

The Australian & New Zealand JOURNAL OF DENTAL AND ORAL HEALTH THERAPY

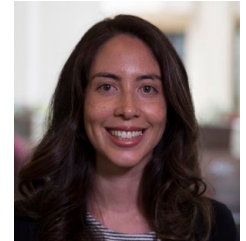


Guest Editorial

**T M Nguyen BOralHtH GCertDenThrpy
MPH MSc (Clin Ed)¹⁻³**

C E Lin BDS, MPH³⁻⁴

1. Deakin Health Economics, Institute for Health Transformation, Deakin University, Australia
2. Health Economics Group, Public Health and Preventive Medicine, Monash University, Australia
3. Dental Health Services Victoria, Australia
4. Melbourne Dental School, Faculty of Medicine, Dentistry and Health Sciences, The University of Melbourne, Australia



A refresh on oral health messages for Australia to enable effective oral health promotion.

Effective oral health promotion relies on evidence to inform oral health messages that can impact on healthy literacy and support healthy behaviours that support health and wellbeing. Good oral health is conceptually understood as a person's ability to adapt through the life course to maintain and care for the health of their mouth, teeth and gums (Peres et al., 2019). Improving health literacy, which includes oral health, had been demonstrated to be a significant independent and modifiable determinant of health (Nutbeam et al., 2018). Despite the well-known impacts of poor oral health, oral diseases remain the most prevalent health condition globally, affecting 3.5 billion people (Watt et al., 2019).

In Australia, the first National Oral Health Plan 2004-2013 articulated the need to develop evidence-based oral health messages for effective oral health promotion (National Oral Health Promotion Clearing House, 2011). Led by the National Oral Health Promotion Clearing House in 2009, a workshop was held in Adelaide to develop a national consensus statement on oral health messages for the Australian public. Experts from the general and oral health field were invited from Australian dental schools, professional associations

and oral health departments from state and territory public dental programs (National Oral Health Promotion Clearing House, 2011).

Experts summarised the scientific evidence and discussed various oral health promotion topics. In 2011, final recommendations were made for diet, toothbrushing, mouthrinses, chewing gum, sports safety, age of first visit, frequency of dental visits and smoking (National Oral Health Promotion Clearing House, 2011). It has been more than 10 years since these recommendations were reviewed and revised to reflect contemporary up-to-date evidence. In 2022, the Australian Dental Association commissioned research to update the 2011 recommendations made by the National Oral Health Promotion Clearing House.

The revised Oral Health Messages for Australia – A National Consensus Statement were released in 2023 were developed using the Delphi methodology. It is reasonably robust in areas where higher levels of evidence may be lacking, allowing for the integration of knowledge from different disciplines and offering great potential in health promotion (Niederberger & Renn, 2022). A key change to the revised messages is a sharper focus

Contents

Editorial - Nguyen and Lin <i>A refresh on oral health messages for Australia to enable effective oral health promotion</i>	1
<i>Message from the Presidents</i>	3
<i>Oral health messages for Australia. A national consensus statement</i>	7
Malik <i>Lip swelling in a patient with mild intellectual disability</i>	15
Murthi, Han <i>The need for a sustainability dentistry guideline in Aotearoa New Zealand</i>	21
<i>Congratulations to Barbara Dewson</i>	27
<i>Congratulations on your PhD</i>	28
Websites of Interest	30
ADOHTA/NZDOHTA Notice board	31

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Contacts

NEW ZEALAND ORAL HEALTH ASSOCIATION
PO Box 36529
Merivale 8146
Christchurch
www.nzoha.org.nz

AUSTRALIAN DENTAL AND ORAL HEALTH THERAPY ASSOCIATION
admin@adohta.net.au
PO Box 405, Nundah QLD 4012
Ph 0498 664 943
www.adohta.net.au

WESTERN AUSTRALIA
adohta-wa@adohta.net.au

QUEENSLAND
adohta-ql@adohta.net.au

NEW SOUTH WALES / AUSTRALIAN CAPITAL TERRITORY
adohta-nswact@adohta.net.au

SOUTH AUSTRALIA / NORTHERN TERRITORY
adohta-sant@adohta.net.au

VICTORIA / TASMANIA
adohta-victas@adohta.net.au

Editorial

EDITORS

Prof. Julie Satur,
Professor Oral Health
Melbourne Dental School,
The University of Melbourne
720 Swanston Street,
Melbourne
VIC 3000, Australia
Email:
juliegs@unimelb.edu.au

Deanna Beckett,
Senior Lecturer, Oral
Sciences'
University of Otago,
Dunedin, New Zealand
Email:
deanna.beckett@otago.ac.nz

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Presidents' Message



William Carlson - Jones,
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Anna Holyoake,
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ADOHTA and NZOHA would like to thank the many people involved in the production, editing and peer review of this journal.

The objectives of the journal are to;

1. provide a vehicle for communication between dental and oral health therapists in Australia and New Zealand
2. develop dental and oral health therapists' access to self directed professional development
3. provide a vehicle for the reporting of new learning and research in the field of dental and oral health therapy
4. develop a capacity to contribute to the body of knowledge around the discipline of dental and oral therapy, for dental therapists, oral health therapists, dental hygienists and the wider health care field

We are proud to present this edition of the ANZJDOHT and we hope you enjoy reading it.

William Carlson - Jones, President ADOHTA
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Oral Health Messages for the Australian Public		Comparison	Target oral disease or condition
2011	2023		
	Oral health is integral to overall health and well-being.	New message added	N/A
Breast milk is best for babies and is not associated with an increased risk of dental caries.		Message removed	Dental caries
After 6 months of age, infant feeding cups rather than infant feeding bottles are preferred for drinks other than formula or breast milk. Sugary fluids should not be placed in infant feeding bottles. Comfort sucking on a bottle should be discouraged.	Avoid putting babies and children to bed with a bottle.	Message revised	Dental caries
Follow the Australian dietary guidelines. Focus on:			
• drinking plenty of tap water;	Tap water should be fluoridated for optimal oral health.	Message revised	Dental caries
• limiting sugary foods and drinks; and	Avoid free sugars (All sugars added to foods and drinks by manufacturer, cook or consumer plus those sugars naturally present in honey syrups, fruit juices and fruit concentrates)	Message revised	Dental caries
• choosing healthy snacks, e.g. fruits and vegetables.		Message removed	Dental caries Periodontal diseases*
Brush teeth and along the gum line twice a day with a soft brush.	Brush teeth twice a day with fluoridated toothpaste and clean in between teeth daily. Fluoridated toothpaste reduces tooth decay. Additional fluoride therapies may be suitable depending on risk - refer to the Australian Fluoride Guidelines.	Message revised and merged	Dental caries Periodontal diseases*
People over 18 months of age should use an appropriate fluoride toothpaste.		Message revised and merged	
Fluoride mouthrinses can be effective in reducing decay. Speak with your oral health professional about whether fluoride mouthrinsing is appropriate for you.		Message revised and merged	Dental caries
Chewing sugar free gum can reduce dental decay.		Message removed	Dental caries
	People who have difficulty cleaning their teeth should be supported.	New message added	Dental caries Periodontal diseases*
Mouthguards should be worn for all sports where there is a reasonable risk of a mouth injury. This includes football, rugby, martial arts, boxing, hockey, basketball, netball, baseball, softball, squash, soccer, BMX bike riding, skateboarding, in-line skating, trampolining, cricket (wicket keeping), water skiing and snow ski racing.	Custom-made mouthguards should be worn for all sports and training where there is a reasonable risk of a mouth injury.	Message revised	Oral trauma
Children should have an oral health assessment by age 2.	Regular professional dental check-ups are important throughout life, starting from the eruption of the first tooth.	Message revised	Dental caries* Periodontal diseases*
Everyone has different oral health needs and risk levels which should be reflected in the frequency of check-ups. Talk with your oral health professional about your risk level and how frequently you need to visit for an oral health check.	Everyone has different oral health needs and risk levels which should be reflected in the frequency of check-ups.	Message revised	Dental caries* Periodontal diseases* Oral cancer*
Quit smoking to improve oral and general health.	Smoking, vaping and tobacco products, including e-cigarettes and chewing tobacco, are harmful to oral health.	Message revised	Dental caries* Periodontal diseases* Oral cancer*
	Alcohol consumption is harmful to oral health	New message added	Dental caries* Periodontal diseases* Oral cancer

N/A = not applicable

* implied target oral disease or condition

Table 1 A comparative summary of the differences between the 2011 and 2023 national consensus oral health messages for Australia.

on oral health and oral disease prevention than those already covered other Australian guidelines. These include existing recommendations on diet and nutrition and infant feeding practices (Welti et al., 2023). A side-by-side comparison of the 2011 and 2023 version of the oral health messages for the Australian public is reported in Table 1.

The 2022 messages are intended for service providers, policymakers, researchers, dental practitioners and other health professionals (Welti et al., 2023). In adapting these messages for public consumption, care must be taken to ensure they are appropriately framed and effectively disseminated.

Health messages can often perpetuate health inequities through implied ‘victim blaming’ and the suggestion that it is solely lifestyle choices that drive poor oral health and are the responsibility of the individual (Watt, 2007). This can have significant negative consequences, including on mental health. For example, Aboriginal and Torres Strait Islander people have reported feeling shame and mistrust when they are ‘lectured’ by dental practitioners about oral health self-care (Collins et al., 2022).

It is helpful to consider augmenting oral health promotion with the value-based messaging approach (Common Cause Australia, n.d.). Based on Schwarz theory of personal values to influence human behaviour (Botterill & Lewis, 2023), the potential to make greater impact through health promotion can be realised. Communicating how messages are framed can also have a profound influence on dietary self-control, including whether they are text-based or graphic-based (Rosenblatt et al., 2018). There is further scope to consider a “Whole Body Health” approach to oral disease prevention (FDI World Dental Federation, n.d.) using evidence-based based messages. Some examples include encouraging human papillomavirus vaccinations to prevent cancer including oropharyngeal cancers (Athanasiou et al., 2020), and the importance of routine dental care during pregnancy (Rocha et al., 2018).

Lessons can be learnt from the health promotion field for obesity prevention. Media over-emphasis on sugar and individual lifestyle choices generate diabetes stigma and impacts mental health (Hunt et al., 2022). There are also potential co-benefits for oral disease prevention and optimal diabetes management, which is often overlooked in the medical profession (Borgnakke, 2019). There is an opportunity to further strengthen oral health promotion by including a social and commercial determinants of health perspective in consensus messages.

We conducted a generic mapping exercise of the 2023 oral health message for the Australian public to target the oral disease or condition being prevented (Table 1). This process identified that there was a greater emphasis for dental caries prevention than other common oral diseases such as periodontal diseases (largely gingivitis and periodontitis) and oral cancer. Although dental caries is the most prevalent oral

disease, the impact of severe periodontitis measured in years lived with disability is more than three-fold in comparison (GBD 2017 Oral Disorders Collaborators et al., 2020). Arguably, the prevention of periodontal diseases requires specific urgency given there has been very limited prevention efforts evaluated from a health economics perspective (Nguyen et al., 2022).

Not surprisingly, the evidence for oral health promotion remains relatively weak at an individual level to prevent oral diseases. This is because successful behavioural interventions require long-term relationships, which is typically beyond the stringent study rigour of randomised controlled trials. Two Cochrane reviews on one-on-one practice based oral hygiene instructions and dietary advice reported there is insufficient evidence to support clinical benefits (Harris et al., 2012; Soldani et al., 2018). There is good evidence oral health promotion can have positive effects on oral health outcomes when they are based on behavioural and psychological models (Kay et al., 2016) such as motivational interviewing (Cascaes et al., 2014).

In summary, the 2023 revision on the oral health messages for Australia is an important step forward to ensure consistent, evidence-based, contemporaneous communication. Academics, policy-decision makers, health promotion practitioners and health professionals should consider how these messages may need to be modified to reflect the intended target audience using the appropriate medium.

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Oral health messages for Australia: A national consensus statement

R Welti,^{*†} M Chinotti,[‡] O Walsh,^{*†} M Arcus,[§] J Asgari,[¶] K Phillips,^{**} J Wallace,^{††‡‡} L Do,^{§§} P Moynihan,^{¶¶} M Silva^{*†}

^{*}Melbourne Dental School, The University of Melbourne, Melbourne, Victoria, Australia.

[†]Inflammatory Origins, Murdoch Children's Research Institute, Parkville, Victoria, Australia.

[‡]Australian Dental Association, St Leonards, New South Wales, Australia.

[§]Royal Australian College of General Practitioners, East Melbourne, Victoria, Australia.

[¶]Consumer Health Forum, Deakin, Australian Capital Territory, Australia.

^{**}Queensland Health, Brisbane, Queensland, Australia.

^{††}University of Newcastle, Newcastle, New South Wales, Australia.

^{‡‡}University of Sydney, Camperdown, New South Wales, Australia.

^{§§}University of Queensland, St Lucia, Queensland, Australia.

^{¶¶}Adelaide Dental School, The University of Adelaide, Adelaide, South Australia, Australia.

ABSTRACT

Background: Oral health promotion initiatives must be evidence-based and consistent with broader health messaging. The Oral Health Messages for the Australian Public were first produced in 2009 and sought to enable a focused, and strategic approach to oral health promotion in Australia. As the evidence base and needs of the Australian population have since changed, this consensus statement was updated in 2022–2023.

Methods: The process of updating the messages consisted of 3 phases (preparatory phase, the Delphi technique, final revision phase). The preparatory phase included public and expert consultation, an umbrella review of published scientific literature and review of available recommendations, policies and guidelines. The Delphi technique used in this study was guided by Guidance on Conducting and Reporting DELphi Studies (CREDES) and included 2 voting rounds. There were 70 experts in round 1 and 60 experts in round 2. Delphi participants comprised of experts from a variety of fields to ensure diversity and inclusion, balance expertise and maximize stakeholder representation. Consensus was defined as 75% agreement.

Results: A total of 11 messages were included in the 2022 update of *Oral Health Messages for Australia*.

Conclusion: The updated oral health messages will support oral health promotion policy and activity at both individual and population level to improve the oral health of Australians.

Keywords: Consensus, evidence-based, oral health promotion, prevention.

(Accepted for publication 9 August 2023.)

CLINICAL RELEVANCE

As oral diseases, including dental caries, periodontal disease and oral cancer, are largely preventable, health promotion is an important part of clinical practice. This evidence-based consensus statement provides key oral health messages that will assist clinicians to support patients to adopt healthy behaviours and advocate for policy that supports health-promoting environments.

INTRODUCTION

Oral diseases are prevalent despite being largely preventable¹ and the implications at an individual and societal level are significant.² Approximately one in three Australians over the age of 15 years have untreated dental decay and 42% of children aged 5–10 have experienced dental caries in their deciduous teeth.² In 2022, poor oral health contributed 4.5% of all the burden that non-fatal burden diseases placed on the community.² Both individual and population level oral health promotion initiatives are an

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important part of disease prevention,³ and it is imperative that these initiatives are evidence-based and consistent with other health recommendations to avoid confusion among both health professionals and the public.⁴

In 2009, a working group came together to develop key oral health messages for the Australian public.⁴ The workshop sought to establish clear, evidence-based oral health promotion messages in response to a goal of the previous National Oral Health Plan.³ The 2011 consensus statement was highly effective, and enabled a focussed and strategic approach to oral health promotion in Australia. Since 2011, the evidence base and needs of the Australian public have changed. For example, vaping/e-cigarettes and alcohol were not included in the previous consensus statement. However, these topics have since emerged as important determinants of health. Therefore, an updated set of key evidence-based oral health promotion messages for Australia is required.

The overall aim of this study was to develop evidence-based oral health messages for use by health professionals, service providers and policymakers to improve the oral health of Australians.

METHODS

The process of updating the messages consisted of three stages:

- (1) Preparatory phase
- (2) Delphi voting stage
- (3) Final revision phase

The study protocol was developed *a priori* and registered on Open Science Framework in October 2022, with a revision in December 2022.⁵ Human Research and Ethics approval was obtained from the University of Melbourne (Project ID number: 24738).

Preparatory phase

The aim of the preparatory phase was to draft an initial list of oral health messages to be included in the Delphi voting process. The preparatory phase included public and expert consultation, an umbrella review of published scientific literature⁶ and review of available recommendations, policies and guidelines.⁷

Based on the preparatory stage, the advisory committee developed a set of messages for the Delphi voting stage.

Delphi voting stage

The Delphi technique used in this study was guided by Guidance on Conducting and REporting DELphi Studies

(CREDES).⁸ This study included two voting rounds and consensus was defined as 75% agreement. Additional messages identified by experts during Round 1 were included in Round 2, if they were listed by $\geq 15\%$ of experts. Study data were collected and managed using REDCap electronic data capture tools hosted at the University of Melbourne.⁹ Quantitative data were exported and analysed using Stata 15 (StataCorp. 2017. *Stata Statistical Software: Release 15*. TX, USA). Statistical analysis included basic descriptive statistics. Thematic analysis of the free-text responses was carried out and analysed using Microsoft Excel (Microsoft Excel for Mac. Version 16.71. Microsoft Corp. Redmond, WA, USA). Free-text responses were first ordered by the key messages then categorized into 'add additional message', 'remove part of the message' and 'change wording.' Additional subcategories were also created as appropriate, for example, 'change wording' was further categorized into 'simplify', 'clarify' or 'complete rephrase'.

Delphi participants

Delphi participants comprised of experts from a variety of fields to ensure diversity and inclusion, balance expertise and maximize stakeholder representation. Experts were eligible for inclusion if they resided in Australia and either worked in oral health promotion; represented a key stakeholder (service providers, consumers, policymakers, professional groups); or had expertise on the topic as reflected by publications, research projects or international collaborations. Experts were required to declare conflicts of interest.

Experts were invited to complete an online expression of interest form that was disseminated widely.⁵ Written consent was obtained from all participants.

Delphi survey Round 1

Delphi Round 1 was piloted by six individuals who were representatives of the expert panel. Eligible participants were invited via email to take part in the Delphi survey. Considered judgement forms, with a summary of published academic and grey literature and project methods were distributed to all Delphi participants and made publicly available to facilitate informed decision-making during the Delphi process.

They were provided with the 2011 messages and proposed new messages. They were asked to rate their level of agreement with the new message replacing the old message on a 5-point Likert scale, where 1 = strongly agree and 5 = strongly disagree. If the participants voted equal to or greater than 3, they were invited to provide an alternative message or suggest removing of the message from the consensus statement. Items that met *a priori* consensus thresholds continued into Round 2 for iteration and to

ensure stability of responses. Items that did not meet *a priori* consensus levels were revised based on feedback from round 1 and continued into Round 2 for re-voting.

Delphi Round 2

In round 2, messages were grouped into topics and experts were asked to indicate their preference for a group of statements under each topic. The summary of round 1 responses allowed experts to reconsider their previous opinion compared to the expert group and indicate their degree of agreement.

Final revision phase

At the conclusion of the Delphi process, the proposed messages were subject to further amendments based on comments from experts in Round 1 of the Delphi and the project's Advisory Committee.

RESULTS

A total of 11 messages were included in the 2022 update of *Oral Health Messages for Australia* (Table 1).

Preparatory stage

A total of 11 professional organizations or government bodies were identified as having a policy, guideline or recommendation related to one or more key areas of oral health. Documents were identified for health and well-being (n = 8), diet (n = 10), infant feeding practices (n = 5), oral hygiene (n = 7), chewing gum (n = 2), age of the first dental check-up (n = 4), frequency of dental check-ups (n = 3), mouthguards (n = 3), smoking (n = 8) or vaping (n = 3) and alcohol (n = 4).

The umbrella review identified 29 systematic reviews with data relevant to diet (n = 6), infant feeding practices (n = 3), oral hygiene (n = 6), chewing

Table 1. Delphi results

	Round 1 (n = 70)				Round 2 (n = 60)
	Agree (%)	Neutral (%)	Disagree (%)	Free-text responses (n=)	Agree (%)
Overall health					100
Message 1: Oral health is an integral part of general health.	92.8	2.9	4.3	5	
Diet					80
Message 2: Enjoy a wide variety of nutritious foods and avoid free sugars (including sugar added to foods/drinks by the manufacturer, cook or consumer, plus sugars naturally present in honey, syrups and unsweetened fruit juices).	62.8	8.6	28.6	21	
Message 3: Breast milk is best for health. Promote, support and encourage breastfeeding. Avoid putting babies and children to bed with a bottle.	61.4	8.6	30	23	
Message 4: Fluoridated tap water is best for health. Avoid sugar-sweetened beverages and fruit juice.	60.0	7.1	32.8	21	
Oral hygiene					85
Message 5: Clean teeth twice a day. Effective tooth cleaning includes brushing with fluoridated toothpaste and cleaning in between teeth. Individuals with difficulty cleaning their teeth due to age or disability should be supported with tooth cleaning.	68.6	14.3	17.2	20	
Message 6: Fluoridated toothpaste reduces tooth decay. Additional fluoride therapies may be suitable depending on risk. Follow the Australian Fluoride guidelines.	72.9	10	17.1	16	
Message 7: No statement specifically addressing fluoride mouth rinses.	84.3	10	5.8	2	
Chewing gum					81.7
Message 8: No statement specifically addressing chewing gum.	68.5	18.6	12.9	4	
Mouthguards					86.7
Message 9: Mouthguards, preferably custom-made, should be worn for all sports and training where there is a reasonable risk of a mouth injury.	82.9	8.6	8.6	9	
Dental check-ups					71.7
Message 10: Regular dental check-ups play an important role in prevention throughout the life course, starting from the eruption of the first tooth or 12 months of age, whichever occurs first.	75.7	8.6	15.7	14	
Message 11: Everyone has different oral health needs and risk levels which should be reflected in the frequency of check-ups.	68.5	15.7	15.7	7	
Smoking/vaping					90
Message 12: Smoking and vaping, including e-cigarettes, is harmful for health, including oral health.	77.1	7.1	15.7	15	
Alcohol					95
Message 13: Alcohol consumption is harmful for health, including oral health. Follow Australian guidelines.	78.6	7.1	14.3	13	

gum (n = 3), frequency of dental check-ups (n = 2), mouthguards (n = 2), smoking or vaping (n = 6) and alcohol (n = 2). No eligible systemic reviews were identified for age of the first dental check-up or overall health and well-being.⁶

Delphi voting stage

A total of 85 expressions of interest were received and 84 experts were invited to participate in the Delphi process. 83% (n = 70) of experts (25 male, 45 female) completed at least the first round of the Delphi. The group included 38 (54%) practising dental practitioners and six (9%) other clinicians including a maternal child and family health nurse, two registered nurses/midwives, a pharmacist and two dietitians. A total of 19 (27%) members stated that they were policymakers and/or public health advisors and five (7%) members were consumer representatives. Overall, 53 (76%) members of the Delphi group reported that they were actively involved in planning, organizing or conducting oral health promotion or activities targeting the prevention of dental diseases. All Australian states and territories were represented. A table summarizing participant characteristics can be found in the supplementary material (Table S1). Ten (14%) participants did not complete the second round of the Delphi.

In round 1, six of the proposed 13 items reached consensus and seven items did not (Table 2). Qualitative analysis indicated that disagreement predominantly related to the phrasing of the messages rather than the key message. A total of 173 comments were submitted, none of which met the 15% threshold for inclusion. In round 2, 11 of the proposed 13 messages reached consensus. Messages 10 and 11 did not reach consensus but were preferred by the majority of respondents (71.7%).

Final messages

Overall health and well-being

- (1) Oral health is integral to overall health and well-being.

The inclusion of this new item was driven by responses received in the early consultation phase of the project. The statement reached consensus in both Delphi rounds, with minor amendment of phrasing in the final stage. This message, listed first, recognizes the significant personal and societal costs of oral disease in Australia. It also facilitates advocacy for oral health to be prioritized and integrated into broader health promotion.

Table 2. 2022 Oral Health Messages for Australia

Overall health	(1) Oral health is integral to overall health and well-being.
Diet and infant feeding	(2) Avoid free sugars (All sugars added to foods and drinks by manufacturer, cook or consumer plus those sugars naturally present in honey syrups, fruit juices and fruit concentrates).
	(3) Tap water should be fluoridated for optimal oral health.
	(4) Avoid putting babies and children to bed with a bottle.
Oral hygiene	(5) Brush teeth twice a day with fluoridated toothpaste and clean in between teeth daily. Fluoridated toothpaste reduces tooth decay. Additional fluoride therapies might be suitable depending on risk—refer to the Australian Fluoride Guidelines.
	(6) People who have difficulty cleaning their teeth should be supported.
Mouthguards	(7) Custom-made mouthguards should be worn for all sports and training where there is a reasonable risk of a mouth injury.
Dental check-ups	(8) Regular professional dental check-ups are important throughout life, starting from the eruption of the first tooth.
	(9) Everyone has different oral health needs and risk levels which should be reflected in the frequency of check-ups.
Smoking and vaping	(10) Smoking, vaping and tobacco products, including e-cigarettes and chewing tobacco, are harmful to oral health.
Alcohol	(11) Alcohol consumption is harmful to oral health.

Diet and infant feeding

Three messages related to diet and infant were included in the update:

- (2) Avoid free sugars (All sugars added to foods by manufacturer, cook or consumer plus those sugars naturally present in honey, syrups, fruit juices and fruit concentrates).
- (3) Tap water should be fluoridated for optimal oral health.
- (4) Avoid putting babies and children to bed with a bottle.

Excess consumption of free sugars causes dental caries throughout the life course. Poor diet, including excessive sugar consumption, is also associated with other

adverse health effects and non-communicable diseases.¹⁰ These consensus messages have adopted an emphasis on oral disease, particularly sugar consumption, and therefore align with, but are not a simple repetition of the Australian dietary guidelines¹¹ and the Australian infant Feeding Guidelines.¹² An emerging concern relates to ready-to-eat infant and toddler foods, many of which are high in sugar and are deceptively promoted to parents and carers of young children as healthy alternatives.

Breast and bottle feeding was a specific focus of the previous consensus statement. Most professional organizations and government bodies, academic literature and Delphi experts agree that breastfeeding up to the age of 24 months is not associated with an increased risk of early childhood caries. However, as Australia's infant Feeding Guidelines already provide clear messages regarding breastfeeding, and in order to avoid replication, this consensus statement focuses on infant feeding and dietary practices with relevance to oral health that are not as comprehensively addressed in other guidelines.¹²

Oral hygiene

Two messages related to oral hygiene were included:

- (5) Brush teeth twice a day with fluoridated toothpaste and clean in between teeth daily. Fluoridated toothpaste reduces tooth decay. Additional fluoride therapies might be suitable depending on risk—refer to the Australian Fluoride Guidelines.
- (6) People who have difficulty cleaning their teeth should be supported.

Many oral diseases are associated with dental plaque and as such, tooth cleaning is a fundamental preventive message. Fluorides play a crucial role in the prevention of dental caries. The 2019 Australian Fluoride Guidelines provide evidence-based, comprehensive guidance about the use of fluorides in Australia.¹³

Toothbrushing techniques, such as manual versus electric toothbrushing, and interdental cleaning methods, such as the use of floss compared to interdental brushes, were not specifically explored in this update.

Some individuals, including infants, children and people with disabilities require assistance with oral hygiene. In 2020, 16% of the total Australian population was aged 65 years and older.¹⁴ Population projections for Australia suggest that this figure will rise to 21% and 23% of the total population by 2066 with rapid acceleration of some age groups (over 65 and over 85).¹⁴ As the population ages and more Australians enter residential aged care facilities or are

supported by community-based service providers in the home, oral hygiene support must be considered as an integral part of care in these settings. Similarly, compulsory training in oral health for health workers in relation to people with disability is a key short-term action of the National Roadmap for improving the health of people with disability, but is yet to be actioned.

A message dedicated to mouth rinses was included in the previous consensus statement.

Some individuals might benefit from the use of mouth rinses. However, due to the lack of supporting academic literature and guidelines and with consensus through the Delphi process, the use of mouth rinses was not considered appropriate for inclusion in the updated messages.

Mouthguards

- (7) Custom-made mouthguards should be worn for all sports and training where there is a reasonable risk of a mouth injury.

The use of mouthguards during activities where there is reasonable risk of a mouth injury is supported by professional organizations, academic literature and the Delphi experts. Advocacy for the compulsory use of mouthguards at both a club and a professional level should be encouraged. Considering the treatment burden associated with dental injuries, the preventive value of custom-made mouthguards is considerable.

Dental check-ups

Two messages related to dental check-ups were included in the updated list of oral health messages:

- (8) Regular professional dental check-ups are important throughout life, starting from the eruption of the first tooth.
- (9) Everyone has different oral health needs and risk levels which should be reflected in the frequency of check-ups

The evidence regarding dental check-ups was limited. However, international guidelines strongly support first dental check-up at 12 months of age, and regular dental check-ups. For example, American Dental Association and the American Academy of Pediatric Dentistry advocate for the first dental check-up to occur at age 1 for early prevention and identification of disease as well as the provision of anticipatory guidance to parents about their child's oral health and establishment of a 'dental home'.¹⁵ A multicentre study involving more than 2000 American children found that the odds of having dental caries at the first

dental visit increased by a multiplicative factor of 2.1 for every year of increased age.¹⁶ Australian adults with an unfavourable pattern of dental attendance were 3.7 times more likely to have had a tooth extracted in the previous year, and half as likely to have received a professional scale and clean treatment compared to regular dental attenders.¹⁷ Although agreement with these messages was below the predetermined threshold for consensus, the vast majority of the expert group (>70%) favoured the new statements over the previous.

Smoking/vaping

- (10) Smoking, vaping and tobacco products, including e-cigarettes and chewing tobacco, are harmful to oral health.

There are no safe levels of smoking, and adverse effects include oral diseases. This message was updated to reflect the recent increase in e-cigarette use especially among young people and the increased promotion of e-cigarettes to children and young people, and increasing evidence of adverse effects on oral health.¹⁸ The WHO recommends that e-cigarettes are treated in the same way as tobacco products, including use of bans and restrictions on advertizing, promotion and sponsorship.¹⁹ The National Tobacco Strategy 2012–2018²⁰ and The Royal Australian College of General Practitioners guide for health professionals are important supporting material.²¹

Alcohol

- (11) Alcohol consumption is harmful for health, including oral health.

Alcohol was included as an additional message given the literature supporting the health risks, including oral health risks, associated with alcohol consumption. Even low levels of alcohol consumption have been shown to have health risks.²² Health professionals should refer to the NHMRC alcohol guidelines when making recommendations on alcohol consumption.²³ There are challenges associated with reducing alcohol consumption due to engrained social motives. However, individuals should be supported to reduce their intake, and reform is possible as highlighted by the decline in tobacco smoking.

DISCUSSION

Eleven messages were included in the 2022 update of Oral Health Messages for the Australian. Compared to the 2009 workshop, 11 messages were revised, two were removed and three were added.

This project adopted a transparent, consultative and scientifically sound process to develop this consensus statement. The Delphi technique is a well-established tool for reaching consensus on complex health-related problems.²⁴ Expert selection is perhaps the most crucial element of the Delphi. The heterogeneous advisory group and expert panel comprising of dental practitioners, consumers, health professionals, policy-makers, academics and researchers will enabled high-quality, highly acceptable recommendations compared to homogenous groups of participants with similar perspectives.

An identified limitation of the Delphi technique is the inherent risk associated with trying to form a consensus and potentially disregarding opposing opinions. However, identifying areas of disagreement, in addition to areas of agreement, has been shown to be beneficial.²⁵ In this study, participants were able to disagree and provide comments, and these comments were able to be incorporated into the final message during the revision phase of the study despite not reaching consensus for inclusion in the Delphi. Moreover, a key characteristic of the Delphi is anonymity among participants to avoid conformity to a dominant view.

These messages are intended for use by service providers, policymakers, researchers, dental practitioners and other health professionals to improve the oral health of the Australian public. The development of consistent oral health messages is an important advocacy tool to promote oral health. The alignment of these messages with the guidelines of other health professional organizations enables oral health promotion in a range of health settings. Organizations are encouraged to disseminate these messages using language and methods of communication as appropriate for the community or group of interest. Further consumer engagement is recommended to ensure such dissemination is impactful and appropriate.

It is important to acknowledge that oral disease in Australia is marked by inequity, with a small proportion of the community bearing the majority of the burden of disease. These evidence-based messages seek to facilitate the delivery of population-level interventions, through policy, service delivery models or oral health promotion activities. Given the inequity in oral health in Australia, it is important that such implementation seeks to address this widening inequity as a priority.

Finally, in order to be effective, it is important that the impact of this statement is monitored and evaluated using appropriate value-based metrics.

CONCLUSION

An updated set of 11 oral health messages for the Australian were identified through robust literature

review, the Delphi technique and a final revision phase. Broad stakeholder engagement was sought to ensure the messages align with other Australian health guidelines. Dissemination and implementation of the messages should prioritize inequity in the community.

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AUTHOR CONTRIBUTIONS

M Silva: Conceptualization; investigation; funding acquisition; methodology; writing – original draft; project administration; supervision. **R Welti:** Conceptualization; investigation; writing – original draft; methodology; project administration; formal analysis. **M Chinotti:** Conceptualization; investigation; methodology. **O Walsh:** Methodology; investigation; project administration. **M Arcus:** Conceptualization; methodology. **J Asgari:** Methodology; conceptualization. **K Phillips:** Conceptualization; methodology. **J Wallace:** Methodology; conceptualization. **L Do:** Conceptualization; methodology. **P Moynihan:** Conceptualization; methodology.

CONFLICT OF INTEREST

Paula Moynihan is a member of the Haleon Scientific Advisory Council for which her institution receives a fee. The other authors have no conflicts of interest to declare.

SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

Table S1. Delphi round 1 participant characteristics.

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R Welti *et al*

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Address for correspondence:

*Mihiri Silva
Melbourne Dental School
The University of Melbourne
Melbourne, Victoria
Australia*

Email: mihiri.silva@unimelb.edu.au

Lip swelling management in a patient with mild intellectual disability: A case report

Z Malik^{1,2,3}¹Specialist Special Needs Dentistry; South Western Sydney Local Health District²Oral Health Services, NSW.³University of Newcastle**ABSTRACT**

This case report is of a 56-year-old male Mr G with mild intellectual disability, who presented with an acute facial swelling for emergency outpatient management to a tertiary dental hospital. Prior to clinical presentation, there had been a five-day history of pain from persistent right lateral tongue ulceration secondary to a sharp fractured mandibular posterior tooth. The ulceration was causing difficulty eating, swallowing and talking. Mr G's caregiver organised for private dental care for relief of pain management which involved recontouring of the sharp tooth. This was performed under local anaesthesia and subsequent referral made to the Special Needs Dentistry (SND) department for comprehensive dental management. Post-operatively, Mr G developed significant right lower lip swelling overnight. The case highlights the differential diagnoses of lip swelling and creates awareness of important considerations with regards to use of local anaesthesia in patients with intellectual disability. The case demonstrates consideration of important factors in pre, peri- and post-operative dental treatment planning for the patient with special healthcare needs.

Patient Case

This case introduces Mr G, a 56-year-old male, who presented for an emergency specialist dental outpatient consult to a tertiary dental hospital with his caregiver (sibling) on a Friday afternoon. Mr G presented with a lower right lip swelling which was detected by his caregiver on the morning of the appointment. Mr G had been taking Maxigesic™ tds as recommended by his general medical practitioner for analgesia prior to presentation. Upon questioning, Mr G reported biting his lower lip the previous night while eating his dinner. He had returned home independently and did not have any support workers with him.

Mr G's caregiver reported Mr G had a lower right sharp tooth recontoured under local anaesthesia in the afternoon the day prior. This had been following a five day history of right tongue ulceration secondary to a lower right sharp tooth. The tooth was assessed by the private dental practitioner and deemed to be unrestorable. Emergency management was provided by way of recontouring the tooth. This was due to the need for possible pharmacological adjunct to carry out the required dental extraction and subsequent referral made to the Special Needs Dentistry department within the tertiary dental hospital. An emergency dental appointment was also provided given the facial swelling reported.

Comorbidities

At the time of Mr G's presentation for the emergency specialist dental appointment, his medical history was significant for mild intellectual disability; idiopathic dilated cardiomyopathy (Bicor™ 5mg) under annual review with his cardiologist (last TTE in October 2018 revealed left ventricular size and function was normal and there was no evidence of valvular pathology); hypertension (Avapro™ 75mg); hyperlipidaemia (Lipitor™ 40mg); anxiety and depression (citalopram 20mg). Mr G had severe obstructive sleep apnoea diagnosed five

years ago with recommendation for daily CPAP use however, Mr G reported variable compliance. Mr G had class II obesity (body mass index (BMI) of 36.7kg/m², weight 96.4 kg); type 2 diabetes mellitus with poor dietary compliance and a history of impulsive eating behaviours (Jardiance™ 25mg, weekly Trulicity™ 1.5mg/0.5ml subcutaneous injection) with no associated retinopathy, nephropathy or neuropathy, and Mr G was regularly managed via a tertiary referral metabolic clinic.

In addition, Mr G presented with oesophageal gastritis (Nexium™ 20mg); diverticulitis; congenital hip dysplasia with a history of bilateral total hip replacements and osteoarthritis of weight bearing joints (Panadol™ 1gm prn). His remaining medications were fish oil 1000mg, vitamin D 500IU and calcium supplementation. There had been no recent hospitalisations. Mr G had multiple food allergies and intolerances however no known drug allergies. Mr G was a lifelong non-smoker and reported no alcohol intake.

Social and Diet History

Mr G lived independently in a supported independent living accommodation which involved daily carer support during the day only provided through the National Disability Insurance Scheme (NDIS). He was independent for all activities of daily living with prompting and required supervision for several instrumental activities of daily living including public transport, shopping and finances. There was regular contact with Mr G's siblings who were his caregivers and legal guardians. They provided substitute consent for Mr G's medical and dental treatment.

Mr G's diet was cariogenic with reference to impulsive eating behaviours particularly for snacks including cakes, chocolates, chips, juice and full sugar containing soft drink. There was minimal water intake.

Dental history

Current oral health practices included brushing once daily with a standard fluoride toothpaste and electric toothbrush. Mr G required prompting for toothbrushing by support workers. There was no interdental cleaning.

Mr G's private dental records from the previous day indicated that the mandibular right first molar (tooth 46) was recontoured under local anaesthesia (2.2ml of 2% lignocaine with 1:80000 adrenaline vasoconstrictor given as right inferior alveolar nerve (IAN) block). Mr G had previously accessed the tertiary dental hospital seven months prior for restorative treatment under local anaesthesia without complication.

Clinical Examination

Mr G tolerated a comprehensive oral examination at time of consultation however he was anxious and distressed. Mr G was afebrile without evidence of other systemic symptoms. Extra-oral examination revealed no regional lymphadenopathy, facial swelling or asymmetry, trismus or

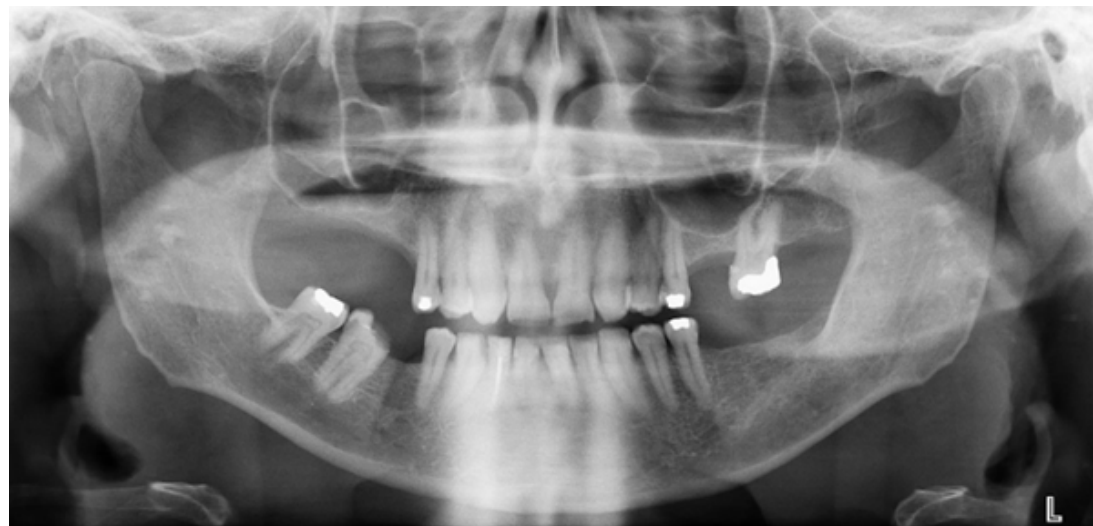
TMJ pathology. Intra-oral soft tissue examination revealed a relatively firm, unilateral swelling localised to the right lower lip with no purulent discharge or obvious laceration. Moderate generalised gingival inflammation was noted secondary to poor oral hygiene and mature plaque and supragingival calculus deposits. There was a 1 cm x 2 cm oval pseudomembranous ulceration on the right lateral tongue with no noted induration or fixation. Hard tissue examination revealed a grossly carious mandibular right first molar (tooth 46) with pulpal involvement. There was evidence of recontoured lingual cusps, in close proximity to the tongue ulceration. Carious cavitation involving the mandibular right canine (tooth 43) was also noted.

Clinical photographs of the soft tissue lesions were taken at time of consultation (see Figure 1). Intra-oral radiographs which were available from Mr G's previous consultation seven months prior confirmed the clinical findings. Intra-oral radiographs taken at the private dental practice one day prior to initial presentation were also obtained (see Figure 2).

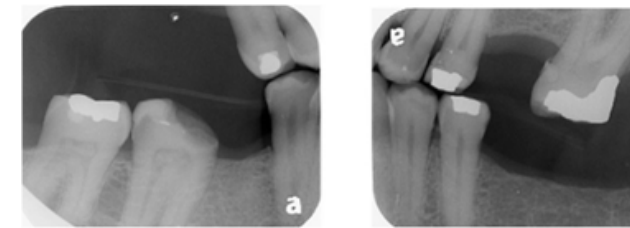
Figure 1: Clinical photographs (extra-oral of lower right lip and intra-oral of right lateral tongue) at time of initial presentation



Figure 2a: Extra-oral and Intra-oral radiographs taken seven months prior to consultation



Orthopantomogram (OPG) radiograph revealed a partial maxillary and mandibular dentition, generalised mild attrition, 46 mesial and distal radiolucency into dentine and 43 mesial radiolucency into dentine.



Right and left bitewing radiographs revealing 46 mesial and distal radiolucency into dentine.



Periapical radiographs of tooth 46 (right) and tooth 43 (left) revealing 46 mesial and distal radiolucency into dentine and 43 mesial radiolucency into dentine with no associated periapical pathology.

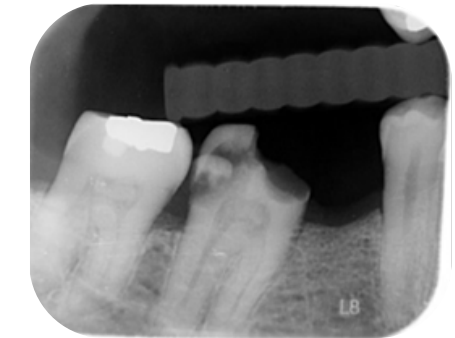


Figure 2b: Periapical radiograph of tooth 46 (partially diagnostic/incomplete image of apex) obtained from the private dental practitioner taken 1 day prior to consultation. The radiograph revealed significant distal caries progression extending into the pulp.

Dental management of Mr G

Following joint specialist Oral Medicine consultation at time of initial presentation, a decision tree method was utilised to establish a differential diagnosis of the lower lip swelling (see Figure 3). The clinical impression was of inflammatory oedema of the lower lip with a possible overlying infective component. This likely developed acutely and secondary to the factitious injury which occurred as Mr G experienced residual lower lip numbness from dental local anaesthesia. No oral swab was taken of the lesion due to the patient's distress during the consultation. Antibiotic therapy (300mg Clindamycin qid oral 5 days) was instituted, and Mr G was recommended to continue analgesia (Maxigesic™) and Vaseline™ to lubricate the lips. A soft diet was advised for seven days. Mr G and his caregiver were provided with education and recommendations for the avoidance of further lip biting and soft tissue trauma.

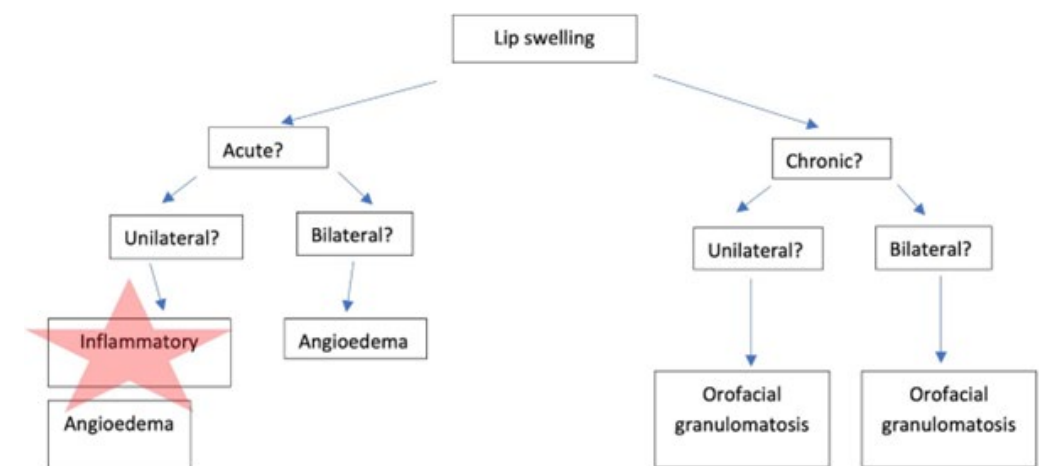


Figure 3: Decision tree for differential diagnoses of Mr G's lip swelling given the clinical presentation 1

Mr G was reviewed four days following the initial specialist consultation. His lower lip swelling had significantly subsided and there were no ongoing symptoms (see Figure 4). Healing of the right lateral tongue ulceration was evident. Mr G had not been lubricating the lips and this was recommended to Mr G and his caregiver. It was recommended Mr G's support staff prompt him to apply paraffin wax to his lips,

and also for Mr G to complete the course of antibiotics.

A recall examination two weeks following initial specialist consultation was scheduled. Further healing of the right lower lip and lateral tongue was evident (see Figure 5). The remaining dental treatment plan involved extraction of the tooth 46 due to the hopeless restorative prognosis,

restoration of the tooth 43 and preventive dental treatment. An oral health care preventive plan was concurrently reinforced at this time including twice daily use of high concentration fluoride toothpaste (Colgate Neutrafluor5000) with use of plaque disclosing gel to assist with motivation and oral hygiene improvement. Reduction of dietary sugars were discussed with the patient and caregiver to reduce Mr G's ongoing dental disease risk. Referral to a dental practitioner (oral health therapist) for non-surgical periodontal therapy and topical fluoride application was made. It was suggested Mr G bring in his electric toothbrush to this appointment with the oral health therapist to facilitate modification to his toothbrushing technique. Twice weekly mouthwashes with chlorhexidine mouthwash were also recommended for one month to reduce biofilm burden and gingival inflammation.

The plan was to carry out the remaining dental treatment needs following complete resolution of the soft tissue lesions. An appointment was arranged following extensive discussion with Mr caregiver regarding the need for close post-operative monitoring of Mr G. Specific advice was given to ensure there would be support staff support with Mr G when he returned home who would institute the provided post-operative instructions and a morning appointment was scheduled accordingly.



Figure 4: Clinical photographs at day +4

Clinical examination of Mr G at subsequent review day +14 showed almost complete resolution of the lip and tongue lesions (see Figure 5).



Figure 5: Clinical photographs at day +14

The remaining dental treatment was carried out in a single visit with local anaesthesia (short-acting local anaesthesia with 2.2ml 2% lignocaine with 1:80000 adrenaline vasoconstrictor given as right IAN block) without complication. Extraction of the tooth 46 required surgical removal. Sutures were placed to achieve primary closure of the extraction socket, and kept short in length to reduce irritation and potential for further trauma. Primary closure was ensured to reduce infection risk particularly given the context of the patient's uncontrolled type 2 diabetes mellitus. Careful post-operative instructions were given to Mr G's caregiver to ensure prudent monitoring given the risk of lip or cheek biting. Soft, cool dietary intake for the duration of numbness was encouraged. These instructions were provided in a written and verbal form to Mr G's and his NDIS support worker who was present to assist in post-operative monitoring until the effects of local anaesthesia were diminished.

DISCUSSION

The case report brings further awareness for dental practitioners around lip swellings and their differential diagnoses, factitious injuries and the dental management considerations for individuals with mild intellectual disability.

Evaluation of a lip swelling requires consideration of the rapidity of onset, whether the swelling is localised or diffuse, history of trauma, relevant medical history, presence of systemic signs of symptoms and other peri-oral or oral signs and symptoms to develop a list of differential diagnoses.¹ Given the localised and acute nature of Mr G's lip swelling, unilateral distribution, related trauma history confirmed by both the patient and private dental records, the provisional diagnosis of inflammatory oedema could be made. It is likely Mr G's repeated traumatic biting of his numb lower lip

allowed for bacterial ingress from the oral plaque bacteria. Subsequent inoculation of the localised region of the lip resulted in an overlying infective component and lower lip cellulitis (no collection). Mr G was additionally predisposed to infection due to his uncontrolled diabetes.² This systemic risk factor provided explanation for the rapidity of onset of the lip swelling. The anterior and localised nature of the lip swelling allowed for exclusion of a spreading odontogenic infection from the carious tooth 46 as a potential differential diagnosis.

Further investigations may have been required for the differential diagnoses presented in Figure 3.1 However, given Mr G presented initially with anxiety and distress given his pain, and there was a high index of suspicion for inflammatory oedema secondary to soft tissue trauma, no further investigations were undertaken. The resolution of the lip lesion with instituted antibiotic therapy, was diagnostic for the infective component of the swelling and likely progression to cellulitis.

In the majority of cases, comprehensive dental management for individuals with mild intellectual disability is provided in the community, either via public or private dental services. An integral supportive role is played by the individual's caregiver, support workers and multidisciplinary healthcare team in the success of dental management.³ Where there are requirements for additional resources to facilitate treatment, such as extended behavioural management or pharmacological adjuncts, tertiary referral or hospital dental clinics may provide a more optimal setting for dental management.³

However, there is evidence of a higher level of unmet dental needs including caries and periodontal disease, compared with the general population for those with intellectual disability.³ Recommendations for improvement of oral health in this group has centred around the provision of individually tailored oral health care plans which incorporate dietary advice. The literature has reported barriers to comprehensive dental management for those with developmental disability including incomplete medical histories, poorly organised post-operative management, suboptimal home care or poor compliance for treatment.⁴ As such, dental treatment for individuals with developmental disability requires careful planning to overcome the specific barriers that may present during particular time points of the proposed treatment.⁴ As for Mr G's case, this was evident in the support worker availability for the post-operative period and the risks associated with local anaesthesia.

Also in the case of Mr G, family members and support workers played an important role in early diagnosis of self-inflicted oral lesions.⁵ Post local anaesthesia for dental treatment, biting the soft tissues of the lip, tongue or cheek is a well-documented adverse complication arising from either curiosity with an unfamiliar sensation of being numb or inadvertently due to the lack of pain sensation.⁶ There have also been reports of accidental lip biting during post-operative eating or sleeping. This type of self-inflicted or factitious injury has typically been reported in the paediatric

population with the incidence of soft tissue trauma highest in the youngest age groups.⁶ Regardless of the type of local anaesthesia used, post-operative soft tissue anaesthesia can last for up to several hours.⁶ The literature has described increased susceptibility for the development of factitious ulcers to include individuals with developmental disability such as those with intellectual disability, autism and other syndromes particularly where there may be insensitivity to pain.⁷ Other high risk groups include those with schizophrenia, itinerant lifestyles, substance abuse and sexual abuse victims.⁷ One study reported complication rates following local anaesthesia of 8.1% amongst 172 people, aged between 16-66yrs with developmental disability (60.5% with intellectual disability) who were seen in a portable dental clinic.⁸ In this study, the most commonly encountered complications included self-inflicted soft tissue injury or inadequate anaesthesia.⁸ However, these complications were of a mild (78.6%) to moderate nature (21.4%) with none reported as severe.⁸ Severe complications following local anaesthesia have been described as those involving extensive pharmacological management, hospitalisation or death.⁸

The literature suggests the management of self-inflicted injuries following dental local anaesthesia should be limited to a conservative approach of analgesia, chlorhexidine and monitoring.⁷ The lesions are self-limiting and heal without complication typically over 10-14 days.⁹ Topical local anaesthetics applied to the area of injury have been suggested for analgesia⁹ but need to be used with caution to prevent further injury in those with developmental disability. However, in the presence of secondary infection and systemic signs such as fever, antibiotic therapy should be instituted with the aim of prevention or treatment of superinfection.⁴ Additionally, encouragement for maintenance of oral hygiene assists in preventing superinfection and encourages healing.⁴ is currently a lack of evidence based treatment protocols for oral self-injury in those with developmental disability, and therefore therapy must take an individualised and tailored approach.⁴ Monitoring of the oral lesion allows for differentiation between functional and organic self-injury.⁴ As was the case with Mr G, further context and history provided by his caregiver, can be useful to assess healing progress.

The use of mandibular infiltrations versus block local anaesthesia does not serve to significantly prevent self-inflicted injuries as the duration of soft tissue anaesthesia may not be reduced.¹⁰ In Mr G's case, the local anaesthesia plan was guided by the need to undertake quadrant dentistry. This included the surgical removal of the tooth 46 and restorative treatment needs in a single appointment. The need for adequate local anaesthesia to ensure compliance was another important consideration for Mr G. As such, an IAN block was chosen for treatment, with restricted quantity used in an effort to decrease the duration of post-operative numbness. However, as for all local anaesthetics, the duration of soft tissue anaesthesia exceeds that of dentinal or osseous anaesthesia.⁷ There is currently no research demonstrating a reduction in soft tissue trauma with the use of shorter acting

local anaesthetics such as lignocaine or articaine.⁷ However, the main advantage of short acting local anaesthetics is they present a reduced timeframe of expected anaesthesia. Subsequently, the length of any post-operative monitoring required is also shortened. Short acting local anaesthetics are frequently preferred in order to reduce the risk of post-operative complications for those with developmental disability requiring dental treatment under local anaesthesia.⁹

The differentiating and integral factor in the prevention of traumatic injuries for all individuals and specifically those with developmental disability is the education given to patients, caregivers and support workers. Post-operative instructions ideally should include supervision for a realistic time frame (approximate duration of numbness) and information regarding the risk of possible trauma.⁹ Monitoring of individuals with developmental disability for several hours after any dental appointment that requires local anaesthesia is important.⁹ It is imperative any post-operative information is given using simple words and language. This should be clearly and directly provided, avoid jargon, abbreviations, acronyms, or the use of metaphors and must be shared to all involved caregivers and support workers in the team.^{10,11} The literature has suggested visual examples of complications post treatment can often be used to highlight the importance of potential complications.⁹ Other suggestions to reduce risk of injury have included the use of a non-adrenaline containing local anaesthetic, placement of a cotton roll in the muco-buccal fold post-operatively and ongoing lubrication of the lips to prevent drying.¹¹ The fabrication of intra-oral appliances such as a lip guard for the prevention of self-inflicted soft tissue injury in those with developmental disability has also been reported in the literature.¹²

In Mr G's case, it is possible that post-operative instructions were not provided extensively following the recontour of tooth 46 or the absence of post-operative monitoring may have primarily contributed to the factitious injury or a combination of factors. It may have been more prudent for the initial tooth recontouring to have been carried out without local anaesthesia particularly given definitive treatment was not being provided. Mr G required support with executive function, prompting and supervision for both general and oral healthcare.

However, the requirement for support can frequently be overlooked and this case highlights the need for further education around high functioning patients with developmental disability living in the community. This case presents an excellent learning opportunity for all dental practitioners to be mindful of nuanced considerations around provision of local anaesthesia for this population. By doing so, there is potential to reduce risk of complications. This case also highlights the need to consider the individual's social circumstances, level of support and care needs in the dental treatment planning of people with mild intellectual disability. In many cases, caregivers and support staff play a vital role in the post-operative care phase. It is imperative that this is done whilst maintaining the individual's dignity, respect and autonomy.

Given the high levels of support staff turnover and shiftwork, effective communication and handover is paramount.

CONCLUSION

This case report demonstrates an instance of a localised lip swelling in an individual with mild intellectual disability; which rapidly progressed to inflammatory oedema with an overlying infective component. Although conservative management was employed with good success, the case highlights the importance of careful appointment planning. This may necessitate a tailored, detailed post-operative plan with both the individual and their caregivers to avoid complications with routine dental procedures especially for patients with developmental disability. This case report raises awareness of this issue as an increasing number of people with developmental disability access dental care in the community.

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The need for a sustainability dentistry guideline in Aotearoa New Zealand

C Murthi, H Han

Auckland University of Technology

ABSTRACT

Environmental sustainability has emerged as a significant issue in dental practices. Notably, the increased usage of personal protective equipment (PPE), primarily composed of single-use plastics (SUPs), poses a significant challenge to sustainable dentistry. This discussion paper explores the environmental implications of dental practices in Aotearoa New Zealand and the necessary interventions for transitioning towards sustainable dentistry, focusing on waste reduction.

Despite the growing awareness of environmental impacts among oral health practitioners, substantial barriers persist. These include a perceived conflict between high-quality patient care, infection control, and environmental sustainability. A lack of education on managing resources and robust sustainable guidelines heightens the lack of sustainable actions. The paper explores potential plastic waste reduction strategies and sustainable practices such as digitisation, 3D printing, and the development of eco-friendly materials for personal protective equipment (PPE). It also highlights the need for preventive care, effective recycling of SUPs and PPE, and meaningful partnerships with dental product companies for innovative solutions.

The paper advocates for creating sustainability dentistry guideline that align with the objectives of the Dental Council, Ministry of Health, and Ministry of Environment. Such guidelines would promote the integration of sustainability into daily operations of dental practices, using a plan-do-check-act (PDCA) model, and contribute towards a circular economy within the dental sector. The transition towards a more sustainable future for dentistry in New Zealand requires a multifaceted approach. This includes reevaluating traditional practices, increased research and collaboration, and formulating clear guidelines and sustainable waste management strategies.

INTRODUCTION

Humanity is facing a particular global challenge of climate change. Collectively as an industry, oral health practitioners (OHPs) are working with unclear environmental sustainability guidelines. Therefore, progress is limited due to the lack of funding, resources, education, and knowledge of sustainable practices. To ensure a system-wide change, decision-making must occur at all dental industry levels. The dental industry in New Zealand should provide OHPs with a robust standards framework that includes ethical codes of conduct related to the environment. These guidelines will help initiate a more coordinated system-wide approach toward reducing waste generated by the dental industry. The New Zealand government's climate change response is to become carbon-neutral by 2050 (Simmelmayer, 2020). The emissions reduction plan sets the overall direction to achieve low carbon emissions and become a more productive, sustainable, and climate-resilient economy (Ministry for the Environment, 2022). The dental industry should look at supporting Aotearoa NZ's commitments under the Paris Agreement to promote an affordable, safe and responsive way of achieving environmental sustainable goals (Martin et al., 2021). Combined with the recent guidelines and resources provided by the FDI World Dental Federation, OHPs can commit to managing plastic waste in their clinics (FDI World Dental Federation, n.d.). This discussion paper aims to provide an understanding of the growing need to establish a sustainability dentistry guideline, in particular waste reduction from personal protective equipment (PPE), single-use plastics (SUPs) and dental homecare products.

BACKGROUND

Climate change, also called the 'hidden pandemic', threatens humans, their health, and biodiversity (McKeever, 2021). Māori are particularly vulnerable to the impacts of climate change as their cultural, spiritual and economic practices are tied with nature and livelihood (Grix & Watene, 2022; Parker, 2020). Coastal communities, food-gathering sources, sacred areas are being threatened by rising sea levels, flooding, plastic pollution and drought amongst other adverse effects. Environmental loss, loss of biological diversity and changes to ecological systems disconnects them from the life-force of the environment (mauri) (Grix & Watene, 2022; Parker, 2020). The deeply held philosophies regarding the natural environment (Kaitiakitanga), the associated cultural practices are closely linked with health and well-being (Grix & Watene, 2022; Parker, 2020). Restoring the environment also has connections to cultural well-being. New challenges arise from shifting weather patterns, rising sea levels, rising sea temperatures, extinction of species, and changing natural systems. Climate change strongly correlates with health and globally is associated with 150,000 deaths per year, primarily seen in underdeveloped countries (Martin et al., 2021; United Nations Conference on Trade and Development, 2021). The World Health Organization (WHO) estimates that by 2050, heat stress, malnutrition, and other environmentally related health conditions will be responsible for 250,000 additional deaths yearly (World Health Organization 2021).

While recent focus has been on the coronavirus disease 2019 (COVID-19) pandemic, the crisis humans face due to

climate change is far more significant due to its severity, extent, and spectrum, leading to a potential overall cost to humanity due to increased burden on the healthcare system (Ahmadifard, 2020). Literature suggests that the COVID-19 pandemic may be linked to climate change as the species migration due to habitat change may have increased the spread of the virus to other species (Bernstein, n.d.). Changes in human activities combined with environmental changes have significantly impacted migrations of certain native species and increased the chance of a viral spread (Gupta et al., 2021). Climate changes would likely bring new viruses, diseases, and vectors, and the imbalance in the ecosystem heightens the risk of having another pandemic (Gupta et al., 2021). In the recent decade, urgent calls for action have been directed at all countries to strategise ways to improve health, reduce inequity, and address climate change issues to preserve natural resources and the environment (Martin et al., 2021; United Nations, 2022). Some countries, such as the United Kingdom, have legislated to reduce carbon dioxide gas emissions, while New Zealand has chosen to become carbon neutral (Duane et al., 2020).

It is well-known that healthcare delivery, especially dentistry, is not environmentally sustainable due to high waste generation (Duane et al., 2020). Paradoxically, health care that aims to support and protect people's health contributes destructively to climate change through unsustainable practices (Martin et al., 2021). In dentistry, OHPs are required to use personal protective equipment (PPE) and single-use plastics (SUPs), which generate a large amount of general waste. In addition, a significant amount of dental homecare products such as toothbrushes, toothpaste and interdental brushes end up in landfill. It is inevitable to create non-recyclable waste as some are considered critical bio-hazard (Martin et al., 2022), yet there is room for improvement to be a more environmentally sustainable industry.

More OHPs are raising concerns about how we use our natural resources and manage waste (Grose et al., 2016). The practice of sustainability and advocating for sustainable practices are primary ways to counteract health and environmental effects and mitigate climate change consequences (Vogell and Azzam, 2020). The United Nations defined sustainability, also known as sustainable development, as "meeting the needs and aspirations of the present without compromising the ability to meet those of the future" (United Nations 1987, pg. 39). In the last decade, sustainability has gained attention and action in dentistry, known as 'green dentistry' (Duane et al., 2020). Broad strategies have been outlined by the FDI World Dental Federation which include preventative care, operative care, integrated care, and ownership of care (FDI World Dental Federation, n.d.). Furthermore, the three main project goals are suggested to help deliver ethical, high-quality, safe, and environmentally sustainable oral health care. The first goal focuses on increasing awareness of implementing sustainable actions in the community, the second describes the need to develop a guide for OHPs, and the third concentrates on strengthening guidelines with research

and literature review (FDI World Dental Federation, n.d.). Unfortunately, professional awareness of sustainability has been diminished by the recent global health crisis, the COVID-19 pandemic. Government resources, already limited and insufficient, have further been challenged by a global pandemic. The WHO estimated that 89 million masks, 76 million gloves, and 1.6 million safety glasses were required each month in the global response to the COVID-19 pandemic (Ahmadifard, 2020, Singh et al., 2020).

This raises the question of whether short-term goals of protecting public health can align with long-term environmental goals. Addressing health and environmental issues and improving policies require a collaborative and interdisciplinary approach to accelerate reducing carbon emissions to achieve proposed emission reduction plan targets (Auckland Council, 2023; Islam and Kieu, 2021). Further understanding must ensure that policies and strategies are adequate for different communities. This requires analysis of social practices, values, beliefs, and cultural perspectives to help identify barriers to sustainable practice (Islam and Kieu, 2021).

PLASTIC POLLUTION

There is overwhelming evidence of microplastics polluting oceans, entering food chains and damaging ecosystems (Lee and Kim, 2022). Global plastic production increased from 250 million metric tonnes in 2009 to 368 million tonnes in 2019 (Lee and Kim, 2022); 8 million tonnes of plastics enter the oceans per year which is a significant contributor to climate change (Jamieson, 2021). However, Aotearoa New Zealand was slow to implement a plastics ban compared to other countries which focuses mainly on consumer recycling (Jamieson, 2021). The government response to the 'rethinking plastics' report was to develop guidelines relating to sustainable use of plastics, identified as high priority. Plastic consumption in dentistry is constantly being overlooked therefore the dental industry needs to change their relationship with plastics, shifting perspective by treating it as a valuable resource rather than a disposable one.

The shift in priorities from acting sustainably to solely protecting self and the public during the COVID-19 pandemic health crisis hindered progress in reducing waste. Around the world, there is growing evidence of discarded masks and gloves ending up in the ocean, beaches, and nature trails. If disposal patterns continue, it will result in about 75% of COVID-19-related PPE waste ending in the environment (Zhang et al., 2021, Singh et al., 2020). This will be a challenge to manage sustainably if immediate actions are not taken to coordinate strategies to address the manufacturing and waste lifecycle (Singh et al., 2020).

As many countries are getting used to a new 'normal' post the COVID-19 pandemic, new strategies are required to reduce carbon emissions and waste generation to prevent further destruction of the environment. Plastic consumption needs to be reduced, which requires maximising its management whilst

reducing the burden on the waste management sector. The shift from the concept to mainstream sustainable movements has guided changes in many health sectors, yet dentistry is showing a much slower pace in developing sustainable policies, research and education to make green dentistry achievable (Duane et al., 2020). The dental field, being a high-energy and resource-intensive industry requires a collective and strategic action plan moving towards a circular plastics economy.

Most OHPs are aware of the environmental issues but cannot integrate sustainability into practice due to the conflict between providing quality care and maintaining high infection control standards (Mittal et al., 2020, Martin et al., 2021). OHPs' changing attitudes, priorities and behaviours can initiate a system-wide change to improve policies, prioritise actions and navigate a way out of a plastic-abundant environment.

IMPACT OF THE COVID-19 PANDEMIC ON PLASTIC WASTE

The COVID-19 virus has a high affinity for saliva and oral tissues and is transmitted via aerosol (Sandhu et al., 2022). As OHPs operate in an aerosol-generating environment using rotary instruments, air-water syringes, ultrasonic scalers, and other equipment. Extensive PPE measures and extra precautions were required to minimise the risk of infection during the pandemic (Lee and Kim, 2022). In 2019 and 2020, 2.3 billion PPE items were distributed in England alone to respond to the COVID-19 pandemic (Zhang et al., 2021). In New Zealand, after limiting dental procedures during the lockdown period, a new standard of infection control was introduced to enable dental services to continue while ensuring OHPs are protected (Dental Council New Zealand, 2021). This places additional PPE to protect practitioners, other dental team members, patients, and their families. It is anticipated there will be a 20% increase in mask usage globally from 2020 to 2025 due to the COVID-19 pandemic (Singh et al., 2020).

The increasing demand for PPE exacerbates issues relating to production and disposal, which can cause added risk to the environment and atmosphere (Ahmadifard, 2020). Firstly, increased PPE production increases the demand for raw plastics, which may lead to increased fracking or petrochemical manufacturing, which are toxic to the environment and add to carbon emissions (Ahmadifard, 2020). Secondly, contaminated PPE is a 'clinical waste', its disposal is heavily regulated, often requiring incineration, which releases toxins into the air. Incineration still does not guarantee the complete elimination of toxic pollutants and microparticles of plastic from the environment (Ahmadifard, 2020). Collectively, dental practices' use of SUPs and PPE can have a considerable environmental impact.

AWARENESS OF ORAL HEALTH PRACTITIONERS

OHPs are ethically obligated to make climate-conscious decisions and tailor interventions to change professional

practice (Mittal et al., 2020). However, awareness of environmental impact still remains low across the profession due to a lack of education and understanding of the current sustainable goals (Martin et al., 2021; Grose et al., 2016). OHPs often provide care without considering the treatment-related impact on the environment (Singh et al., 2020). The clinical waste audit conducted at the Capital and Coast Hospital Dental Department in New Zealand indicated three to four times as much waste per patient was being generated compared to similar studies from Greece, Iran, and India (Koyama et al., 2022). Even though different patient demographics and needs and the difference in cross-infection standards are not considered, the sizable difference cannot be ignored (Koyama et al., 2022).

There is a great need for the dental industry to understand international and national environmental sustainability goals and align practice with sustainable plans. Behaviours and attitudes that exist within the profession, such as not considering or prioritising sustainable practices, are impediments to change. To change the narrative, processes would need to change at educational, institutional, and individual levels. There is much need to increase the knowledge base of all oral health professionals to support the shift to practising sustainably and integrate sustainability goals into daily practice (Barker et al., 2022). Additionally, there is a need to support research and development into more sustainable PPE and recycling, which aligns with achieving a more circular economy (Singh et al., 2020, Zhang et al., 2021).

CURRENT WASTE MANAGEMENT STRATEGIES

Eco-friendly dentistry is still an emerging concept and part of a broader vision of providing ecologically sustainable healthcare (Duane et al., 2020). The main areas of dentistry that require improvement are waste management, energy and water consumption, transport, procurement, and single-use plastic items, including PPE (Martin et al., 2021). There are some barriers to adopting sustainable dentistry. Factors like the cost of switching to sustainable methods or products, time, lack of knowledge on best practices, limited sustainable products, professional obligations, and infection control cannot be ignored (Martin et al., 2021). Also, the molecular composition of masks comprising a combination of polymers and other materials makes separating materials for recycling or processing very complex (Rahman et al., 2022).

Even now, some methods will help resolve some environmental issues. Digital technology such as digital radiography eliminates conventional radiographs that require harmful chemicals to develop and uses toxic lead foil packaging (Mittal et al., 2020), reducing the amount of heavy metals. Digitisation also made single-visit dentistry possible by fabricating crowns and inlays through a computerised milling and grinding unit, saving time for OHP and the patient. This also reduces carbon emissions by minimising patient appointments and reducing travel. Moreover, going

paperless received attention during the pandemic with paper forms going digital. This included appointment reminders, patient forms, consent forms, invoices, and patient letters. 3D printing has a growing interest in sustainability because of its potential for mass production and its advantage over traditional manufacturing methods. 3D printing or additive manufacturing can also be explored to produce sustainable PPE using biodegradable or eco-friendly materials (Irfan Ul Haq et al., 2020), thus solving shortages and saving materials that usually go to waste if using subtractive manufacturing methods. The benefits of using 3D printing include the ability to use multi-material for printing, short product development cycle, customisation capability, time efficiency, and cost-effectiveness (Irfan Ul Haq et al., 2020).

Perhaps the most powerful way to reduce our use of plastic-based PPE would be to invest in an alternative, PPE made from renewable materials. This is a sentiment that has been reflected in the manufacturing sector. Some options explored in different studies were electronic textiles and antimicrobial textiles (Karim et al., 2020). In the hopes of providing more sustainable options for protective equipment in the setting of the pandemic, plastic-free visors comprised of sustainably sourced wood pulp and paper have been launched in the United Kingdom (UK) (Ahmadifard, 2020). Developing biodegradable materials like oxy-biodegradable suction tubes, tissues, barriers, wipes, towels, and cups that can enter the environment will not lead to long-term consequences (Plastics New Zealand, n.d.). Considering autoclavable plastic or stainless-steel suction tubes and cups to help increase the lifecycle of products. Oxy-biodegradable options are becoming more popular –plastic has an additive that degrades the plastic in the environment, and then once broken down, microorganisms further break down the plastic into nutrients for the soil (Plastics New Zealand, n.d.). We can reduce the amount of plastic by promoting high standards of oral healthcare that focus on preventable care. The consequence of good oral health can reduce the need for interventive operative care, leading to a reduction of required appointments, waste generation, and carbon emissions.

Increasing greener options for oral care products, such as bamboo toothbrushes or plant-based products, and providing digitised educational materials are also some sustainable practices seen in clinics. An innovative move to new recyclable toothpaste tubes was made to help reduce the 20 billion tubes in landfills annually. The Colgate company has exemplary strategies and goals which other companies can adopt (Colgate-Palmolive, 2023; British Dental Journal News., 2021). Collaboration between dental product companies and OHPs can encourage the public to take sustainable actions. Some companies offer free recycling programs to support communities in being environmentally friendly. Dental clinics can utilise this service to collect items, such as toothpaste tubes and caps, electric toothbrush heads, floss containers, recyclable toothbrushes, manual toothbrushes, and interdental brushes, from patients and hand them over to recycling companies. Dentistry is

highly commercialised, and from that perspective marketing sustainable practices such as recycling could improve the reputation of those companies to OHPs and consumers (Ovideo-Allison and Shockley, 2021; Wainer, 2022).

A NEED FOR A FUTURE SUSTAINABILITY GUIDELINE FOR AOTEAROA NEW ZEALAND

Even simple principles can effectively and practically reduce waste from dental clinics. De Leon emphasised that most OHPs consider two critical aspects for accepting new sustainable initiatives (De Leon 2020). Firstly, the simplicity of the recommendations and the ease of implementation. Secondly, the ability to see immediate success with the application of sustainable initiatives. Small changes, such as reducing the use of paper, digitising educational material, and electronic receipts, can lead to positive environmental impacts.

Khanna and Dhaimade suggested that most waste generated in dental clinics can be easily recycled (Khanna and Dhaimade 2019). To support New Zealand OHPs towards the clinical practice that promote environmental sustainability, the dental industry should work with New Zealand Dental Council, Ministry of Health, and Ministry of Environment to develop sustainable dentistry guidelines. Based on the current study, most of the research, data, analysis, and best practice guidelines originate from the UK, providing a general theme, plan, and identification of barriers related to sustainable practice. The UK evidence-based recommendations are still helpful for New Zealand OHPs. Yet, creating best practice guidelines for New Zealand OHPs and dental practices, followed by future research, will ensure applicability to the unique local community incorporating Tikanga Māori. Collaborative efforts of individual OHPs and the governing body will ensure New Zealand dentistry remains sustainable and viable.

RECOMMENDATIONS

It is believed that actions toward environmental sustainability are largely a government task. However, people are recognising their responsibility at a more individual, business, organisational, and corporate level. Ovideo-Allison and Shockley suggest beginning with a plan, do, check, and act (PDCA) model for integrating sustainability into daily operations and dental care models (Ovideo-Allison and Shockley 2021). Moreover, recognising the organisation's culture, purpose, philosophy, and priorities is also essential to ensure the continuity of these processes. A high level of commitment is required from leaders and organisations to establish policies, philosophy, priorities, and an action plan. The scope of management needs to be realised as this will help formalise commitment at other levels of the industry. Organisations must be transparent about their processes and reviews to generate trust in the system.

Data collection on plastic waste needs improvement therefore expanding on current evidence is imperative as well

as improving the accessibility of data on plastics to OHPs. To achieve carbon reduction, the dental industry collaboration with dental clinics could carry out emissions assessments and plastic audits. Companies such as Toitu Envirocare, Energy Emissions and Conservation Authority, climate connect Aotearoa, and plastics New Zealand are key examples of how sustainability changes businesses and industries. Enhancing the links to external stakeholders and dental supply companies and seeking more collaborative relationships will drive investment towards a more circular economy. This strategic change, supported by waste minimisation initiatives and funding for innovative solutions that aims to create a more circular and sustainable economy by offering alternatives to plastic-use through creation of new materials and mitigation of plastics (Auckland Council, 2023). This coincides with research filling knowledge gaps and encouraging innovation.

Recycling dental materials should take a much more significant role in managing clinical SUPs, including PPE, and packaging as it offers a solution to reduce waste (Oktem et al., 2023). Therefore, dental students can become great leaders to promote recycling programmes in universities and clinics (Oktem et al., 2023). The use of best practice guidelines through the adoption of technology, effective logistical management systems, and environmental regulations will be the key to a more sustainable practice with less use of plastic. A step forward would mean improving existing waste management infrastructures and developing a circular economy that allows PPE to be recycled, reused and processed, minimising environmental damage. This will be a challenge to manage sustainably if immediate actions are not taken to coordinate strategies that address manufacturing and waste cycles (Singh et al., 2020).

CONCLUSION

What is understood from historical events is that a movement towards a zero-carbon goal for Aotearoa New Zealand will require a multifaceted approach. Objectively looking at transforming traditional ways of practising dentistry and building relationships with the dental industry and government stakeholders will improve the plan of action. New Zealand needs to recognise their own framework, which requires more research, but it is critical to start making changes; waste management are one area all OHPs can focus on.

In conclusion, this discourse underscores the urgency to transform dental practices into more sustainable models. It is evident that OHPs in New Zealand, like their counterparts globally, are navigating a challenging landscape fraught with the necessity to balance quality patient care and strict infection control standards against an ever-increasing environmental footprint. Although the increasing environmental consciousness among OHPs signals a positive shift, persistent barriers need to be addressed through comprehensive, actionable, and context-specific sustainability guidelines. The exploration of potential strategies set a course toward a future where dental practices significantly contribute to

sustainable development. Moving forward, engaging dental product companies and fostering partnerships for innovative, environmentally friendly solutions will undoubtedly enhance the sector's sustainability while protecting public health. The proposal of creating robust, comprehensive waste reduction guidelines and the integration of a PDCA model in routine operations are steps in the right direction. It is critical to start making changes now before it is too late.

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Congratulations to Barbara Dewson MNZM



The ANZDOHT congratulates NZOHA life member and dental therapist Barbara Dewson on becoming a member of the New Zealand Order of Merit (MNZM) for services to dental and oral health therapy! Barbara graduated from the Willis St School of Dental Nurses in 1970 serving as the Supervising Dental Nurse for the Whanganui District between 1983 and 1994 before becoming the Dental Manager for Good Health Whanganui Hospital and Community. She initiated two community dental projects for free dental health care for adults at Rātana Pā and in Ohakune.

She was Treasurer of the New Zealand Dental Therapists' Association and their Journal editor for 12 years and became a founding editor of the ANZ Journal of Dental and Oral Health Therapy in 2012. In 2002, she contributed to developing the dental therapist competencies for dental therapist practice in preparation for the registration of Dental Therapists in 2003. Following registration, she was Chair of the Dental Council's Dental Therapy Board for nine years and, more recently, has provided dental/oral health therapy professional advice.

In 2009, she assisted in redesigning the Whanganui School Dental Service (now the Community Oral Health Service), in particular the mobile dental facilities offered in schools by the District Health Board. She was awarded Dental Therapist of the Year in 2016 and has been Treasurer of the New Zealand Community Oral Health Services Society for 13 years. Mrs Dewson received life membership of the New Zealand Dental and Oral Health Therapists' Association.

Ka mau te wehi Barbara! Your profession is very proud of you and this award recognises all the hard mahi she continues to provide behind the scenes!

On behalf of the dental and oral health therapy professions in Australia and New Zealand we congratulate and pay tribute to Barbara on her 50 plus years of outstanding contributions to the dental therapy and the oral health of the community.

Congratulations on your PhD

Dr Stacey Bracksley-O Grady

BOH, Grad Dip Public Comm.Health, BPH (Hons), PhD (La Trobe University)

Current role: Lecturer at La Trobe Rural Health School



Congratulations on your PhD

Dr Smita Keshoor

PhD, BOHT (AUT)

Current role: Current Role: Oral Health Therapist Auckland, (formerly Lecturer Oral Health AUT)



EXPLORING THE ROLE OF HEALTH PROMOTION IN IMPROVING ORAL HEALTH (WORKFORCE DEVELOPMENT)

Dental disease is one of the most common non-communicable diseases globally and poses a major public health problem. Despite many health promotion initiatives successfully improving oral health outcomes, rates of dental disease remain unacceptably high in at risk populations. Health promotion initiatives are key to improving oral health outcomes across the life span, but in practice are often poorly defined and understood. A multimethod study was undertaken to explore the role health promotion plays in improving oral health, the health promotion training of dental and oral health professionals in practice and the role that non-dental providers might play in improving population oral health. The research methods employed to answer these important questions included a nominal group technique, a content analysis and Delphi survey methods. This thesis contains seven published studies presented in two sections. The first section focuses on workforce development and includes an exploration of health promotion within dental and oral health curricula and identifies gaps in health promotion training within Australian universities. In section two the Continuum of Health Promotion Practice is applied to examine health promotion approaches that may be used to improve oral health and the role non-dental health professionals might play. Three studies focusing on population approaches (guidelines for toothbrushing programs within childhood settings), behavioural approaches (oral health training sessions for non-dental professionals) and individual approaches (dental screening) are presented. A fourth study exploring the knowledge and practices of paediatricians completes this section. The discussion draws on theoretical and contemporary literature highlighting the role of multidisciplinary teams in the prevention of dental diseases. Key findings demonstrate that health promotion training is required for both dental and non-dental professionals to increase understanding of the disease process and the role that health promotion and prevention can play in improving oral health outcomes. Key recommendations for research, policy, practice, and education are presented.

Thesis Reference:

Bracksley-O'Grady, S. (2023). Exploring the role of health promotion in improving oral health (workforce development, Doctoral dissertation, La Trobe University. OPAL: https://opal.latrobe.edu.au/articles/thesis/Exploring_the_role_of_health_promotion_in_improving_oral_health_workforce_development_/23544261

List of associated publications

Bracksley-O'Grady, S., Dickson-Swift, V., Anderson, K & Gussy, M. (2015). Health promotion training in dental and oral health degrees: a scoping review *Journal of Dental Education* 79 (5), 584-591

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ABSTRACT

Study Purpose: To investigate the effects of early-life vitamin D supplementation on the dental health of New Zealand (NZ) children. Background: NZ has a high caries burden, where dental disparities exist from a very young age. Children of Māori and Pacific ethnicity have a higher risk of developing early childhood caries (ECC) compared to NZ European children, as do children living in socioeconomically deprived households.

Vitamin D deficiency (VDD) has been linked with ECC, particularly if it is present during tooth developmental periods. VDD is prevalent in pregnant NZ women and young Māori and Pacific children. Aim: To assess the effects of pregnancy and infancy vitamin D supplementation on ECC and developmental dental defects.

HYPOTHESIS

Pregnancy and infancy vitamin D supplementation protects the primary dentition against ECC and enamel developmental defects. Objectives: To compare the dental health of preschool children, who received one of two vitamin D supplementation doses or placebo, during pregnancy and infancy.

METHODOLOGY

Participants were recruited from the Pregnancy and Infancy Vitamin D (PIVID) study, where 260 pregnant women and their infants were randomly assigned to one of three treatment groups. Vitamin D or placebo supplementation was given to pregnant women from 28 weeks gestation until delivery, and their infants from birth to age six months. The three supplementation groups comprised of: higher dose vitamin D, lower dose vitamin D (mothers: 2000/1000 IU, children: 800/400 IU per day, respectively), and placebo (Grant et al., 2014). The study sample comprised of approximately 30% Māori and 50% Pacific children.

Children from the PIVID study were dentally examined at ages two, three and four. Data were collected on dental outcomes, demographics, and maternal and infant dental risk factors. Descriptive statistics and regression

models were used to compare the effects of vitamin D supplementation on childhood dental health outcomes.

These were: the presence of all 20 primary teeth, decayed missing and filled teeth (dmft), enamel developmental defects, dental plaque present and plaque and gingival indices.

RESULTS

This observational study followed a cohort of children previously enrolled in the PIVID randomised control trial (RCT). This study was not powered to be able to show statistical significance for clinically important differences in oral health outcomes between study groups.

Children in the higher dose vitamin D group had odds of 3.16 (95% CI 0.90-14.78, $p = 0.096$) of having all 20 primary teeth present at age two, compared to placebo, and odds of 0.39 (95% CI 0.13-1.11, $p = 0.081$) of having decayed teeth at three years old. Children in the higher dose vitamin D group had increased odds of dental plaque present on teeth, at ages two (OR = 7.29, 95% CI 1.87-48.52, $p = 0.012$) and three (OR = 4.20, 95% CI 1.27-19.79, $p = 0.032$), compared with placebo. Additional risk factors associated with increased odds for ECC were irregular dental visits, ethnicity, and a higher intake of sugar snacks.

CONCLUSION

In NZ, where ECC and vitamin D deficiency are prevalent, vitamin D supplementation in pregnancy and early infancy may be beneficial in protecting the primary dentition against ECC.

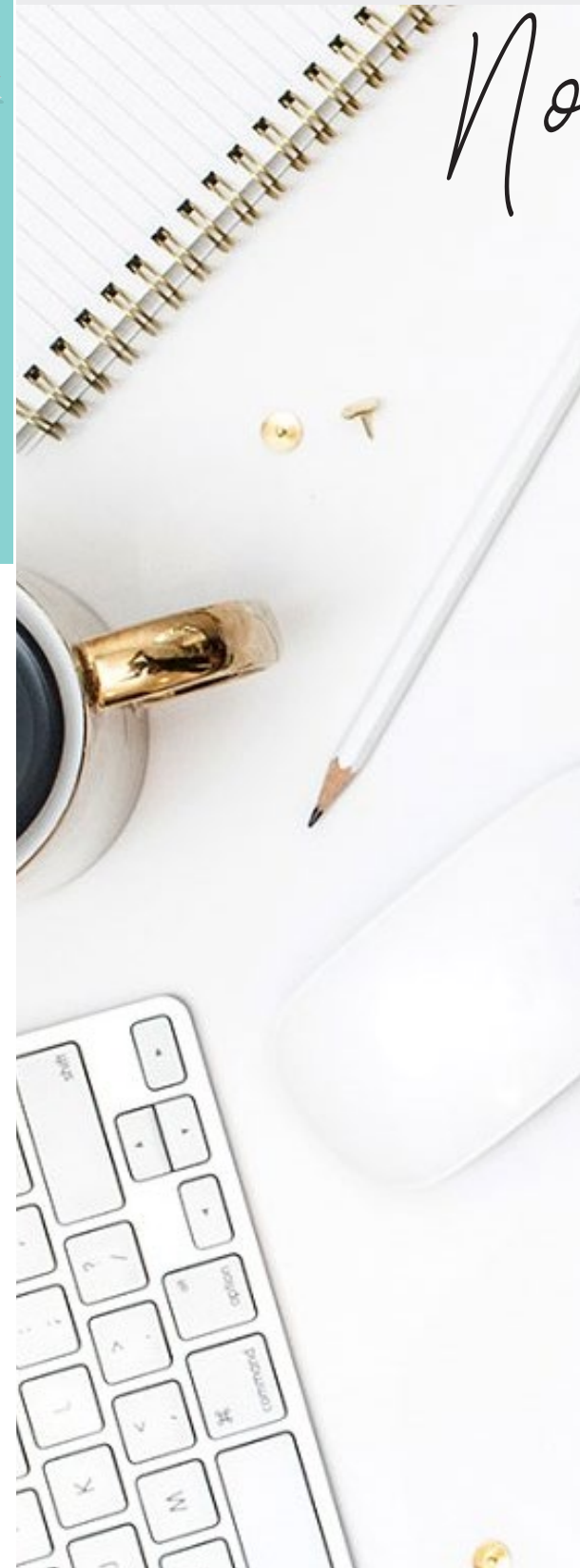
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Online access for the Thesis: <https://hdl.handle.net/10292/14503>

Smita Keshoor, Oral Health Therapist (PhD)

Websites of interest



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Diabetes Australia produces a number of diabetes resources that are available to health professionals and the general public. <https://www.diabetesaustralia.com.au/tools-e-learning> Cone Beam CT Radiation Licensing Courses. Presented by Dr Louise Brown. Teledent. <https://teledent.com.au/CPD-RADIATION-LICENSING-COURSES~156>

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