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# NZ dentists' views on community water fluoridation in 2019

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## Abstract

**Objective:** To determine New Zealand general dental practitioners' support for community water fluoridation (CWF), and to gauge their opinions on its possible side-effects.

**Methods:** An online survey was conducted in 2019, involving the 800 general dental practitioners who had email addresses on the Dental Register. A total of 218 dentists (30.0%) responded.

**Results:** Most practitioners (84.2%) reported still supporting community water fluoridation; the other 15.8% either were unsure or did not support it. Higher proportions of more recent graduates supported CWF. Some 91.3% of practitioners agreed that drinking fluoridated water was a harmless way to prevent dental caries, but 3.1% felt that fluoridated water may cause other health problems. There were no systematic differences by sociodemographic and practice characteristics, although a higher proportion of males and more experienced practitioners reported being confident in discussing CWF-related issues.

**Conclusions:** Most New Zealand dentists continue to support community water fluoridation and still consider it to be a safe and effective way to prevent dental caries, although concerns about enamel defects still persist.

## Introduction

Fluoride is present in most natural waters at subtherapeutic levels to some extent (Cheng, 2007). The implementation of community water fluoridation (CWF) and the introduction of fluoride dentifrices have contributed to a significant decline in dental caries (Walsh et al, 2019). The prevalence and severity of dental caries have been falling since the late 1970s, a decline that was first observed in the USA and Western and Nordic European countries (Lagerweij and van Loveren, 2015). Dental caries, however, remains the most prevalent chronic condition affecting adults and can have profound effects on quality of life (Kandelman et al, 2008; Lawrence et al, 2008).

The most recent New Zealand Oral Health survey showed considerable improvements over the past 20 to 30 years, but that dental caries remains highly prevalent (Ministry of Health, 2010). The mean permanent dentition caries increment is one newly affected surface per year irrespective of age (Thomson, 2004). Decreasing rates of edentulism among New Zealanders mean that there are more people (and surfaces) at risk than ever before (Thomson, 2012).

CWF is the controlled addition of fluoride ions to public drinking water. It has been shown to substantially reduce the rate of caries in both children and adults (Rugg-Gunn and Do, 2012). In New Zealand, fluoride occurs naturally in the water at less than 0.2 parts per million [ppm, equivalent to 0.2 mg/L]. Currently, the NZ Ministry of Health recommends adjusting fluoride levels to between 0.7 and 1.0 ppm (Ministry of Health, 2018). CWF is not a cure for dental caries, but those living in fluoridated areas experience less cumulative lifetime decay than those living in non-fluoridated areas (Slade et al, 2013). Ongoing exposure to the fluoride ion at low concentration and high frequency is the most rational, effective and efficient way to obtain its benefits, which are largely topical. Along with the daily use of fluoride dentifrices, fluoridation is an effective addition to caries-prevention efforts (Coop et al, 2009).

The promotion and implementation of CWF remains a cornerstone of dental public health efforts to improve the health of New Zealanders. Although health officials across all sectors understand that fluoridation is important for communities (Fawthorpe, 2012), it remains highly contentious among some of the general population. The use of misinformation and rhetoric to induce doubt in the minds of the public and government officials is on the rise (Armfield, 2007). Dental practitioners remain key advocates in promoting it and are often consulted—whether formally or informally—to give advice to decision-makers or the public about CWF (Melbye, 2013). Knowing the level of support (or otherwise) for CWF among dentists is critical to understanding how CWF is perceived and promoted at an individual and population level. Grant et al (2013) found that the great majority of New Zealand dentists support CWF and this was especially so in those who had recently graduated. A small proportion of practitioners felt that fluoridated water does not impact dental caries and may cause other health problems. Similar findings were reported by Tsurumoto et al (1998) from a survey of Australian dental practitioners. The aim of this study was to update the New Zealand general dentists' support for community water fluoridation (CWF), and to gauge their beliefs about possible systemic side-effects.

## Methods

Category B ethical approval was obtained from the Human Ethics Committee at the University of Otago prior to the distribution of the questionnaire. An email survey of actively-practising general (non-specialist) dental practitioners (GDPs) was conducted in May 2019.

The sampling frame was the 2019 Dental Register maintained by the Dental Council of New Zealand, and all GDPs with contactable email addresses were eligible. Those without a current annual practising certificate or a registration in an additional scope were excluded. A specifically-designed online questionnaire was designed and hosted on Qualtrics<sup>1</sup>. A simple random sample of 800 GDPs was generated; 73 had non-valid email addresses and “bounced” immediately, and 727 were contactable. Of those, 218 responded to the survey, giving it a response rate of 30.0%; 196 dentists answered the section on water fluoridation.

Participants were asked the same two questions from the Grant et al (2013) survey: ‘Do you support community water fluoridation?’ and ‘How confident do you feel in discussing water fluoridation issues with patients?’ They were then given a series of statements relating to CWF and its effects on dental caries, IQ, bone cancer, hip fractures, and other systemic problems and asked to rate each statement according to their opinion. The response options included but were limited to ‘strongly disagree’, ‘disagree’, ‘neither agree nor disagree’, ‘agree’, or ‘strongly agree’. Participants had the option to comment below each question.

The CWF-related questions were part of a larger survey which also sought demographic information. A cover letter explaining the purpose of the survey (along with a link to the online questionnaire) was emailed to all contactable GDPs on May 3, 2019. To encourage participation, incentives were offered in the form of two random draws for supermarket vouchers. Non-respondents were followed up three and six weeks later with a new cover letter and the questionnaire. Data collection ceased at the end of July 3, 2019.

Data were analysed using the statistical package for the Social Sciences (SPSS). Computation was performed using cross-tabulations and Chi-square tests. The level of significance was set at  $p < 0.05$ .

## Results

Of the 800 dentists in the sample, 780 were contactable by email. Some 196 (25.1%) of contactable dentists answered the questions about CWF. The majority agreed that brushing with a fluoride toothpaste helps to prevent dental caries, and the great majority believed that drinking fluoridated water helps to prevent dental caries (Table 1). Of the questions presented, drinking fluoridated water may cause bone cancer had the lowest response rate.

Overall, 94.9% of respondents supported CWF (Table 2). This tended to be higher among more recent graduates. When asked about their confidence in discussing CWF with patients, a higher proportion of males (than females) reported being very confident. Considerable differences were observed by the number of years since graduation, with a higher proportion of recent graduates not being very confident. Dentists located in towns were more confident than those in cities.

Table 3 summarises dentists’ beliefs on fluoride and caries prevention. The only difference by dentist characteristics was that a smaller proportion of those with 31+ years since graduation believed that drinking fluoridated water helps prevent caries. While 91.3% of respondents believed that drinking fluoridated water prevents caries, only 88.3% believed it was a harmless way to prevent caries.

Concerns about the adverse effects of CWF (Table 4) showed that around half believed that CWF may cause dental fluorosis. A very small proportion believed that CWF may cause consequences such as bone cancer, hip fractures, lowered intelligence or other health problems. This proportion had no noteworthy differences by sex, years since graduation, practice location and practice type.

## Discussion

This study set out to investigate the level of support for community water fluoridation (CWF) among New Zealand general dental practitioners, along with their beliefs surrounding possible side-effects. It found that the great majority continue to support CWF. That proportion remains higher among more recent graduates. Those in

**Table 1.** Responses to fluoride statements (brackets contain percentages)

	Number of responses	Disagree/neutral	Agree/strongly agree
<b>The benefits of fluoride</b>			
Brushing teeth with a fluoride toothpaste helps to prevent caries	195 (99.5)	11 (5.6)	184 (93.9)
Drinking fluoridated water (0.7-0.8ppmF) helps prevent caries	196 (100.0)	17 (8.7)	179 (91.3)
<b>Fluoride safety</b>			
Using fluoridated water is a harmless way to prevent caries	196 (100.0)	23 (11.7)	173 (88.3)
Drinking fluoridated water may cause dental fluorosis	195 (99.5)	115 (58.7)	80 (40.8)
Drinking fluoridated water may cause bone cancer	194 (99.0)	193 (98.5)	1 (0.5)
Drinking fluoridated water may cause hip fractures	196 (100.0)	194 (99.0)	2 (1.0)
Drinking fluoridated water may affect Intelligence	196 (100.0)	194 (99.0)	2 (1.0)
Drinking fluoridated water may cause other health problems	195 (99.5)	189 (96.4)	6 (3.1)



practice >10 years reported being more confident about discussing CWF with patients than their recent graduate counterparts. There remains a small proportion of practitioners who feel that consumption of fluoridated water may cause other health and development problems, and they also believed that it does not prevent dental caries.

It is appropriate to consider the weaknesses and strengths of the study before discussing its findings. The response rate was lower than is desirable by modern standards, and was less than the 43.3% obtained by Grant et al (2013). Our simple random sample survey did target fewer participants than in 2010. It is possible,

**Table 2.** Support for water fluoridation and confidence in discussing it, by dentist characteristics (brackets contain percentages)

	Support water fluoridation	Very confident in discussing water fluoridation with patients
Sex		
Male	120 (94.5)	63 (50.4)
Female	65 (95.6)	28 (41.2)
No of years since graduation		
1 to 10	51 (98.1)	13 (25.0)
11 to 20	26 (96.3)	17 (63.0)
21 to 30	36 (97.3)	17 (45.9)
31 or more	73 (91.3)	44 (56.4)
Location of practice		
Big city	100 (97.1)	46 (45.1)
Provincial city	53 (93.0)	24 (42.9)
Town	33 (91.7)	21 (58.3)
Practice Type		
Normal	146 (93.6)	77 (49.7)
Corporate-owned	25(100.0)	9 (37.5)
Institutional	186 (94.9)	5 (33.3)
All combined	186 (94.9)	91 (46.9)

**Table 3.** Beliefs about fluoride and caries prevention, by dentist characteristics (brackets contain percentages)

	Brushing with a fluoride toothpaste helps to prevent caries	Drinking fluoridated water helps prevent caries	Drinking fluoridated water is a harmless way to prevent caries
Sex			
Male	119 (94.4)	117 (92.1)	112 (88.2)
Female	64 (94.1)	61 (89.7)	60 (88.2)
No of years since graduation			
1 to 10	50 (98.0)	50 (96.2)	48 (92.3)
11 to 20	25 (92.6)	25 (92.6)	24 (88.9)
21 to 30	35 (94.6)	36 (97.3)	33 (89.2)
31 or more	74 (92.5)	68 (85.0)	68 (85.0)
Location of practice			
Big city	97 (95.1)	97 (94.2)	96 (93.2)
Provincial city	54 (94.7)	50 (87.7)	48 (84.2)
Town	33 (91.7)	32 (88.9)	29 (80.6)
Practice Type			
Normal	148 (95.5)	146 (93.6)	139 (89.1)
Corporate-owned	22 (88.0)	19 (76.0)	21 (84.0)
Institutional	14 (93.3)	14 (93.3)	13 (86.7)
All Combined	184 (94.4)	179 (91.3)	173 (88.3)

as Locker (2000) has suggested, that responders and non-responders differed in important ways. Accordingly, we determined the extent of this: the proportion of female respondents was similar to that in the GDP source population (Broadbent, 2016) but the responding sample had all been in practice for longer, on average. It also may be that this current investigation over-estimated the proportion supporting CWF because those who do so are more likely to have found the survey topic attractive and so took part; alternatively, it may be that the proportion opposed to it is overestimated because they wanted to make a point. The differences in response rates mean that the comparison of findings from the two surveys could be impacted. The earlier survey did face a poor response rate too, but not as marked as this one. Notwithstanding these considerations, there is no actual way of determining the extent of any of these associated biases.

This study used the Qualtrics<sup>SM</sup> survey platform, an improvement on the previously used method. However, similar problems were encountered with the electronic survey approach. First, there were a number of typographical errors in the DCNZ's Dental Register (from which the sample was drawn); second, some of the email addresses were not valid, and not every dentist on the Register had one. There were also problems with the small number of practitioners who used a common practice email address; in those situations, where no alternative email address could be determined (by consulting the NZDA membership list), only one dentist from that practice could be selected. Among the study's strengths is the following up of the same source population from 2010 and its ability to provide current information on dentists' beliefs about CWF and whether those have changed in meaningful ways.

Overall, the data show that most New Zealand GDPs support CWF and believe it to be a harmless and efficacious method for preventing dental caries in the population. However, the risk of dental fluorosis remains of concern. New longitudinal research indicates that developmental defects of enamel (manifesting as mild diffuse opacities) do fade over time (through ongoing remineralisation by oral fluids) (Wong et al, 2016; Do et al, 2016) which is a concern generally outweighed by lower dental caries incidence in children and adults residing in areas with CWF (Griffin et al, 2007; Schluter et al, 2008; Ministry of Health, 2010; Kamel et al, 2013). The trade-off between tooth decay (which does not fade) and the minimal aesthetic impact of diffuse opacities (which do) is a worthwhile one (Thomson, 2013).

Similar to that observed in Grant et al (2013), a small proportion of dental practitioners seem to hold contrary views on CWF. Those opposed to CWF tend to trivialise positive findings, to misinterpret epidemiological data, and to discredit scientists and the various health bodies which support CWF (Armfield, 2007). Owing to concerns about the respondent burden, the current investigation did not explore aspects such as the sources of dentists' information on public health issues such as CWF, their participation in formal or informal networks or the impact of opposition campaigns on them or their patient's views. Further investigation of these aspects would be beneficial.

These findings and the similarities to the findings of Grant et al (2013) support the case for improving dentists' awareness of CWF-related issues, and for improving their skills and confidence in discussing such issues with patients and the general public. The viability of a CPD-related course was not explored in this study, but the potential for its benefit is apparent from the current findings.

**Table 4.** Beliefs about the adverse health effects of drinking fluoridated water, by dentist characteristics (brackets contain percentages)

	Dental fluorosis	Bone cancer	Hip fractures	Drinking fluoridated water may affect intelligence	Other systemic health problems
<b>Sex</b>					
Male	52 (40.9)	0 (0.0)	1 (0.8)	2 (1.6)	2 (1.6)
Female	28 (41.8)	1 (1.5)	1 (1.5)	0 (0.0)	4 (5.9)
<b>No of years since graduation</b>					
1 to 10	20 (38.5)	0 (0.0)	1 (1.9)	1 (1.9)	1 (2.0)
11 to 20	10 (37.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
21 to 30	12 (33.3)	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.7)
31 or more	38 (47.5)	1 (1.3)	1 (1.3)	1 (1.3)	4 (5.0)
<b>Location of practice</b>					
Big city	43 (42.2)	1 (1.0)	1 (1.0)	1 (1.0)	2 (2.0)
Provincial city	22 (38.6)	0 (0.0)	1 (1.8)	1 (1.8)	3 (5.3)
Town	15 (41.7)	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.8)
<b>Practice Type</b>					
Normal	61 (39.4)	0 (0.0)	2 (1.3)	2 (1.3)	4 (2.6)
Corporate-owned	11 (44.0)	1 (4.2)	0 (0.0)	0 (0.0)	2 (8.0)
Institutional	8 (53.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
All combined	80 (41.0)	1 (0.5)	2 (1.0)	2 (1.0)	6 (3.1)



In conclusion, of those New Zealand dentists responding to the survey, the majority continue to support community water fluoridation and still consider it a safe and effective way to prevent dental caries. Confidence by these respondents in discussing CWF with patients is lower than might be expected, and concerns about the effect of CWF producing enamel

defects persist. A small proportion of the respondents still believe CWF is harmful and does not prevent caries. It is imperative that the profession and public health authorities to continue to monitor the understanding of CWF by health practitioners to determine where effort might be expended in establishing future professional development programmes.

## References

- Armfield J (2007). When public action undermines public health: a critical examination of anti-fluoridationist literature. *Aust N Z Health Policy*. 4: 25.
- Broadbent JM (2016). Dental Council Workforce Analysis 2011-2012. *New Zealand Dental Council*. 1: 5-11 (Updated 2013-2015).
- Cheng K K, Chalmers I, Sheldon TA (2007). Adding fluoride to water supplies. *BMJ* (Clinical research ed.) 335: 699-702.
- Coop C, Fitzgerald AC, Whyman RA, Lethaby A, Beatson E, Caddie C, Drummond BK, Hegan B, Jennings D, Koopu PI, Lee JM, Thomson WM (2009). Summary of guidance for the use of fluorides. *N Z Dent J*. 205: 135-137.
- Do L, Ha D, Spencer A (2016). Natural history and long-term impact of dental fluorosis: a prospective cohort study. *Med J Australia*. 204: 25-25
- Fawthorpe L (2012). The knowledge, attitude and confidence of health officials in communicating fluoridation information. *Regional Public Health NZ*: 4-30
- Grant M, Dawson SK, Thomson WM (2013). New Zealand dentists' views on community water fluoridation. *NZ Dent J*. 109: 69-73.
- Griffin SO, Regnier E, Griffin PM, Huntley V (2007) Effectiveness of fluoride in preventing caries in adults. *J Dent Res*. 86: 410-415.
- Kamel MS, Thomson WM, Drummond BK (2013). Fluoridation and dental caries severity in young children treated under general anaesthesia: an analysis of treatment records in a 10-year case series. *Community Dent Health*. 30: 15-18.
- Kandelman D, Petersen PE, Ueda H (2008). Oral health, general health, and quality of life in older people (2008). *Spec Care Dent*. 28: 224-36.
- Lagerweij MD, van Loveren C (2015). Declining Caries Trends: Are We Satisfied?. *Curr Oral Health Rep*. 2: 212-217.
- Lawrence HP, Thomson WM, Broadbent JM, Poulton R (2008). Oral health-related quality of life in a birth cohort of 32-year olds. *Community Dent Oral Epidemiol*. 36: 305-16.
- Locker D (2000). Response and non-response bias in oral health surveys. *J Public Health Dent* 60: 72-81.
- Melbye M, Armfield J (2013). The dentist's role in promoting community water fluoridation: A call to action for dentists and educators. *J Am Dent Assoc*. 144: 65-73.
- Ministry of Health (2010). *Our oral health: key findings of the 2009 New Zealand Oral Health Survey*. Wellington: Ministry of Health.
- Ministry of Health (2018). Fluoride and oral health. Available at: <https://www.health.govt.nz/our-work/preventative-health-wellness/fluoride-and-oral-health>
- Rugg-Gunn AJ, Do L (2012). Effectiveness of water fluoridation in caries prevention. *Community Dent Oral Epidemiol*. 40: 55-64.
- Slade GD, Sanders AE, Do L, Roberts-Thomson K, Spencer AJ (2013). Effects of fluoridated drinking water on dental caries in Australian adults. *J Dent Res*. 92: 376-82.
- Schluter PJ, Kanagaratnam S, Durward CS, Mahood R. (2008). Prevalence of enamel defects and dental caries among 9-year-old Auckland children. *N Z Dent J*. 104: 145-152.
- Thomson WM (2004). Dental caries experience in older people over time: what can the large cohort studies tell us? *Br Dent J*. 196: 89-92.
- Thomson WM (2012). Monitoring Edentulism in Older New Zealand Adults over Two Decades: A Review and Commentary. *Int J Dent*. 2012: 1-4.
- Thomson WM (2013) New Zealand drinking water should be fluoridated—the 'yes' case. *J Prim Health Care*. 5(4): 330-332
- Tsurumoto A, Wright FC, Kitamura T, Fukushima M, Campain AC, Morgan MV (1998). Cross-cultural comparison of attitudes and opinions on fluorides and fluoridation between Australia and Japan. *Community Dent Oral Epidemiol*. 26: 182-193.
- Walsh T, Worthington H, Glenny A, Marinho V, Jeronic A (2019). Fluoride toothpastes of different concentrations for preventing dental caries. *Cochrane Database of Systematic Reviews*.
- Wong HM, Wen YF, King NM, McGrath CP (2016). Longitudinal Changes in Developmental Defects of Enamel. *Community Dent Oral Epidemiol*. 44: 255-62.

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