Evidence Based Approach to Exploring Fluoride

**Aims:** To provide an evidence based approach to exploring the effects of fluoride on dental health, the current recommendations for reducing dental decay and an overview of water fluoridation.

**Objectives:** On completion of this verifiable CPD article the participant will be able to demonstrate, through the completion of a questionnaire, the ability to:

- Identify some of national programmes and protocols the government have used to improve dental health
- Identify the ways in which fluoride interferes with the process of tooth decay
- Recognise that social economic status can affect caries incidence
- Identify the current recommendations by the Department of Health for reducing dental decay

**Introduction**

Fluoride is a naturally occurring mineral which is found in many foods and in some drinking water.¹ Fluoride interferes with the process of tooth decay known as dental caries. It has been suggested that dental caries used to be “the most common disease affecting mankind” and although it has “decreased in prevalence in the last 30 years it remains a major health problem for people of all ages.” ²

The Department of Health reported that although there has been a significant improvement in dental health in the last thirty years, and this is partly attributed to the introduction of fluoride toothpastes, there is still a disparity in oral health across the regions of England.³ This disparity is attributed to economic deprivation, social exclusion and cultural differences.

The government are committed to improving oral health across the nation through the implementation of a population approach by commissioning appropriate dental services to meet the needs of the population. Guidance has been provided to the primary care trusts and strategic health authorities in the form of national programmes and protocols such as Delivering Better Oral Health a Toolkit for Prevention, ⁴ Choosing Better Oral Health⁵ and Guidance of Fluoridation on Drinking Water.⁶

**Fluoride or Good Oral Hygiene**

Studies have been conducted to examine whether it is fluoride that affects caries incidence or if it is simply a case of better oral hygiene habits.
A small study conducted by Polk et al. in 2009 investigated if the socioeconomic status of adolescents affected caries incidence and to see if there was a correlation between oral hygiene habits and socioeconomic status that would account for this disparity. They found that socioeconomic status did affect the incidence of caries, but this could not be accounted for by the difference in their oral hygiene habits.\(^7\)

In 1989 Carmichael et al. found that caries incidence was higher in social classes IV and V and water fluoridation reduced social inequalities in dental caries prevalence.\(^8\) This was supported by Mc Donagh et al. in 2000 who conducted a systematic review of water fluoridation for the University of York and found that “water fluoridation does reduce caries prevalence”.\(^9\)

Therefore, it could be concluded that socioeconomic status does affect the incidence of caries and good oral hygiene habits do not generally reduce this disparity but water fluoridation can reduce the incidence of caries in lower socio economic groups regardless of oral hygiene habits.

**The Effects of Fluoride**

Fluoride interferes with the process of tooth decay in four ways:

- If children under the age of seven ingest fluoride it alters the structure of the developing enamel making it more resistant to decay.

- If fluoride is ingested during tooth development it can alter the structure of the enamel resulting in shallower fissures reducing the ability of plaque remaining undisturbed on the tooth surface.

- Low levels of fluoride in plaque and saliva encourage remineralisation gradually improving the strength of the enamel and its ability to resist acid attack.

- Fluoride reduces the ability of plaque bacteria to produce acid by inhibiting the function of some of the enzymes which are essential for the plaque bacteria to produce acid.\(^1\)

**Water Fluoridation**

The DOH (2007) reported in 2007 that approximately 10% of England’s population live in areas where the water fluoridation is either naturally or artificially at the optimum level for dental health.\(^10\)
In 2003 the water act was amended enabling strategic health authorities to order water companies to fluoridate water supplies providing there is support from the local population following public consultation. In 2005 a public consultation took place in Southampton to explore the feasibility and cost effectiveness of water fluoridation to help improve dental health in the city. The population of Southampton has a high level of tooth decay compared to the national average according to the dental health survey of children and young people (2003). The strategic health authority voted in favour of fluoridating the water supply and instructed Southern Water to fluoridate the local supply and this was expected to take place in 2010. However, written responses to the consultation resulted in 72% of respondents opposing the plans. This led to a legal battle and in February 2012 a high court judge ruled that the strategic health authority was not acting unlawfully in seeking to fluoridate the water. However, due to government changes the strategic health authority is due to be disbanded in March 2013 and currently the scheme to add fluoride to Southampton's water has not gone yet ahead.
For and Against Water Fluoridation

The British Fluoridation Society (BFS) suggest that studies and independent reviews of the relevant medical and scientific literature over many years have consistently failed to find evidence that water fluoridation has any effect on the health of the body other than reducing tooth decay.\textsuperscript{12}

The BFS published a resource called One in a Million aimed at informing primary care trusts, strategic health authorities and the public about the benefits of water fluoridation. It was reported that inequalities in dental health are still widespread in the UK and children living in the poorest non-fluoridated communities still continue to suffer from unacceptable high levels of decay.\textsuperscript{13} The BFS stated that “the link between poverty and tooth decay is well established in non-fluoridated areas but weaker in fluoridated areas.” \textsuperscript{12}

Fluoride Action Network is a very vocal organisation against fluoride and they state that “It is becoming increasingly clear, fluoridating water supplies is an outdated, unnecessary, and dangerous relic from a 1950s public health culture that viewed mass distribution of chemicals much differently than scientists do today.” \textsuperscript{14}

They believe that there are three core reasons that fluoride should not be added to our water these are:

- Fluoride is unnecessary and ineffective
- Fluoridation is an outdated form of mass medication
- Fluoridation is not safe practice\textsuperscript{14}

Current Recommendations

Dentifrices (Toothpastes)

The Department Of Health recommends all children and young adults brush twice daily using fluoridated toothpaste and this should contain between 1,350ppm and 1500ppm fluoride. They recommend that brushing should be carried out at night and at one other occasion during the day. After brushing they should spit out without rinsing.\textsuperscript{4}

This is supported by a study conducted by Chestnutt et al. in 1998 who noted that “Toothbrushing frequency and rinsing method after brushing were found to be strongly correlated with caries experience”.\textsuperscript{13}

Davies et al. reported that there were three factors that were important when considering fluoride toothpastes efficacy:

- The frequency of brushing
- The fluoride concentration of the toothpaste
- The way in which the participant rinsed following brushing.\textsuperscript{15}
It was suggested that to maximise efficacy, fluoride toothpaste of 1,500ppm should be used, and rinsing with large volumes of water after brushing should be discouraged. This regime was supported by Marinho et al. in a systematic review of fluoride toothpastes for the prevention of dental caries in children and adolescents and it was found that “regular use of fluoride toothpaste is associated with a clear reduction in caries increment.”16

**Mouthwashes**

The Department Of Health recommends that fluoride rinses can be prescribed for patients over the age of 8 years and should be used at a different time to toothbrushing to maximise the topical effect of the fluoride; however, patient compliance is required. 4

This is supported by a study conducted by Zero et al. to examine the relationship between fluoride retention in the mouth and the clinical efficacy of fluoride products used in the home. They concluded that the time of application of fluoride mouthwashes was an important factor in levels of fluoride found in the mouth. 17

**Topical Application of Fluoride**

The Department Of Health indicates that fluoride varnish can be prescribed if patients live in a non-fluoridated drinking water area and evidence suggests it should be applied twice yearly or 3/4 times yearly in high risk groups. 4

This is supported by Marinho et al. who conducted a systematic review of fluoride varnishes for preventing dental caries in children and adolescents. 18

The application of fluoride varnish is simple and requires minimal training, care should be taken to only apply small quantities of the varnish to teeth and contraindications should be examined before application is carried out.4

**Dental Nurse Involvement**

Although the dentist still remains the only clinician to diagnose dental disease the scope of practice published by the General Dental Council in 2009 goes some way to looking at the issue of extended roles for DCPs in areas such as fluoride application. 19 Davies et al. concluded that appropriately trained dental nurses can be trained to apply fluoride varnish to patients’ teeth.20

The scope of practice outlines the additional skills that dental nurses can perform if they are appropriately trained and these skills include:

- Oral health education and promotion
- Skills in assisting with the treatment of patients with special needs
- The application of fluoride varnish during a programme which is overseen by a consultant in public dental health.19

All of these skills would enable a dental nurse to be an active team member in a programme aimed at increasing fluoride availability. Good quality data which
identifies areas of high levels of disease should be used to target specific areas giving dental nurses the opportunity to be involved with research.

Dental nurses with extended skills should be encouraged to work in a variety of environments collaborating with primary healthcare personnel, practice nurses, health visitors and teachers. Dental nurses could work at engaging and working with contacts in local communities and be more involved with the planning of local services.

Conclusion

This article has outlined the important role of fluoride in the prevention of dental caries and the government’s commitment to increasing fluoride availability for the nation. Significant evidence has outlined the role of fluoride in improving dental health in areas of social inequality.

However, the issue of public approval of water fluoridation has been highlighted and this could be explored further.

The use of fluoride dentifrices and not rinsing following toothbrushing to reduce caries incidence has been explored and is found to have a strong correlation to a reduction in caries experience.\(^{16}\)

Mouthwashes and the topical application of fluoride varnish have been suggested to provide a useful adjunct to improve fluoride availability. It has been suggested that the developing role of dental nurses and their ability to collaborate with other health care workers could contribute to increasing fluoride availability and the overall promotion of oral health.

Recap:

- Brush twice a day using a fluoridated toothpaste of at least 1,350 ppm\(^4\)
- Spit out after brushing do not rinse with water\(^4\)
- If you use a fluoride mouthwash use it at a different time to brushing\(^4\)
- Visit your dentist regularly

Portfolio tip

New non-verifiable CPD is available now to allow you to explore the subject of fluoride further.

Don’t forget to log the hours you spend reading into your non-verifiable CPD log

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References