

Parental support for water fluoridation in Lithgow, New South Wales

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ABSTRACT

Background: The objective of this paper was to report on the level of support for water fluoridation among parents of primary school children in Lithgow and on the socio-demographic and oral health factors that may have influenced this support.

Methods: As part of a survey in Lithgow of the oral health status of school children, their parents were asked to complete an oral health-related questionnaire. Questions on support for fluoridation and socio-demographics were included. Descriptive statistics and logistic regression analysis were used to examine associations between variables.

Results: Seventy per cent of the responding parents supported water fluoridation. However, this support was significantly higher among those from a higher socio-economic background. Nearly half the parents thought that health authorities or the government should take on the responsibility for matters related to water fluoridation. No statistically significant differences in caries experience were observed amongst children whether or not their parents supported fluoridation, except for 5–6 year olds ($p < 0.01$).

Conclusions: Lithgow parents strongly supported the introduction of water fluoridation but suggested that governments and health authorities should adopt a more proactive role in relation to fluoridation implementation.

Keywords: Attitudes, caries, prevention, support, water fluoridation.

Abbreviation: SiC = Significance Caries Index.

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INTRODUCTION

The prevalence of dental caries has declined over time among children in most industrialized countries.^{1,2} Declining trends in caries experience can be attributed to increases in the use of fluorides, improved oral hygiene, and a decrease in the frequency of sugar intake.³ As early as 1958, the World Health Organization (WHO) recognized the importance of water fluoridation and has repeatedly endorsed it as a sound public health policy in reducing the risk of dental caries.⁴ Water fluoridation reaches the entire community across all social strata and age groups.^{2,5} However, the role of community participation in the decision to fluoridate and the legislative framework for its implementation varies throughout the world. As an example, water fluoridation is mandatory in Singapore and Ireland.⁶ In the United States there is no federal legislation on fluoridation and the decision depends on each individual state.⁶

In New South Wales (NSW), under the *Fluoridation of Public Water Supplies Act 1957*, the responsibility

to implement fluoridation rests with local government authorities who manage water supplies. However, under the *Area Health Services Act 1997*, Area Health Services have a general responsibility to promote, protect and maintain the health of the community. In 2006, 100% of metropolitan Sydney was fluoridated but only 59% of those living elsewhere in NSW had such access.⁷ In an effort to promote the further uptake of fluoridation, the NSW state government increased the capital subsidy in 2004 from 50% to 100% for the new fluoridation plant. Since 2004, efforts by NSW Health in partnership with Area Health Services, the Australian Dental Association and local governments has resulted in 94% of the NSW population having access to fluoridated water.⁸ Despite advocacy on the part of government and international health and scientific agencies for water fluoridation, its effectiveness in reducing dental caries risk and safety has been questioned by opponents of fluoridation.⁹ One of the common tactics is to circulate disinformation through the media which may sway public and political support for this public health intervention.

In 2005, the Lithgow Local Government Area (LGA) was the only area within the boundary of the Sydney West Area Health Service that remained unfluoridated (Sivaneswaran S, written communication, November 2005). The Centre for Oral Health Strategy (NSW Health) commissioned the University of Sydney to undertake a baseline survey of the oral health of primary school children residing in the Lithgow LGA in order to provide data to assist the local council in their deliberations and allow future monitoring of any changes in caries rates. As part of the survey, information was sought from parents regarding their support for the fluoridation proposal. This paper reports on the level of support for water fluoridation among parents of primary school children in Lithgow and on the socio-demographic and oral health factors that may have influenced this support.

MATERIALS AND METHODS

All school principals in the Lithgow LGA were approached by a letter of invitation to take part in the survey and all agreed to do so. The parents of all primary school children were then invited to take part in the dental survey via a take-home information pack containing: (a) an information statement; (b) a consent form; and (c) a questionnaire. The questionnaire asked the parents:

- Would you be in favour of adding fluoride to your water supply to try and prevent tooth decay?
- Who do you believe will benefit from water fluoridation?
- Who should decide on the fluoridation of water supplies?

In addition, socio-demographic data were also collected for the purpose of modelling the community support for fluoridation. Weekly reminder notices about the dental examination were sent for four weeks via school newsletters and children with parental consent were examined. Those who were absent on the examination day were given alternate dates for the dental examination and return of the questionnaire. The diagnostic criteria for dental caries were according to WHO guidelines, whereby a decayed tooth is defined as a cavity extending into the dentine.

Caries experience is often represented as the mean number of teeth that are decayed, missing due to decay (extracted), or filled due to decay; termed dmft in the deciduous dentition. Although the mean dmft scores provide a good summary statistic for dental caries experience for a population, it hides those individuals that carry the major burden of dental disease. The Significance Caries Index (SiC) was designed to bring attention to those individuals who have considerable caries experience, and is the mean dmft of the 30% of the population with the highest caries scores.^{10,11}

A modified version of this index, the SiC₁₀ is the mean dmft of the highest centile of any study population.¹²

Statistical analysis was undertaken using EpiInfo (Version 3.3.2 copyright by Centers for Disease Control and Prevention, Atlanta, USA). Chi-square tests were used to assess categorical data comparisons and modelling was conducted using multivariate logistic regression analyses. The estimated residential population at 30 June 2006 of 5–12-year-old children in Lithgow was used to calculate sampling weights for each child.¹³ These weights were applied when calculating age-specific indices to produce estimates that were representative of 5–12-year-old children in Lithgow. Comparisons between the mean dmft, SiC and SiC₁₀ were tested for significance using the non-parametric method (Kruskal-Wallis).

RESULTS

Of the 1592 parents contacted, 703 (44%) gave parental consent for their children to be examined and completed a questionnaire at home. Seventy per cent (n = 495) of the responding parents supported water fluoridation, 9% (n = 63) were against fluoridation and 21% (n = 145) were unsure.

Of those parents who supported fluoridation, 93% (n = 459) believed that fluoridation would reduce decay in both children and adults, only 7% (n = 36) of parents believed that fluoridation would only benefit children. Table 1 shows socio-economic status was significantly associated with support for water fluoridation. For example, males with higher levels of education, families with private health insurance, households with higher incomes and a mother with a professional occupation were more likely to report benefits from fluoridation. In addition, fathers born in Australia and with higher levels of education also offered positive support. Variables which were not statistically significant were age of male parent, occupation of the male parent, country of birth of female parent and education level of female parent.

In the multivariable logistic regression analysis females aged over 40 years had twice the odds of favouring water fluoridation, compared to the reference group, 20–29 year olds (Table 2). Although not shown in Table 2, further analysis showed that female parents aged over 40 years in Lithgow were those with higher levels of education, occupation and family income. Members of higher socio-economic groups consistently supported fluoridation more strongly than the disadvantaged respondents. For example, compared with residents of households with annual incomes of less than \$20 000, those with annual family incomes of more than \$40 000 were 85% more likely to support fluoridation.

Nearly half (n = 348) the parents thought that health authorities or the government should take on the

Table 1. Parental support for water fluoridation by householder characteristic

Householder characteristic [†]	n [‡]	Yes %	No %	Don't know %	Chi square	p value
Age (years) of the female parent						
20–29	72	59.7	6.9	33.4	13.612	0.009
30–39	408	70.8	9.1	20.1		
Over 40	201	77.1	9.5	13.4		
Education level of the male parent						
Some high school	109	65.1	11.9	22.9	21.369	0.006
Completed high school	133	73.7	6.8	19.5		
Vocational training	211	73.5	7.6	19.0		
University or college	97	77.3	15.5	7.2		
Total household income per year						
Up to \$20 000	100	66.0	8.0	26.0	12.896	0.012
\$20 001 to \$40 000	104	68.3	8.7	23.1		
More than \$40 000	318	78.9	8.5	12.6		
Private insurance						
Yes	251	76.9	10.0	13.1	14.536	0.006
No	406	68.7	7.4	23.9		
Child in a one-parent household						
Yes	143	65.0	7.7	27.3	6.536	0.038
No	552	72.8	9.4	17.8		
Country where the male parent was born						
Australia	509	73.5	9.0	17.5	8.946	0.063
Overseas	40	65.0	15.0	20.0		
Occupation of the female parent						
Managers and professionals	123	77.2	8.1	14.6	15.925	0.003
Other workers	287	76.7	8.7	14.6		
Pensioners, unemployed and labourers	266	63.5	10.2	26.3		
Number of extracted teeth in female parent						
No extractions	335	68.4	11.9	19.7	5.772	0.056
One or more extractions	346	73.4	6.6	19.9		
Number of extracted teeth in male parent						
No extractions	251	73.7	11.6	14.7	6.254	0.044
One or more extractions	377	70.8	7.7	21.5		

[†]Only variables showing a significant association with support for fluoridation were included in this Table.

[‡]Sample size includes only responding parents.

responsibility for matters related to water fluoridation (Fig 1). Only 18% (n = 126) of residents thought that it was a community responsibility and 16.5% (n = 116) thought that the Australian Dental Association should be involved in the decision-making process.

Clinical data are presented for the 667 children available on the examination days. Table 3 shows the age-specific caries experience in the primary dentition of children stratified by parental support for fluoridation. It was found that irrespective of parental support for fluoridation, there was no significant difference in the children's caries experience in the primary dentition across all age groups, except for 5–6 year olds where children of supporters had a mean dmft of 2.06 versus 0.39 for children of non-supporters. Statistically significant differences were also observed in the caries freedom, SiC and the SiC₁₀ values of the 5–6 year olds whose parents supported fluoridation and those who did not.

DISCUSSION

Seventy per cent of the responding parents supported water fluoridation in Lithgow and most understood

correctly that fluoridation reduces risk of decay in both children and adults, which is consistent with other data collected in NSW.¹⁴ Although surveys elsewhere indicate that support for water fluoridation is high, Frazier noted that fluoride plebiscites are often defeated.¹⁵ In 1969, Sapolsky reported that pre-referendum opinion polls usually favour fluoridation but when a vote is held, there is a 60% chance of defeat.¹⁶ A possible explanation of this confusing outcome could be the difference in the sampling frame used to select the random sample of population for the purpose of the survey compared with the sampling frame of registered voters in a referendum. Another possible explanation is that the voters may change their minds during a fluoridation campaign when confronted with conflicting claims by fluoridation opponents. Faine *et al.*¹⁷ noted that anti-fluoridationists are good at bringing a large number of voters to their side and that Sapolsky's confusion hypothesis is an attempt to explain why potential voters, initially favourable to fluoridation, can swing to oppose the measure during a referendum debate.

Fluoridation plebiscites conducted in regional areas of NSW have reported lower levels of support

Table 2. Multiple variable logistic regression analysis of parental support for water fluoridation

Explanatory variable	n [†]	OR [‡]	95% CI		p value
Age (years) of the female parent					
20–29[§]	72				
30–39	412	1.58	0.95	2.65	0.080
Over 40	205	2.09	1.18	3.69	0.011
Total household income per year					
Up to \$20 000	100				
\$20 000 – \$40 000	105	1.08	0.60	1.92	0.806
More than \$40 000	321	1.85	1.13	3.02	0.014
Education level of the female parent					
Some high school	143				
Completed high school	254	1.51	0.97	2.36	0.067
Vocational training	121	0.84	0.51	1.41	0.527
Completed university or college	171	1.51	1.11	2.45	0.051
Education level of the male parent					
Some high school	110				
Completed high school	137	1.38	0.80	2.36	0.241
Vocational training	214	1.44	0.88	2.36	0.144
Completed university or college	97	1.87	1.01	3.46	0.045
Occupation of the female parent					
Pensioners, unemployed and labourer	266				
Managers and professionals	126	1.76	1.09	2.83	0.020
Other workers	291	1.78	1.23	2.56	0.002

[†]Sample size includes only responding parents.

[‡]Adjusted odds ratio.

[§]Reference category shown in bold.

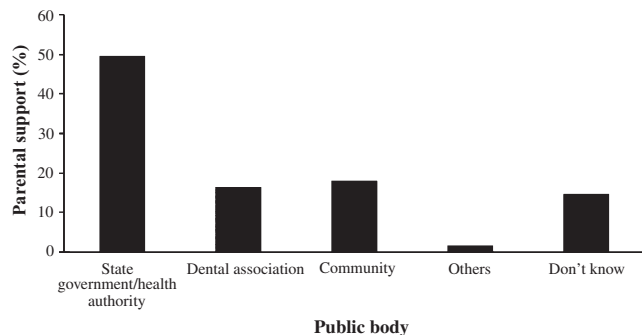


Fig 1. Parental identification of specified public body to have authority for fluoridation policy.

compared with the 2005 state average. For example, Sivaneswaran reported that only 56% of the population who voted in Deniliquin were in favour of adding

fluoride to their water supplies.⁷ In addition, the Mid Western Regional Council (Mudgee, NSW) with assistance from NSW Health, facilitated an extensive communication and consultative process and only 54% of the population voted to add fluoride to their water supply (Sivaneswaran S, written communication, July 2008).

The results of this study indicate that a variety of socio-demographic factors are associated with support for water fluoridation in accordance with the findings of the 2002 national telephone survey in Australia,¹⁸ except that females aged over 40 years were more likely to support water fluoridation compared with 20–29 year olds. If programmes to promote water fluoridation are to be successful, intensive education efforts targeted at specific population groups should be considered.

Fluoridation most benefits those who are at greater risk of caries⁵ and therefore it could be postulated that support for fluoridation would be higher amongst those parents whose children were more likely to have tooth decay. However, no statistically significant differences were observed in caries experience of children of supporters and non-supporters with the exception of the 5–6 year olds. In that case, the higher caries experience was associated with support for fluoridation. Since dental caries is a multifactorial disease, the fact that parents of children with high dental caries supported fluoridation does not explain the difference.

The strong support by parents that the health authorities should take on the responsibility for matters related to fluoridation echoes other data gathered by NSW Health.¹¹ In this regard, our study is consistent with studies conducted in the United States,¹⁹ United Kingdom²⁰ and New Zealand.²¹ These data give strong support to the notion that health ministers should adopt a more proactive role in implementing cost-effective health promotion measures such as water fluoridation. It is not surprising that less than 20% of the respondents considered that the decision-making responsibility for fluoridation should rest with the community given that local councils are prepared to entertain

Table 3. Deciduous dentition caries experience by parental support for fluoridation

Age (years)	Support					No support				
	n	%cf [†]	Mean dmft	SiC [‡]	SiC ¹⁰	n	%cf	Mean dmft	SiC	SiC ¹⁰
5–6	82	62*	2.06*	5.88*	11.10*	35	86	0.39	1.13	3.06
7–8	140	44	1.52	3.72	5.79	56	50	1.55	4.03	5.88
9–10	125	41	1.54	3.64	5.47	57	40	1.42	3.40	4.96
11–12	117	70	0.75	2.24	4.18	51	65	0.92	2.71	4.82

[†]Percentage of children caries free.

[‡]Significance Caries Index.

*Statistically significant difference (non-parametric Kruskal Wallis H) between the support and non-support group, p<0.05.

prolonged debates and commit to costly referenda on this subject.

In general, a response rate of 60% is considered adequate²² to address data validity; a poor response rate does not necessarily lead to bias. While the response rate of 44% was less than hoped for, it was anticipated that weekly reminder notices over four weeks in school newsletters should have increased response behaviour.²³ It is possible that the low response rate could be due to apathy towards water fluoridation or to issues relating to health literacy that have been raised in other NSW publications.²⁴ Furthermore, in our study the choice of the question on support for fluoridation and its use to prevent tooth decay may well have a potential to sway opinion.

The data from this study were used to inform the local council of the level of parental support for fluoridation and to make the councillors aware of the caries experience among primary school children in the hope that this information would encourage them to support the fluoridation proposal. Following this study, the local council commissioned an independent body (Western Research Institute, Bathurst) to conduct another survey of households in Lithgow. It is heartening to note that following intensive community consultation by Lithgow City Council, 72% of households voted in favour of fluoridation (Murphy T, written communication, August 2009). The Council's Ordinary Meeting in November 2007 resolved that "Council proceed with water fluoridation and request the installation of the necessary infrastructure".²⁵ Lithgow City Council has subsequently written to the Director-General of Health to formally apply to fluoridate the water supplies within the Lithgow LGA under section 6 of the Fluoridation of Public Water Supplies Act. By 2010, the Lithgow community (approximate population of 19 756) will have access to fluoridated water.

CONCLUSIONS

Lithgow parents strongly supported the introduction of water fluoridation and socio-demographic factors (higher education, income and occupational qualification) were associated with this support. The parents suggested that governments and health authorities should adopt a more proactive role in relation to fluoridation policy.

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