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Editorial

Prevention of dental caries through the use of fluoride – the WHO approach

Poul Erik Petersen and Hiroshi Ogawa

Dental caries continues to pose an important public health problem across the world. The World Health Organization (WHO) emphasizes that the disease affects about 60–90% of schoolchildren, the vast majority of adults and that dental caries contributes to an extensive loss of natural teeth in older people globally (Petersen, 2008a; WHO, 2016). Meanwhile, in most westernized high income countries, an improvement in dental health has taken place over the past three decades in parallel with the introduction of prevention-oriented oral health systems. A decline in the prevalence and the severity of dental caries is particularly observed in countries having established public health programmes using fluoride for dental caries prevention, coupled with changing living conditions, healthier lifestyles, and improved self-care practices. In Eastern Europe and Central Asia dental caries levels are high and with health systems in transition the exposure of the population to fluoride for disease prevention has diminished dramatically. In low and middle income countries of Africa, Asia, and Latin America the lack of preventive programmes is further complicated by the fact that these countries have a shortage of oral health personnel and the capacity of health systems is mostly limited to treatment of symptoms or emergency care. In children and adults suffering from severe tooth decay, teeth are often left untreated or they are extracted to relieve oral pain or discomfort. In the future, tooth loss and impaired quality of life are therefore expected to increase as a public health problem in many developing countries.

The current global and regional patterns of dental caries largely reflect distinct risk profiles of countries which relate to structure of society, living conditions, lifestyles, and the existence of preventive oral health systems (Kwan and Petersen, 2010). The socio-behavioural risk factors in dental caries are found universally and they play significant roles in children, adults and older people. The disease level is relatively high among underprivileged population groups, i.e. people with low education background, poor living conditions, people with poor dietary habits and high consumption of sugars, and people with limited tradition of dental care. Unless serious efforts are made to tackle the social inequity by modifying risk factors and by establishing effective caries prevention programmes, the level of dental caries in disadvantaged populations and countries will unduly increase (Kwan and Petersen, 2010). Evidently, substantial population groups in low and middle income countries have not yet obtained the health benefit from fluoride in community prevention programmes. The reasons for not having been able to implement prevention programmes varies in nature ranging from lack of national policy for oral health to low awareness of the importance of oral health.

Fluoride and prevention of dental caries

The major reasons for the burden of dental caries in countries relate to the high consumption of sugars and inadequate exposure to fluoride (WHO, 2010; 2015). The use of fluoride is a major breakthrough in public health. Controlled addition of fluoride to drinking water supplies in communities where fluoride concentration is below optimal levels to have a cariostatic effect began in the 1940s and since then extensive research has confirmed the successful reduction in dental caries in many countries. Industrial production of fluoridated salt started in Switzerland in 1955 and its use expanded to several countries in various parts of the world with similar success as water fluoridation. Milk fluoridation has also been reported to be successful in dental caries prevention, particularly among children, and schemes have been developed in countries around the globe based on integration with school health and nutrition programmes (Jürgensen and Petersen, 2013). As no effort is required from the individual for ingesting fluoridated water, salt or milk these methods have been designated as automatic systems for dental caries prevention. Fluoride in toothpaste has also been available for decades and it is considered a main contributor to the decline in dental caries observed among people of industrialized countries; unfortunately, toothpastes are not universally used due to the cost factor which inhibits poor population groups from accessing such preventive measure. Finally, fluoride has been made available in products for professional application, including gels, varnishes and restorative materials. Fluoride mouth rinses incorporated in school health programmes have also been available for decades with various degrees of success in caries prevention.

Correspondance to: Dr Poul Erik Petersen, ppe@euro.who.int, and Dr Hiroshi Ogawa, ogawah@who.int, WHO Oral Health Programme, 20 Avenue Appia, CH-1211 Geneva, Switzerland.

WHO policy on use of fluoride for prevention of dental caries

The use of fluoride for population based prevention of dental caries has been endorsed officially by WHO since the late 1960s. The policy on automatic administration of fluoride is emphasized by several World Health Assembly (WHA) Resolutions, i.e. WHA22.30 (1969) and WHA28.64 (1975) on fluoridation and dental health, and WHA31.50 (1978) on fluoride for prevention of dental caries. These previous statements particularly focused on the public health importance of water fluoridation. The most recent WHA resolution (WHA60.17, 2007) confirms the current WHO policy for promoting oral health and the approach of WHO Oral Health Programmes at global and regional levels. It emphasizes that oral disease intervention is a significant component of non-communicable disease prevention. The Resolution "Oral Health: Action Plan for Promotion and Integrated Disease Prevention" (Petersen, 2008b) urges Member States to ensure that populations benefit from appropriate use of fluoride. The item reads as follows:

> *(4) for those countries without access to optimal levels of fluoride, and which have not yet established systematic fluoridation programmes, to consider the development and implementation of fluoridation programmes, giving priority to equitable strategies such as the automatic administration of fluoride, for example, in drinking-water, salt or milk, and to the provision of affordable fluoride toothpaste.*

Various countries are in the process of developing fluoridation programmes while other countries are adjusting existing programmes. At global and regional levels the WHO provides advice and technical support on request to Member States for planning appropriate fluoridation schemes in agreement with socio-cultural conditions. Subsequent to the WHA60.17, WHO published in 2010 a document entitled "Inadequate or excess fluoride: a major public health concern" which describes the use of fluoride in a public health environment (WHO, 2010). Fluoride is most effective in dental caries prevention when a low level of fluoride is constantly maintained in the oral cavity. Meanwhile, there are some undesirable side-effects of excessive fluoride exposure. Experience has shown that it may not be possible to achieve effective fluoride-based caries prevention without some degree of mild enamel fluorosis, regardless of which methods are chosen to maintain a low level fluoride in the mouth. Public health administrators must therefore seek to maximize caries reduction while minimizing enamel fluorosis. It is important that fluoride exposure be known and health administrators be made aware of exposure before the introduction of any fluoridation or supplementation programmes for prevention and dental caries (WHO, 2014).

The Technical Report Series 846 (TRS846) on "Fluorides and Oral Health" (WHO, 1994) is the existing authoritative WHO publication offering advice and technical support to countries. The TRS846 has been widely used as a manual in planning of fluoride programmes by public health authorities and administrators of oral health programmes. In addition, the manual is used extensively by academic institutions, researchers, and oral health professionals. The TRS846 was published in 1994. Over the past two decades the emphasis on an evidence-based approach has grown significantly to advance policy and to apply sound interventions for public health. This initiative also applies to the request of updating the evidence on use of fluoride.

Evidence-based public health

The Randomized Controlled Trial (RCT) is considered essential for clinical research; although such a design is inadequate for evaluating the efficacy of public health interventions (Rychetnik et al., 2002). The RCT design may have relevance in measuring the effect of clinical interventions as the causal chain between the agent and the outcome is relatively short and simple. The causal chains in public health interventions are more complex, making RCT results inappropriate for systematic assessment of the performance and the impact of large-scale interventions. Community trials involve population groups under normal conditions in field settings and quasi-experimental designs, observational studies, and time-series evaluations are often the only feasible options; therefore such alternative approaches may well yield valid and generalizable evidence. Systematic reviews are essential tools for health care workers, researchers, consumers and policy makers who want to keep up with the evidence that is accumulating in their field. Consequently, such reviews are important to the validation of the benefit of the use of fluoride.

Fluoride and Oral Health

The present issue of Community Dental Health provides an important update of the scientific evidence on use of fluoride for prevention of dental caries. It examines the effect of fluoride from biological, clinical and public health perspectives. The document focuses on the presence of fluoride in the environment; fluoride metabolism and excretion; fluoride in teeth and bone; biomarkers of fluoride exposure; dental caries prevention and enamel fluorosis; fluoridated drinking water, salt and milk; topical use of fluoride, and fluoride-containing toothpaste. Based on the modern conception of evidence for public health the report emphasizes the effectiveness and appropriateness of different fluoride administration forms in communities and specifies the practical impact of implementation of combined administration of fluoride. This publication aims at summarizing the experiences from use of fluoride around the globe. Such update information is highly relevant to countries which are in process of introducing fluoride programmes or to those countries engaged in adjustment of programmes.

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