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Inconsistencies in recommendations on oral hygiene practices for children by professional dental and paediatric organisations in ten countries

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Background. Some of the basic dental health practices that are recommended to the public by professionals are not evidence based. Incorrect oral health messages may adversely affect children's oral health behaviours.

Aim. To identify and list the recommendations concerning children's oral hygiene practices provided by dental and paediatric organisations, and to assess how these recommendations relate to the scientific evidence currently available.

Design. *Cross-sectional*. The authors contacted professional organisations in ten countries requesting items (brochures, leaflets or folders) containing messages on children's oral hygiene practices. They then listed these recommendations and assessed how they related to scientific evidence obtained from systematic reviews available at PubMed and the Cochrane Library.

Results. Fifty-two of 59 (88%) organisations responded to our request and 24 dental health education materials were submitted to the authors. They mentioned recommendations on oral hygiene practices for children, such as toothbrushing frequency, supervision and technique; when to start and how long toothbrushing should last; toothbrush design and replacement; flossing; gums/teeth wiping; tongue cleaning; type and amount of toothpaste and advice on toothpaste ingestion. The search at PubMed and the Cochrane Library resulted in 11 systematic reviews addressing these topics.

Conclusions. Several oral hygiene messages delivered by professional organisations showed inconsistencies and lacked scientific support.

Introduction

There is an ethical obligation of health professionals to ensure that materials disseminated to the public on dental health education must be evidence based. Incorrect and conflicting messages may confuse people and hinder compliance with oral health practices which may eventually undermine their confidence in health professionals[1].

Conflicting health messages stem from lack of or poor scientific evidence, or evidence that has not been systematically summarised. These make it difficult to provide consistent evidence-based recommendations. Practitioners then tend to fall back on tradition, experience or outdated evidence[2]. They may feel unsure about providing sound counselling in an environment of uncertainty[2–4].

Practitioners may find difficulty in keeping up-to-date with emerging knowledge because of the increasing rate of dental publications and their lack of skills to critically appraise research quality[2,5,6]. Moreover, patients can obtain oral health information from multiple sources[7]. When taken together, these issues may substantially contribute to the dissemination of contradictory health messages.

The aims of this study were to identify and list the recommendations concerning children's oral hygiene practices provided by national dental and medical (paediatric) organisations aimed at the general public, and to assess how these recommendations relate to the scientific evidence currently available.

Materials and methods

First, we selected countries that had a significant scientific output of dental research[8]: Uni-

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ted States of America (USA), Canada, United Kingdom (UK), Denmark, Finland, Norway, Sweden, Australia, Japan, and Brazil. Secondly, we selected the national organisations according to their apparent international reputation and by browsing the websites of the World Dental Federation, the International Association of Paediatric Dentistry and the International Association of Paediatrics. Attempts were made to select at least one general dental organisation, one paediatric dentistry organisation and one paediatric (medical) organisation per country. Lastly, whenever an organisation did not produce the item requested but suggested we should contact another organisation, this other organisation was also included.

A first round of e-mails was sent to each organisation in September 2008. In case of no answer, four more attempts (two e-mails and two letters) were made until April 2009. The postal addresses and e-mails of all organisations were obtained either by searching Google™ or at the websites of the international associations mentioned above. All organisations were requested to send any and all kind of items such as brochures, leaflets or folders containing recommendations on children's oral hygiene practices aimed at the general public. As some websites are more search-friendly than others and to avoid missing any information, we also asked the organisations whether information on this issue was disclosed on their websites.

Scientific evidence was obtained from systematic reviews available at the Cochrane Oral Health Review Group (http://www.ohg.cochrane.org/reviews.html)[i] and at PubMed (http://www.ncbi.nlm.nih.gov/sites/pubmedutils/clinical)[ii], using the tool 'Clinical Queries', the filter 'Find Systematic Reviews' and the text words 'oral hygiene' and 'dentifrices', accessed on January 10, 2010. It was defined *a priori* that only mechanical oral hygiene practices would be assessed: toothbrushing, flossing and gums/tongue cleaning. The search and the selection of the systematic reviews were performed by one author (APPS). Whenever there were any doubts about the pertinence of a review, another author (PN) was consulted and any disagreement was solved by consensus.

Results

Recommendations provided by professional organisations

Of the 59 dental or medical organisations that were contacted by mail or electronic mail (Fig. 1), 52 (88%) answered; 20 reported not producing the items requested, even though one disclosed information on the topic on its website; 22 sent the items requested either in print or electronic format and ten sent items that were further excluded due to idiom constraints or because they were aimed at professionals or did not address the topic of interest. Among the seven organisations that did not answer, one disclosed the information requested on their website, amounting to 24 items to be evaluated (Table 1). All items mentioned at least one aspect of children's oral hygiene practices such as toothbrushing frequency, supervision and technique; when to start and how long toothbrushing should last; toothbrush design and replacement; flossing; gums/teeth wiping; tongue cleaning; type and amount of toothpaste and advice on toothpaste ingestion (Table 2).

Almost all organisations provided information on toothbrushing frequency, type of toothpaste and amount of toothpaste. On the other hand, many organisations failed to provide any recommendation concerning toothbrushing technique, the amount of time children should spend at toothbrushing, toothbrush replacement and tongue cleaning. Huge inconsistencies were detected concerning the most appropriate toothpaste for children and although the vast majority of organisations advocated toothbrushing supervision, there was no consensus about until what age this practice is needed.

Scientific evidence currently available

The search carried out at the Cochrane Oral Health Review Group retrieved 95 systematic

[i]Self-Archived at WebCite® on January 10, 2010 (http://www.webcitation.org/5mgBmSiOE).

[ii]Self-Archived at WebCite® on January 10, 2010 (http://www.webcitation.org/5mgBzHGv1).

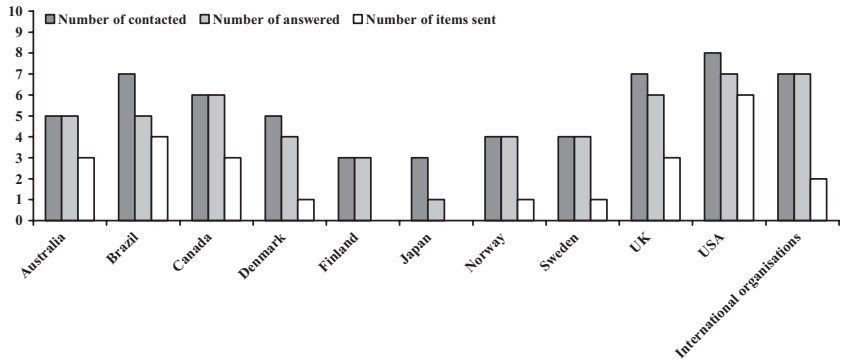

Fig. 1. Number of dental and medical organisations in each country that were contacted, answered and sent items containing oral hygiene messages.

reviews, five of which were considered pertinent to this study. The search carried out at PubMed Clinical Queries yielded 258 citations using the text words 'oral hygiene' and 72 using the text word 'dentifrices'. Of these 330 citations, six were systematic reviews addressing the topic of interest. Only systematic reviews focusing on oral hygiene practices aimed at children were considered[9–19] (Table 3).

One systematic review assessed the role of flossing in the reduction of interproximal caries[12] whereas the other ten addressed issues pertaining to fluoride toothpaste[9–11,13–19]. Concerning the role of fluoride dentifrice in caries prevention, a significant increase of the preventive fraction was found when toothbrushing with fluoride dentifrice was performed twice daily in comparison with only once a day[14]. Also, three systematic reviews reinforced the need to supervise children's toothbrushing as it probably results in a higher compliance and a higher frequency of fluoride dentifrice use[11,14,19]. Two systematic reviews about low fluoride dentifrice showed lower caries increments in children using 1000 ppm dentifrices in comparison to children using 250 ppm dentifrices. One does not recommend the use of 250 ppm dentifrices in areas where fluoride levels in water are low[9], whereas the other supports the use of 250 ppm dentifrices when fluorosis is of concern[18].

Discussion

Other health professionals, apart from paediatric dentists, play a role in oral health education aimed at children. For instance, children are more likely to visit a paediatrician than a dentist in their first years of life. Despite limited knowledge of and little familiarity with basic oral health-related issues, most paediatricians acknowledge their role in identifying dental problems, counselling families on dental caries prevention and referring patients[20]. Therefore, in this study we gathered oral hygiene messages conveyed not only by paediatric dental associations, but also by other organisations that may, at least to some extent, provide counselling on oral health to the general public. The fact that there was no attempt to draw a representative sample of national or international organisations or to make comparisons across countries does not weaken the importance of our findings. Whenever dentists, oral health programs, academic institutions or the Internet deliver conflicting oral health messages to the public, confusion, scepticism and low acceptance of educational messages may arise[1,7]. Thus, the existence of a certain level of disagreement among oral hygiene recommendations should be addressed despite the lack of representativeness.

Organisations that recommend twice daily toothbrushing are in line with current available scientific evidence on frequency of toothbrushing. However, there is no evidence suggesting that higher frequencies of toothbrushing, i.e., more than twice a day, are beneficial. Hence, systematic reviews addressing head to head comparisons of different frequencies of toothbrushing are required.

There is general agreement on the importance of supervised toothbrushing, although recommendations differ on at what age children are able to brush their teeth on their own. This may give rise to doubts as to when

Table 1. Dental and medical (paediatric) organisations that responded and sent dental health materials on children's oral hygiene practices.

Organisation	Item provided
Australia	
Australian Dental Association	*Oral hygiene for babies and toddlers* (http://www.webcitation.org/5mevLBvmr)*
Australian and New Zealand Society for Paediatric Dentistry	*Preventive care for children* (http://www.webcitation.org/5mevfbJXZ)*
Australian Research Centre for Population Oral Health	*Oral health promotion for infants, and preschool and school children* (http://www.webcitation.org/5mex16SNb)*
Brazil	
Association of Dental Surgeons of the State of São Paulo**	Information sent by e-mail
Brazilian Association of Health Promotion Dentistry	*Sorriso em todas as idades* (http://www.webcitation.org//5mevxeEAd)*
Brazilian Dental Association	Folder sent by mail (*Educação em saúde bucal*)
National Oral Health Council, Ministry of Health	*Caderneta de saúde da criança* (http://www.webcitation.org//5mf56jJOT)* and *Mantenha seu sorriso fazendo a higiene bucal / corretamente* (http://www.webcitation.org/5mf5vxYJA)*
Canada	
Canadian Dental Association	*Dental Care for Children* (http://www.webcitation.org/5mexNdyM7)*
Canadian Paediatric Society	*Healthy teeth for children* (http://www.webcitation.org/5mexbqs3K)*
Health Canada	*Health living – oral health* (http://www.webcitation.org/5meyyiaYY)*
Denmark	
Danish Society of Pediatric Dentistry	Information sent by e-mail
Norway	
Norwegian Association for Promotion of Oral Health	Folder sent by e-mail (*Veiviser til god tannhelse*)
Sweden	
Swedish National Board of Health and Welfare	Folder sent by e-mail (*Folktandvården – the Dental Public Service in / Stockholm*)
United Kingdom	
British Dental Association	*BDA Smile – Infants & Children* (http://www.webcitation.org//5mexHmlE9)*
Department of Health	*Dental care for babies and children* (http://www.webcitation.org//5meyZz24C)*
Scottish Intercollegiate Guidelines Network	*Prevention and management of dental decay in the pre-school child /* (http://www.webcitation.org/5mezrjQmy)*
United States of America	
American Academy of Pediatrics	*Children's health topics – oral health* (http://www.webcitation.org//5metlHAHn)*
American Academy of Pediatric Dentistry	*Parent Education Brochures* (http://www.webcitation.org//5metnDAV1)*
American Dental Association	Folders sent by mail (*Happiness is a healthy smile, Healthy smiles for / mother & baby, Your child's teeth, Why baby teeth are important*)
Centers for Disease Control and Prevention	*Brush Up on Healthy Teeth* (http://www.webcitation.org//5mf4ewHar)*
National Institute of Dental and Craniofacial Research	*A Healthy mouth for your baby* (http://www.webcitation.org//5mezLkkWc)*
National Maternal and Child Oral Health Resource Center	*Head Start – FAQs* (http://www.webcitation.org/5mezWwwld)*
International organisations	
European Academy of Paediatric Dentistry	*A guide to oral health for the prospective mothers and their infants /* (http://www.webcitation.org/5meyhGWyd)*
International Association of Paediatric Dentistry	*Parents – Let me ask you, Doc* (http://www.webcitation.org//5mezCrWJQ)*

*Self-Archived at WebCite® on January 9, 2010.
**Despite named 'São Paulo', it is in reality a national organisation.

parents should brush their children's teeth and when only supervision is required. It should be pointed out that the studies that assessed toothbrushing supervision were carried out in schools or similar settings. It remains unclear whether home toothbrushing supervision, as advised by dental and medical organisations, is capable of providing the same protection against dental caries as school-based supervised programmes do.

Scant scientific evidence, implied by lack of systematic review, may partly explain why

Table 2. Oral hygiene recommendations aimed at children provided by 24 dental and medical (paediatric) organisations.

Subject	Recommendation	Number of organisations
Toothbrushing		
Toothbrushing frequency*	Subject not mentioned	7
	At least once a day	4
	Twice a day	14
When to brush*	Subject not mentioned	7
	After meals	8
	After sugar intake	2
	After medication intake	2
	After breast/bottle feeding	4
	Before sleeping	11
Toothbrushing supervision*	Subject not mentioned	5
	Toothbrushing should be supervised	4
	Until 6 years of age	2
	Until 7 years of age	2
	Until 8 years of age	4
	Until 9 years of age	3
	Until 10 years of age	2
	Until 11 years of age	2
	Until the child is skilled	5
	Children brush on their own and parents finish off toothbrushing	5
	Parents should brush their children's teeth until 2 years of age	1
	Parents should brush their children's teeth until 3 years of age	2
	Parents should brush their children's teeth until 4 years of age	1
	Parents should brush their children's teeth until 6 years of age	1
	Parents should brush their children's teeth until 7 years of age	2
	Parents should brush their children's teeth until 12 years of age	1
	Parents should brush their teeth in front of their children	4
Toothbrushing technique*	Subject not mentioned	16
	Gentle motions	6
	Small circular motions	5
	Short back and forth motions at chewing surfaces	5
	Do not scrub	3
	Angle the bristles towards the gums at 45 degrees	2
	Jiggle the toothbrush from the gum line towards the tip of the tooth	2
	Avoid flicking and circular motions	1
	Three or two teeth at a time	2
	One tooth at a time	1
	Use a disclosing solution	3
When to start toothbrushing*	Subject not mentioned	4
	When the first primary tooth emerges	13
	When the first primary molar emerges	5
	After the eruption of the incisors	2
	At 18 months of age	2
	At 24 months of age	1
Time spent at toothbrushing	Subject not mentioned	21
	At least one minute	1
	2 minutes	2
Toothbrush design*	Subject not mentioned	8
	Finger toothbrush	2
	Child toothbrush	5
	Small head	10
	Soft bristles	14
	End-rounded bristles	2
	Bulky handle	1
	Powered toothbrush	4
Toothbrush replacement*	Subject not mentioned	19
	Every 3–4 months	4
	When it becomes worn out	2

Table 2. ***Continued.***

Subject	Recommendation	Number of organisations
Flossing*	Subject not mentioned	13
	At least twice a week	2
	Daily	3
	Daily, whenever teeth have contact	5
	When children are two and a half years of age	1
	Parents should floss until 8–10 years of age	3
	Parents should supervise flossing until 10–11 years of age	1
	Floss with fluoride toothpaste	1
Gums/teeth wiping*	Subject not mentioned	8
	Until the first primary tooth emerges	4
	Until the first primary molar emerges	5
	Until one year and a half	1
	Until the second birthday	1
	Using gaze pad or wet cloth	14
	Using a soft-bristled toothbrush	6
	Using a finger toothbrush	3
Tongue cleaning	Subject not mentioned	20
	Children should have their tongue cleaned	4
Toothpaste		
Type of toothpaste*	Subject not mentioned	3
	Non-fluoride toothpaste until 18 months of age	1
	Non-fluoride toothpaste until 2 years of age	5
	Non-fluoride toothpaste until 3 years of age	4
	Non-fluoride toothpaste until 4 years of age	2
	Low fluoride toothpaste until 6 years of age	3
	Fluoride toothpaste, irrespective of age	9
Amount of toothpaste*	Subject not mentioned	3
	Small amount	1
	Smear	10
	Pea grain	14
	Rice grain	2
	Bean grain	1
	Child's little finger nail	1
	Transversal technique	1
Advice on toothpaste ingestion*	Subject not mentioned	7
	Keep the tube of toothpaste out of children's reach	5
	Do not swallow toothpaste	15
	Do not eat or lick toothpaste	1
	Do not rinse after toothbrushing	6
	Do not rinse after toothbrushing with lots of water	1
	Rinse after toothbrushing	1
	Rinse well after toothbrushing	1

*The number of organizations does not add up to 24 as the same organization may provide more than one recommendation.

toothbrushing techniques, amount of time spent at toothbrushing and frequency of toothbrush replacement have been overlooked by most organisations.

Flossing is regarded as an integral part of tooth cleaning as it disrupts and removes dental biofilm at interproximal surfaces and the biological plausibility of interproximal caries reduction due to flossing is widely accepted by lay people and professionals. The only systematic review on flossing we found failed to show interproximal caries risk reductions for self-flossing, although the authors acknowledged the presence of a moderate to high risk of bias in the trials evaluated[12]. However, dentists and health organisations should bear in mind that there is lack of evidence to support self-flossing as a measure to prevent interproximal caries, especially when people are exposed to fluoride.

Although the effectiveness of fluoride dentifrice in reducing the incidence of dental caries has already been established[11,14,19], no

Table 3. Summary of systematic reviews* focusing on oral hygiene practices aimed at children.

Title	Author/Year	Conclusions/Recommendations
Systematic review of studies comparing the anti-caries efficacy of children's toothpaste containing 600 ppm of fluoride or less with high fluoride toothpastes of 1000 ppm or above	Ammari *et al.*[9] (2003)	Toothpastes containing 250 ppm F were not as effective in caries prevention in permanent dentition as those containing 1000ppm F. Data comparing 500 ppm with 1000 ppm fluoride toothpastes were very limited and further research is required
Reduction in dental caries with four concentrations of sodium fluoride in a dentifrice: a meta-analysis evaluation	Bartizek *et al.*[10] (2001)	The use of a 2800-ppm F dentifrice showed significantly lower caries increments than the use of a 1100-ppm F dentifrice in school children. The 1700 ppm F and 2200 ppm F dentifrices showed some directional advantages over the 1100 ppm F dentifrice, although not statistically significant
Anticaries effectiveness of fluoride toothpaste: a meta-analysis	Chaves *et al.*[11] (2002)	Toothbrushing with fluoride toothpaste significantly decreases the incidence of dental caries. Higher caries reductions were observed when toothbrushing was supervised
Dental flossing and interproximal caries: a systematic review	Hujoel *et al.*[12] (2006)	Professional flossing in children with low fluoride exposure and poor toothbrushing habits is effective in reducing interproximal caries risk. Self-flossing has failed to show an effect. Studies assessing the effects of fluoride toothpastes and flossing devices are required
Topical fluoride (toothpastes, mouthrinses, gels or varnishes) for preventing dental caries in children and adolescents	Marinho *et al.*[13] (2003)	The benefits of topical fluorides have been firmly established. No conclusions about adverse effects could be reached
Fluoride toothpastes for preventing dental caries in children and adolescents	Marinho *et al.*[14] (2003)	There is clear evidence that fluoride toothpastes are effective in preventing caries, regardless of water fluoridation. Higher effects were shown with higher baseline caries levels, increased fluoride concentration, increased frequency of use (toothbrushing performed twice daily in comparison with only once a day) and supervised toothbrushing. No conclusions about adverse effects could be reached
Combinations of topical fluoride (toothpastes, mouthrinses, gels, varnishes) versus single topical fluoride for preventing dental caries in children and adolescents	Marinho *et al.*[15] (2004)	Topical fluorides (mouthrinses, gels or varnishes) used in addition to fluoride toothpaste achieve a modest reduction in caries compared to toothpaste used alone. However, combined use of topical fluorides and toothpaste may be considered for children at higher risk of caries. No conclusions about adverse effects could be reached
One topical fluoride (toothpastes, or mouthrinses, or gels, or varnishes) versus another for preventing dental caries in children and adolescents	Marinho *et al.*[16] (2004)	Fluoride toothpastes, mouthrinses and gels reduce caries in children and adolescents to a similar extent but acceptance is likely to be greater for fluoride toothpaste. There is no strong evidence that varnishes are more effective than other types of topical fluoride. No conclusions about adverse effects could be reached
Comparison of the anticaries efficacy of dentifrices containing fluoride as sodium fluoride or sodium monofluorophosphate	Proskin *et al.*[17] (1995)	Dentifrices containing fluoride as sodium fluoride or as sodium monofluorophosphate provide equivalent anticaries effectiveness
Effect of 1000 ppm relative to 250 ppm fluoride toothpaste. A meta-analysis	Steiner *et al.*[18] (2004)	Slightly lower caries increments were found in children using 1000 ppm fluoride toothpastes when compared with children using 250 ppm fluoride toothpastes. The authors state that the 1000 ppm toothpaste's effects on fluorosis and the availability of fluoridated salt justify the use of 250 ppm toothpastes for Swiss preschool children
Caries-preventive effect of fluoride toothpaste: a systematic review	Twetman *et al.*[19] (2003)	There is strong evidence for the caries preventive effect of daily use of fluoride toothpaste. Superior preventive effects were found with 1500 ppm F toothpastes and supervised toothbrushing. There is incomplete evidence regarding the effect of fluoride toothpaste in the primary dentition

*Self-Archived at WebCite® on January 10, 2010. Cochrane Oral Health Review Group: http://www.webcitation.org/5mgAGHLGp; PubMed using the text words 'oral hygiene': http://www.webcitation.org/5mgB6zESt; PubMed using the text word 'dentifrices': http://www.webcitation.org/5mgBBZjLf.

systematic review addressed its dental fluorosis risk. Nowadays, children may be exposed to different sources of fluoride, which arguably puts them at a higher risk of fluorosis, especially those aged 20–30 months old, a critical period for sustaining aesthetic alterations in the permanent upper incisors[21]. Hence, dental and medical organisations agree that preschool children should not only use a small amount of dentifrice but also avoid swallowing it. Other strategies aimed at preschool children that have been adopted by a number of organisations include refraining from fluoride dentifrice and using low fluoride dentifrice. However, in light of current evidence, it seems unjustifiable to prevent preschool children from the well-established benefits of fluoride dentifrice. Regarding low fluoride dentifrice, both systematic reviews addressing this topic highlight important weaknesses in the trials included and most of these trials were performed in schoolchildren, whereas the target population for low fluoride dentifrice use comprises preschool children[9,18]. Therefore, it seems premature to advise preschool children to brush their teeth with low fluoride dentifrice due to fluorosis concerns, especially because it has been suggested that mild fluorosis does not have a negative impact on the perception of dental appearance, self-rated oral health or child and parent perceptions of oral health-related quality of life[22].

The post-brushing behaviour is a source of controversy among organisations, as it is among researchers. We found two clinical trials on the topic showing different results[23,24]. Hence, the evidence on to rinse or not to rinse with water after toothbrushing remains inconclusive.

Although there seems to be no apparent explanation for postponing the age children should start toothbrushing, some organisations do not recommend toothbrushing soon after the eruption of the first tooth. Concerning wiping babies' gums prior to tooth eruption, although it is a widely recommended practice, its effectiveness has yet to be proved.

Items from four organisations stated the need for tongue cleaning, even though they were rather unclear about the benefits accrued from this behaviour. On the one hand, there is evidence that toothbrushes and tongue scrapers reduce the levels of volatile sulphur compounds and thus may be effective in the treatment of halitosis in adults[25]. Maybe the importance of tongue cleaning among children lies in the fact that acquiring this habit at an early age could result in its maintenance in adulthood and avoid halitosis in children and adults. On the other hand, the presence of mutans streptococci appears to be a predictive factor for dental caries risk in preschool children[26]. As it has been suggested that the tongue is a potential reservoir for these cariogenic species in young children[27], the act of tongue cleaning may have implications for dental caries prevention, although it is noteworthy that this intervention has not been tested in a clinical trial.

Several of the oral hygiene messages identified showed inconsistencies across the different organisations and although some of these messages are in line with the best currently available scientific evidence, most lack scientific support. This study raised some potential areas for future research, which can contribute to an appropriate incorporation of scientific evidence by dental and medical organisations and eventually reduce conflicting oral hygiene messages delivered to the general public.

What this paper adds

- This paper reports that there exist serious differences in the dental health education messages that dental professional organisations disseminate to the public.

Why this paper is important for paediatric dentists

- This paper highlights the need to provide the public with evidence-based recommendations regarding oral hygiene practices.

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