

研究者：Kaung Myat Thwin

(所属：Department of Oral Health Promotion, Tokyo Medical and Dental University)

研究題目：Effectiveness of silver diamine fluoride (SDF) in arresting early childhood caries in Myanmar preschool children

Introduction：

Dental caries remains epidemic and is a major oral health problem in many developing countries. A previous study reported that the prevalence of dental caries in 3-4 years old children was 82.9% with mean dmft of 6.42 in Myanmar. Among the various methods to manage dental caries in children, topical application of silver diamine fluoride (SDF) has become the focus of attention because of its effectiveness, low cost and simplicity. SDF has been developed and used in Japan more than 50 years and now widely used in many countries. However, SDF has not been used much and no research on SDF has been conducted in Myanmar yet. The purposes of this study were to investigate the caries arresting effect of SDF on primary tooth surfaces, and to assess the effect of SDF on cariogenic bacteria among Myanmar children.

Materials and Methods：

A 6-month intervention study was conducted for 201 children in five preschools of Yangon city. The children were allocated to two groups；Group A received SDF and sodium fluoride (NaF) applications, and Group B received only NaF application.

A dentist and an assistant to help with conducted all the clinical oral examinations at baseline and 6-month follow-up. Four surfaces (labial, lingual, mesial, and distal) of anterior teeth and five surfaces (buccal, lingual, mesial, distal, and occlusal) of posterior teeth were assessed using a WHO-CPI probe and a dental mirror with a handheld light. The tooth was classified as sound, active caries, arrested caries, filled or missing.

After oral examination, the caries risk test was performed by using Dentocult[®] SM (Oral Care Co. Ltd., Japan) and Cariostat[®] (DENTSPLY-Sankin K.K. Co. Ltd., Japan) at baseline and at 6-month follow-up. The sampling procedures and incubation were performed according to the manufacturer's instruction.

SDF (38% , 44,800 ppm F) (Saforide, Toyo Seiyaku Kasei Co. Ltd., Osaka, Japan) and NaF (2% , 9,000 ppm F) (Bee Brand Medico Dental Co. Ltd., Osaka, Japan) were used for the intervention in this study. In Group A, SDF was first applied to enamel or dentine level carious surfaces with an applicator after cleaning teeth with a tooth brush, and then NaF to all sound tooth surfaces with a toothbrush. In Group B, NaF was applied to all tooth surfaces.

Results :

The prevalence of dental caries significantly increased from baseline to the 6-month follow-up in Groups A and B ($p=0.021$ and $p=0.049$). Both groups showed significant increases in dt ($p<0.001$ and $p=0.001$), dmft ($p<0.001$ and $p<0.001$) and dmfs ($p<0.001$ and $p=0.010$) at 6-month follow-up. On the other hand, no significant differences were found in mt and ft at 6-month follow-up compared with the baseline.

The debris scores significantly decreased from 1.92 ± 0.50 at baseline to 1.30 ± 0.53 at 6-month follow-up in Group A ($p<0.001$), and from 2.00 ± 0.42 to 1.69 ± 0.53 in Group B ($p<0.001$). A significantly higher debris score was observed in Group B than in Group A at 6-month follow-up ($p<0.001$) (Table 1).

In Group A, the overall mean number of arrested carious surfaces was 2.68 ± 2.76 , and the proportion of arrested carious surfaces was 72.0% at 6-month follow-up. The proportion of arrested carious surfaces in maxillary teeth was similar to that in mandibular teeth with approximately 70%. The proportion of arrested carious surfaces in anterior teeth (80.3%) was almost twice as high as posterior teeth (42.8%).

Table 2 shows the results of caries risk tests at baseline and 6-month follow-up in the two groups. In Group A, all caries risk scores were significantly decreased from baseline to 6-month follow-up. On the other hand, there were no significant changes in any caries risk tests between baseline and 6-month follow-up in Group B.

Table 1. Dentition status and debris score at baseline and 6-month follow-up in two groups

	Group A (n=134)			Group B (n=67)		
	Baseline	6 months	p-value	Baseline	6 months	p-value
Number of teeth	19.96 ± 0.19	19.98 ± 0.21	0.319	19.85 ± 0.58	19.96 ± 0.20	0.146
Caries prevalence	81.3%	87.3%	0.021	76.1%	81.4%	0.049
dt	5.16 ± 4.49	5.66 ± 4.55	<0.001	5.43 ± 4.65	5.94 ± 4.60	0.001
mt	0.01 ± 0.08	0.02 ± 0.11	0.319	0.03 ± 0.17	0.06 ± 0.21	0.321
ft	0.06 ± 0.43	0.08 ± 0.42	0.287	0.03 ± 0.17	0.07 ± 0.45	0.388
dmft	5.22 ± 4.59	5.76 ± 4.67	<0.001	5.49 ± 4.72	6.07 ± 4.76	<0.001
dmfs	10.82 ± 13.69	11.63 ± 13.9	<0.001	11.72 ± 11.94	12.42 ± 12.12	0.010
Debris score	1.92 ± 0.50	1.30 ± 0.53	<0.001	2.00 ± 0.42	1.69 ± 0.53	<0.001

Table 2. Results of caries risk tests at baseline and 6-month follow-up in two groups

	Group A (n=134)			Group B (n=67)		
	Baseline	6 months	p-value	Baseline	6 months	p-value
Dentocult [®] SM Plaque	0.95 ± 0.70	0.56 ± 0.51	<0.001	0.72 ± 0.66	0.71 ± 0.63	0.869
Dentocult [®] SM Tongue	0.76 ± 0.80	0.62 ± 0.57	0.005	0.60 ± 0.78	0.72 ± 0.79	0.184
Cariostat [®]	1.61 ± 0.81	1.37 ± 0.52	<0.001	1.39 ± 0.57	1.46 ± 0.53	0.267

Discussion :

Caries status worsened from baseline to 6-month in both groups of children. Although NaF was applied to all erupted sound teeth at baseline, newly erupted teeth without fluoride exposure or even teeth with fluoride exposure might develop caries during the six months. This result suggests that it is necessary to make further efforts to stop new caries occurring. The debris scores decreased after six months in both groups of children. This was probably partly because caregivers and children understood the importance of regular tooth brushing and mouth rinsing after meals for removal of dental plaque and debris, after receiving the oral health education.

A quite high proportion of carious surfaces was arrested after SDF application. High concentration of fluoride and silver ions from SDF form silver phosphate on tooth surfaces, and arrest caries progression. The effect of SDF on the anterior teeth was twice as large as on posterior teeth. The possible reason is that SDF application to anterior teeth is easy with no complicated surface morphologies and less likely to be affected by saliva contamination during the SDF application.

All caries risk test scores also decreased after six months in Group A, whereas no significant change was observed in Group B. Silver ions in SDF are also considered to be associated with the result. Silver ions can prevent biofilm formation by inhibiting DNA replication and disrupting the membrane transport function of cariogenic bacteria. It was concluded that SDF was effective not only in arresting carious lesions but also in diminishing the quantity of cariogenic bacteria present and the degree of acid production. Therefore, SDF application should be more utilized in children with early childhood caries especially in developing countries.

Presentations :

- ① Relationship between dental caries and oral health behaviors in Myanmar children

Kaung Myat Thwin, Takashi Zaitso, Masayuki Ueno, Yoko Kawaguchi

The 66th congress meeting of Japanese Society for Oral Health, Yamagata, Japan. (June 1-2, 2017)

- ② Effectiveness of silver diamine fluoride in arresting early childhood caries among Myanmar preschool children

Kaung Myat Thwin, Takashi Zaitso, Masayuki Ueno, Yoko Kawaguchi

The 9th Asian Conference of Oral Health Promotion for School Children, Siem Reap, Cambodia. (September 22-23, 2017)

- ③ Antibacterial and caries arresting effects of silver diamine fluoride in Myanmar preschool children

Kaung Myat Thwin, Takashi Zaitso, Masayuki Ueno, Yoko Kawaguchi

The 38th Myanmar Dental Conference, Yangon, Myanmar. (January 18-19, 2018)

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