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Impact of 24-month fluoride tablet program on children with disabilities in a non-fluoridated country

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ABSTRACT

The aim of this study was to evaluate the caries preventive effects of a school-based fluoride tablet program in children with disabilities. Two hundred and seventeen children with disabilities were divided into two groups: the intervention group (IG) ingested 1.0 mg fluoride tablet daily while the control group (CG) ingested a placebo. The initial oral examinations were conducted prior to fluoride intake and 24-month follow-up examinations were conducted to evaluate the effectiveness of fluoride tablet ingestion. The results from this study demonstrated significant reductions in the DMFT index (the sum of decayed, missing, and filled permanent teeth), 0.63, as well as the DMFS index (the sum of decayed, missing, and filled surfaces of the permanent dentition), 1.25, when compared with the CG. A statistically significant reduction in the DMFT index and DMFS index (30.42% and 36.84%, respectively) suggested an anti-cariogenic benefit to fluoride tablet administration. Greater caries reduction occurred on mesio-distal and bucco-lingual surfaces (53.27% and 52.57%, respectively). Fluoride tablets should be considered as a caries preventive strategy in school-based caries prevention programs for children with disabilities in fluoride deficient areas.

1. Introduction

Dental caries is the most common oral disease in children with disabilities. Medical, physical, social, or psychological disabilities often diminish children with disabilities' ability to perform oral hygiene adequately and to communicate their physical complaints accurately, thus reducing their access to oral health care (Huang et al., 2010; Liu et al., 2009, 2010).

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Martens et al. (2000) reported that among a population of disabled children with mental retardation, physical impairment, and learning disabilities, the children with better manual dexterity did not exhibit higher levels of oral hygiene or lower levels of plaque accumulation and the presence of calculus. Another survey in special schools indicated that children with disabilities' needs for treatment and preventive oral health care were 2.01 and 5.25 times higher than children without disabilities, respectively (Hennequin, Moysan, Jourdan, Dorin, & Nicolas, 2008). In Taiwan, children with disabilities have poorer oral health with a significantly elevated level of untreated caries and a lower number of filled teeth (Huang et al., 2010; Liu et al., 2009, 2010). Among 6–12 year-old Taiwanese children with disabilities, only 32.37% of decayed teeth were filled, which is lower than the general population (47.72%) (Chen & Huang, 2007; Liu et al., 2010).

One of the most effective and widely used methods to prevent and control dental caries is fluoride (Centers for Disease Control and Prevention, 2001). Taiwan is a non-fluoridated country with negligible fluoride concentrations in the drinking water (lower than 0.3 parts per million (ppm)). In addition, no systemic fluoride programs are being conducted, involving water, milk, or salt fluoridation. The literature reveals that only 9.84% of Taiwanese children with disabilities utilize fluoride varnish services (Weng, Kung, Tsai, Chiang, & Chiu, 2011). Although a topical fluoride swish program is currently being administered in the public schools in Taiwan, neither fluoride mouth-rinses nor dentifrice can be reliably used in children with disabilities who may not be able to swish or rinse adequately.

Fluoride tablets have many advantages. They can be measured precisely, easily administered via various means of delivery, and can provide both topical and systemic benefits (Aithal, Udupa, & Tandon, 1996; Rozier et al., 2010). Fluoride tablets are considered as a safe and economical strategy in preventing and controlling dental caries (D'Hoore & Van Nieuwenhuysen, 1992; O'Rourke, Attrill, & Holloway, 1988). In addition, fluoride tablets are recommended in preventing dental caries in people with special needs in areas where drinking water is deficient in fluoride (Glassman & Miller, 2003; Rozier et al., 2010).

Most school-based or community-based fluoride application programs in the world typically service ordinary populations, and few are tailored to accommodate the unique encumbrances of disabled populations. In Taiwan, a national school-based fluoride mouth-rinse program has been conducted for ordinary children in primary schools since 2000. The former results of a fluoride mouth-rinse program in Taiwan (not published) reported that 0.2% NaF fluoride mouth-rinse once a week is effective in reducing the incidence of new dental caries by 43.9% among ordinary children (Kuo, Chia, Wu, Chen, & Huang, 1997). However, the program did not include special schools for children with disabilities. A 3-year-long community-based study that evaluated the benefits of serving dietary sugar containing 1 mg sodium fluoride to 5–15 year-old children with mental disabilities, reported cariostatic benefits (42% reduction in the DMFS index) (Luoma et al., 1979). Another study conducted in Taiwan reported that fluoride tablets are effective in reducing the defs index (the sum of decayed, missing, and filled surfaces of the primary dentition) by 52.5% in pre-school children with cleft palate (Lin & Tsai, 2000). However, the sample size was limited to children receiving therapy at the pediatric and orthodontic clinics and did not include children with permanent teeth.

The literature does not provide any studies that examine the effectiveness of school-based fluoride tablet administration in Taiwanese special schools for children with a broad range of disabilities. Therefore, this study was designed to evaluate the caries preventive effectiveness of a school-based fluoride tablet program lasting 24 months for school age children with disabilities.

2. Materials and methods

2.1. Study population

This study was conducted from October 2006 to October 2008. There are 830 children with disabilities aged 6–12 years old in 18 special primary schools in Taiwan, who have mild/moderate, severe or profound disabilities including multiple disabilities, intellectual disabilities, or sensory disabilities. The disabilities were evaluated and certified by the Department of Health, Executive Yuan in charge of health in Taiwan. Six out of 18 principles of special primary schools who agreed to join this research program, and within those schools, 349 parents agreed to their children participating in this program. Six special primary schools were randomly selected as either a fluoride tablet group or a placebo group. Three fluoride tablet groups were intervention groups (IG) and 3 placebo groups were control groups (CG). Initially, the IG contained 163 students and the CG contained 186 students. The intervention and control groups received oral examinations before and at the end of the consecutive 24-month fluoride tablet administration. In addition, each caregiver/parent completed a questionnaire, and each participant passed a urine test at the beginning of the study and received and ingested one fluoride tablet at school each day during the school year. Sixty-three percent of students in the IG and 61% in the CG completed this program, we excluded children who did not complete the 24-month fluoride tablet administration.

2.2. Preparations before administering of fluoride tablet

The Human Experiment and Ethics Committees of Kaohsiung Medical University approved the study (Protocol number: KMUH-IRB-950125).

The risks and benefits of fluoride tablet ingestion, the school based fluoride tablet administration procedures, and contents of this study were explained and instructions were provided for parents or caregivers of the participating children