younger can brush teeth on their own). This shows that parents and caregivers should be aggressively educated on correct oral care concepts.

Educational intervention can enhance children's dental care knowledge and, hence, improve oral health. In our research, the plaque control record improved, but this was not statistically

Table 5
Dental plaque record (%) of 16 Truku aboriginals before and after oral care intervention

Item	No.	Preintervention	Postintervention	<i>p</i>
Sex				
Male	8	41.75 ± 18.84	31.50 ± 13.50	0.08
Female	8	40.50 ± 15.72	39.13 ± 12.37	0.78
Age (y)				
0–6	5	36.20 ± 13.70	36.80 ± 8.17	0.91
7–15	11	43.36 ± 18.15	34.64 ± 15.15	0.08
Total		41.13 ± 16.77	35.31 ± 13.11	0.118

significant ($p = 0.118$). This may have been the result of insufficient tested samples (16 of 67) or a need for more effort in improving oral health care behaviors, such as brushing teeth spontaneously, spending enough time for brushing teeth, reducing intake of sweets, and seeing a dentist regularly. Care of children's teeth requires continual supervision.

The scarcity of dental resources in remote areas is a long-lasting problem. Statistics from the Taiwan Dental Association show that dentists are generally needed in remote areas in Hualien and Taitung County [10]. Among the 10 remote townships, there is only a dentist for each 3 townships. In some areas, although there are dental clinics, they are mostly located in administrative centers and are quite distant from aboriginal tribes. For residents in these tribes, lack of sources of dental care knowledge and treatment for dental problems remains a serious issue, and improvement is not expected in the short term. Nevertheless, aggressive intervention with educational programs may be a feasible alternative.

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