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Original Article

The effect of professional fluoride application program for preschool children in Taiwan: An analysis using the National Health Insurance Research Database (NHIRD)



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KEYWORDS

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Abstract *Background/Purpose:* Dental caries in primary dentition is a major public health problem in many countries, as well as Taiwan. The service of professional topical fluoride application for children under 5 years of age, performed twice a year by the BNHI in Taiwan through the “Preventive Dental Health Service for Children” plan, began in July 2004. The purpose of this study was to examine the effect and trend of professional topical fluoride application on dental utilization.

Materials and methods: The sample subjects were taken from the Normalized Million People File of 2010 in the National Health Insurance Research Database from 2000 to 2012, for the purpose of analyzing the status of the professional topical fluoride program. The main analysis included utilization of professional topical fluoride application, utilization of restorative treatment and utilization of endodontic therapy in children 1-to-5-years of age. The Cochran–Armitage trend test was used for statistical analysis.

Results: Professional topical fluoride utilization increased year upon year, particularly after 2012 ($P < .001$). There was a tendency to reduce the utilization of endodontic therapy ($P < .001$). The severity of dental caries (number of times receiving dental restoration or endodontic therapy) was decreased after professional topical fluoride application was performed ($P < .001$).

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Conclusion: Because the dental caries rate for preschool children in Taiwan remains high, it is beneficial to receive professional topical fluoride application for dental care, as this reduces the severity of dental caries and endodontic therapy needs.

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Introduction

Oral health is essential to an individual's general health and quality of life. The World Health Organization (WHO) established the goal of creating nationwide oral health care in 1979, with the theme of "Health for All". The plan was to make a 2000 Oral Health Goal where 50% of 5-to-6 year-old children were caries-free. For the year 2010, this goal was increased to 90%.¹ According to the WHO Global Oral Health Database, tooth decay affects an estimated 60–90% of schoolchildren and nearly 100% of adults worldwide.² An oral status survey of Taiwanese children under the age of 6 found that the caries prevalence rate was 60% in 3-year-old children, 75% in 4-year-old children, and 89% in 5-year-old children.³ These data show that the prevalence of dental caries in preschool children is higher than the standards set by the WHO. While the prevalence of dental caries has been in decline for the general population over the past decades, dental caries in primary dentition remains a prevalent public health care problem in many countries, including Taiwan. Dental caries is an infectious, multifactorial disease that can occur in very young children and possesses the ability to progress rapidly.^{4,5}

Widespread use of fluoride has been a major factor towards the decline in both the prevalence and severity of dental caries in economically developed countries. Community water fluoridation is the most feasible and cost-effective strategy for reaching entire communities. Water fluoridation has resulted in children experiencing 35% fewer decayed, missing and filled baby teeth, along with 26% fewer decayed, missing and filled permanent teeth. Fluoridation has also led to a 15% increase in the number of children having no decay in their baby teeth, while a 14% increase in children with no decay in their permanent teeth was also a result.⁶ Unfortunately, such an economical, safe and effective method to better monitor oral hygiene in Taiwan has not been put into use.

The Guideline on Fluoride Therapy, as revised by the American Academy of Pediatric Dentistry (AAPD), recommends professionally applied topical fluoride treatment as being efficacious in reducing caries in children who are at risk.⁷ Fluoride reduces the incidence of dental caries, while also slowing or reversing the progression of existing lesions. The role that fluoride containing products play in the prevention of dental caries has been reported in many studies, and has also been confirmed through systemic reviews and meta-analysis.^{8–10} Most studies have examined fluoride varnish efficacy in the permanent teeth of school-aged children, where the evidence exposing the benefits of applying fluoride varnish to permanent teeth is generally positive.¹¹ A Cochrane collaboration meta-analysis report

written by Marinho et al. (2002) estimated the pooled preventive fraction of fluoride varnishes in primary teeth to be 33% (95% CI:19–48%).¹² The use of fluoride varnish for inhibiting caries in primary teeth has increased because of its attractive safety properties, as compared to gels and foams.¹³

In view of the high rate of dental caries in children in Taiwan, the government, in order to improve the oral status of preschool children, offers a free service twice a year for children under 5 years of age. The Preventive Dental Health Service for Children program handled by the Bureau of National Health Insurance (BNHI) in Taiwan, began in July 2004. The Preventive Dental Health Service for Children includes oral examinations, oral hygiene instruction and professional fluoride application. The purpose of this study was to examine the effect and trend of a professional fluoride application program on dental caries in children.

Materials and methods

Study design and population

This study was a secondary data analysis that adopted a sample of one million beneficiaries who were retrieved from Taiwan's National Health Insurance Research Database (NHIRD) in 2010. Taiwan launched a single-payer National Health Insurance program on March 1, 1995, and by 2014, 99.9% of Taiwan's population was enrolled. All contracted institutions must file claims according to standard formats, which are later transformed into the NHIRD. The Longitudinal Health Insurance Database (LHID) 2010 contains all the original claims data of 1,000,000 beneficiaries enrolled in the year 2010, who were randomly sampled from the year 2010 Registry for Beneficiaries of the NHIRD. There the registration data of everyone who was a beneficiary of the National Health Insurance program during the period of January 1, 2010 to December 31, 2010 was drawn for random sampling. There were approximately 27.38 million individuals in this registry at the time. All the registration and claims data of these million individuals collected by the National Health Insurance program constituted the LHID2010. There was no significant difference in the gender and age distribution between the patients in the LHID2010 and the original NHIRD. Therefore, using the LHID to analyze their medical records will be representative of the significance.

Because all personal information was de-identified in the database to protect privacy, no informed consent was required. We selected children who were between 1-to-5

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