

The provision of dietary advice by dental practitioners: a review of the literature

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Purpose: The aim of this literature review was to examine the dietary advice practices of dentists and dental hygienists and to identify factors influencing whether practitioners provide dietary advice to patients. **Methods:** A systematic search was carried out of the electronic databases CINAHL Plus, Medline via OVID and the Cochrane Library, using the search terms 'Diet', 'Nutrition', 'Dental hygienists' and 'Dentists'. Articles included in the review were all empirical studies and existing literature reviews examining the provision of dietary advice practices of dentists, dental hygienists and dental students. Only articles published after 1993 were included in the review to better reflect the current practices of dental practitioners. **Results:** The literature revealed that dietary advice is rarely provided by dental practitioners, and that when dietary advice is provided it is often limited. The literature also established that provision of dietary advice is influenced by a number of factors, including financial considerations, time constraints and the dietary education of dental practitioners. **Conclusions:** Further research is required to strengthen the findings from the review and to investigate dietary advice specific to the prevention of dental erosion. Additional research is also required to examine dental curricula and assess the dietary advice practices of dental students.

Key words: diet, nutrition, dental hygienist, dentists

Introduction

Oral health related problems are a costly burden to health care systems, as well as impacting significantly on an individuals' self-esteem, ability to eat, health and quality of life (Moynihan and Petersen, 2004). Diet has a direct, local effect on oral health, particularly in regard to the formation of dental caries and dental erosion (Moynihan and Petersen, 2004). The incidence of dental caries in the Australian population has dropped considerably over the past 30 years, however it appears that this trend has plateaued and, in fact, among children caries experience has been on the rise since 1993 (Mejia *et al.*, 2012). Dental erosion appears to be on the rise in many industrialised countries (Moynihan and Petersen, 2004) and it is often suggested that an increase in the consumption of acidic drinks is the major factor behind this trend (Nunn *et al.*, 2003).

Dental caries is caused by the demineralisation of hard tooth structure and occurs when bacteria metabolise ingested sugars, causing organic acids to be produced. The organic acids decrease pH, causing calcium to be lost from the tooth surface and subsequent demineralisation to occur (Moynihan and Petersen, 2004). Dental caries is, therefore, closely related to diet, as it is dependent on the presence of sugars.

Dental caries affects people throughout all life stages, with a range of effects observed among different age groups. Early Childhood Caries (ECC) is a dental disease which should be of particular concern to dental practitioners. ECC is characterised by severe, rampant caries in the teeth of young children and is strongly associated with frequent consumption of drinks containing sugars, such as juice, sweetened milk and baby formula (Kawashita, 2011). Given the close

association between diet and ECC, dietary advice is arguably the most important form of treatment in preventing ECC, and Manski and Parker, (2010) argue that dental hygienists should be instrumental in ECC prevention. Older people are particularly vulnerable to root caries, with root surface caries being more prevalent in older adults than any other age group (Saunders Jr and Meyerowitz, 2005). It is likely that this high root caries experience is related to recession of the gingiva or damage caused by oral hygiene habits (Saunders Jr and Meyerowitz, 2005) and be exacerbated by dietary changes as a result of institutionalisation. Dry mouth may also be a risk factor for caries among older people and may be related to increasing polypharmacy in elderly patients (Hajjar *et al.*, 2007).

Dental erosion is the progressive loss of hard tooth structure caused by contact with acids, including dietary acids, environmental acids and intrinsic acids from reflux or vomiting. Acids found in food are the most common cause of dental erosion, with popular sources including soft drinks, fruit juices, wine, some herbal teas and large quantities of vinegar, pickles and citrus fruits (Moynihan and Petersen, 2004). One group who are particularly vulnerable to dental erosion are teenagers, in particular teenage boys (Arnadottir *et al.*, 2010). It is believed that the high prevalence among adolescents is due to an increased consumption of soft drinks (Taji and Seow, 2010), and may also be associated with adolescents' gaining independence in making food choices. Educating patients about the potential damage that dietary acids can cause is extremely important in preventing and managing dental erosion (Bartlett, 2009).

A literature review carried out by Thompson *et al.* (2003) demonstrated that dietary advice provided by dieti-

cians and other health professionals has the potential to influence patient eating habits. Given the influence of diet on dental disease, it seems logical that dental practitioners should be providing dietary advice to their patients. However, a study assessing the dietary counselling practices of dental hygienists in Oregon observed that only 53% of dental hygienists provided any dietary advice to patients; this study also found a significant link between hygienists' own dietary knowledge and their confidence in nutrition, as well as the quality of the dietary advice (Levy and Raab, 1993). Furthermore, research conducted by Threlfall *et al.* (2007) revealed that the content of dietary advice provided by general dentists in the UK varied greatly.

It appears that dietary advice is often overlooked by dental practitioners and when dietary advice is given, the advice varies considerably. This is a concern given the clear relationship between diet and dental disease (Moynihan and Petersen, 2004). Levy and Raab carried out a study in 1993 which examined the dietary counselling practices of dental hygienists in Oregon and reviewed current and past literature on the topic. The aim of this review therefore, is to build on the information from the literature review presented in this paper, by critically analysing the current literature and reporting on the frequency of provision of dietary advice by dental hygienists, dentists and dental students, considering high risk groups. The review also aims to examine whether any factors influence the content or frequency of dietary advice.

Methods

Criteria for consideration

Studies considered for the review were empirical studies, case studies and existing literature reviews published in peer-reviewed journals. Only studies published between 1993 and March 2013 were included in the review, as a review was carried out in 1993 by Levy and Raab which examined previous literature on the topic. Participants considered were dentists, dental hygienists and dental students, with no limits placed on participants' age, gender or the dental setting in which the dietary advice was provided. Studies included in the review were those investigating the provision of dietary advice by dental practitioners with an intention of influencing patients' health or preventing dental diseases. Papers not written in English were excluded from the review due to practicality reasons.

Outcome measures

The primary outcome assessed in the review was the frequency of provision of dietary advice. Frequency refers to the percentage of patients to whom dietary advice is given, measured either by self-reporting of dental practitioners or data taken from clinical records. Secondary outcomes assessed were factors influencing the frequency or content of dietary advice such as the dental practitioners' place of employment, number of hours worked per week, number of years practicing, as well as the age, general health or socioeconomic status of patients. These outcomes were also assessed mainly by self-reported measures.

Search Methods

A search was carried out in March 2013, using the following electronic databases: CINHAL Plus, Medline via OVID

and the Cochrane Library. The search strategy was developed for CINHAL Plus and the Medical Subject Headings (MeSH) used were 'Diet', 'Nutrition', 'Dental hygienists' and 'Dentists'. This search strategy was adapted for Medline via OVID and the Cochrane Library, so that the search term 'nutrition', which was unavailable as a MeSH term was searched as a keyword. The reference lists of manuscripts found in the initial search which were deemed relevant to the review were also examined for suitable papers.

Study Selection

Eligibility assessment was performed by screening the titles, keywords and abstracts of articles, where available, to determine their relevance. If the title or abstract was unclear the full text version of the manuscript was obtained and examined for relevance. The full text version of each study which appeared to be relevant to the literature review was obtained and each of these underwent data extraction and critical analysis. Papers were excluded if they did not measure the frequency of provision of dietary advice or influencing factors, or if duplicates were present. Terms accepted to indicate dietary advice included, 'dietary advice',

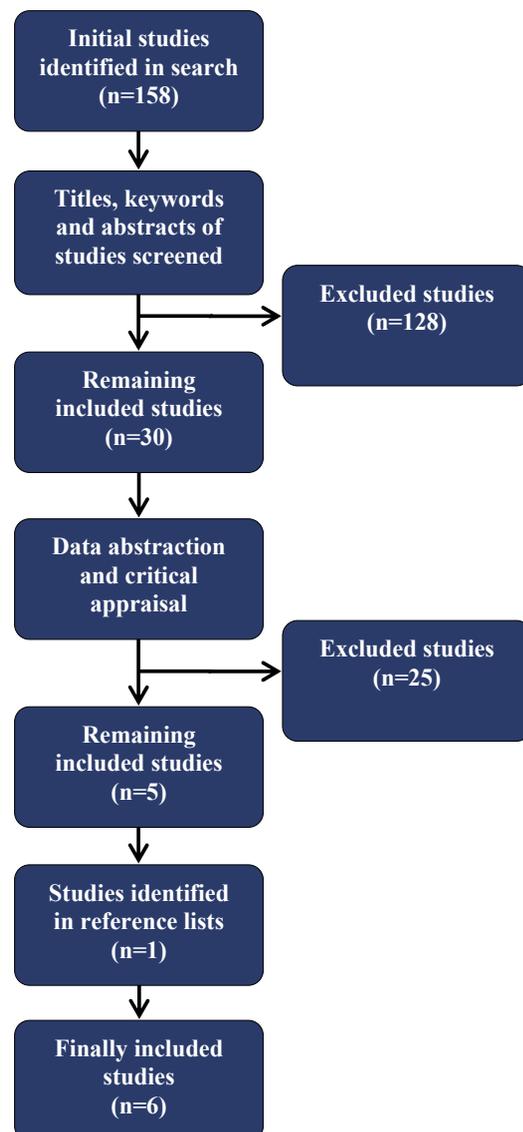


Figure 1. Flowchart of study selection

‘dietary counselling’, ‘nutritional advice’ and ‘nutritional counselling’. Two researchers were involved in the study selection process. Each study was assessed for methodological quality, including selection bias, measurement bias and potentially confounding factors.

Results

Description of studies

The initial search provided 158 results but after removing duplicates and excluding articles that did not meet inclusion criteria, just 30 articles remained. The full texts of the remaining studies were examined and it was decided that a further 25 articles did not meet the selection criteria. Only one further study was identified in the reference lists of relevant studies; making six studies deemed suitable

for inclusion in the review. A flowchart of the study selection process is presented in Figure 1. Of the six studies included in the review, one was a qualitative study using semi-structured interviews and the remaining five were cross-sectional studies. Four of the cross-sectional studies used a survey to obtain information and the other examined patient records. Of the six studies included in the review two were concerned solely with provision of dietary advice while the other four studies examined a range of preventive strategies, where provision of dietary advice was one of those discussed. No studies examining dietary advice specific to dental erosion were identified in the search. Furthermore, no studies involving students and no studies relating to elderly patients were identified. A summary of the included studies is presented in Table 1.

Table 1. Summary of included studies

<i>Author</i>	<i>Year</i>	<i>Age group</i>	<i>Persons providing advice</i>	<i>Main outcome</i>	<i>Secondary outcomes</i>	<i>Quality issues</i>	<i>Funding</i>
Källestål <i>et al.</i>	1999	Children and adolescents	Dentists and dental hygienists	Self-reported frequency of caries-prevention methods used, including application of fluoride, oral hygiene education, dietary advice and information on the use of fluoride.		Reliant on self-reporting through the use of questionnaires. Potential quality issues include recall bias and response bias.	Västerbotten County Council grants for the Swedish part of the study.
Levy & Raab	1993	Not specified	Dental hygienists	Self-reported frequency of dietary counselling procedures.	Self-reporting of: 1. Attitude towards the importance of nutrition to dental health 2. Confidence in nutrition knowledge and dietary counselling skills 3. Perception of practice constraints 4. Personal dietary practices	Responses were self-reported and may be influenced by recall bias and response bias. Generalisation may be limited to dental hygienists from Oregon.	Not specified
Manski & Parker	2010	Infants and toddlers	Dental hygienists	Self-reported knowledge, attitudes and practice behaviours of dental hygienists related to ECC.	Independent variables were age, type of practice, years practicing since graduation, amount of education, highest degree earned, percentage of children in practice, percentage of Medicaid patients treated and membership/years with ADHA.	As the study was dependant on self-reporting through surveys potential limitations include response bias and recall bias. Limited generalisability to dental hygienists practicing in Maryland.	Not specified
McKinney <i>et al.</i>	1996	Not specified	Dentists	Self-reported attitudes and practices of dentists toward nutrition counselling and nutrition-related activities.	Self-reported barriers preventing dentists from providing nutrition counselling and nutrition-related activities	As the study was dependant on self-reporting through surveys potential limitations include response bias and recall bias. The response rate was only 42.9%.	Not specified
Sarmadi <i>et al.</i>	2011	3-19 year-olds	Dentists and dental hygienists	Preventive measures provided, including fluoride, diet information, diet counselling, tooth brushing instruction, use of chlorhexidine and fissure sealants.		Generalisation may be limited to the public dental service in Uppsala County, Sweden. As a retrospective study its reliability is dependent on the quality of the records. Any failure of dental practitioners to note all measures in the records could potentially influence the study's results.	Not specified
Threlfall <i>et al.</i>	2007	‘Young children’	General dental practitioners	Qualitative semi-structured interviews regarding preventive services provided to young children.		As a qualitative study this is heavily reliant on the researcher and may be influenced by the researcher's personal biases and prior knowledge of the topic. The results are not generalisable to other populations.	Not specified

Provision of dietary advice by dentists

Limited research has been carried out to examine the frequency of provision of dietary advice by dentists, with only two relevant studies considered suitable for inclusion in the review. McKinney *et al.* (1996) report that a large percentage of dentists believe that provision of dietary advice lies within the realistic scope of practice for dentists and should be a part of routine patient care in the dental office. Despite these findings the same study observed that almost half of dentists (42.6%) surveyed in the US reported that they rarely brought up the subject of nutrition with their patients, although 37.7% of respondents mentioned the subject every few visits. Remarkably, a small number of dentists (8.1%) never brought up the subject of nutrition, or discussed it only once the patient had mentioned it. In addition to these findings the study revealed that the largest percentage of nutrition discussions (40.2%) lasted less than two minutes, with over 85% of all discussions lasting under ten minutes (McKinney *et al.*, 1996). Children in some European countries appear to receive dietary advice more frequently. According to a cross-sectional study (Källestål *et al.*, 1999), dietary advice was provided by dentists to 45, 56, 65 and 69% of children and adolescents in Iceland, Denmark, Norway and Sweden respectively. This dietary advice was the second most frequently provided preventive service by dentists in Denmark, Iceland and Sweden, following oral hygiene instruction. These results suggest that there is a greater focus on dietary advice in some European countries, in particular Sweden. However, it is important to note that the second study focuses on dietary advice provided only to children which may account for the increased provision of dietary advice.

Provision of dietary advice by dental hygienists

Only two studies were identified in the search which examined provision of dietary advice by dental hygienists. Consider first a study of dental hygienists in Oregon which reported that 52% of those surveyed provided dietary advice in their practices (Levy and Raab, 1993). However, more than half of the respondents provided dietary advice “to fewer than 10% of their patients”. Furthermore, it appears that approaches to provision of dietary advice vary considerably among dental hygienists. Diet intake records were used very rarely by these dental hygienists with only 3% reportedly using this method. Diet analysis was also performed infrequently, with less than one-in-five respondents analysing patients diets for nutritional adequacy. The most common approach among dental hygienists in Oregon was the provision of diet-related advice, with 64% of respondents reportedly opting to use this approach. From the other study (Källestål *et al.*, 1999), dietary advice appears to be provided more frequently by dental hygienists in Denmark and Norway where 56% and 72% of children and adolescents in Denmark and Norway, respectively, receive dietary advice from dental hygienists. However, as this study was interested in how many children received dietary advice, rather than how many practitioners provided dietary advice, the results are difficult to compare.

Dietary advice specific to high caries risk groups

A number of studies were identified in the review which investigated dietary advice provided specifically to high

caries risk groups. A Swedish study carried out in 2010 examined the clinical records of randomly selected high caries risk children from Sweden, to determine how frequently preventive strategies were provided to these patients (Sarmadi *et al.*, 2011). The study revealed that practitioners provided general diet information in approximately half the cases, with more lengthy and personalised diet counselling only being provided in every fifth case. When asked to rate the level of importance of different preventive services for risk patients, 62% of dentists in Sweden considered diet to be the most important service (Källestål, *et al.*, 1999). Similar to these findings, a qualitative study carried out in the UK found that all dentists surveyed in their sample of general dental practitioners reported that they provided advice about diet and oral hygiene to prevent caries in children, with most dentists believing that diet was the most important factor when providing preventive advice to children (Threlfall *et al.*, 2007).

Nutritional counselling was reported as the least frequent preventive method used by Maryland dental hygienists for controlling ECC, with hygienists more likely to use oral hygiene instruction, topical fluoride, home applied fluoride and fissure sealants (Manski and Parker, 2010). This study revealed that only 65% of respondents reportedly used nutritional counselling as a preventive method of reducing ECC. Although 65% of hygienists appears to be a reasonable figure, i.e. 35% of hygienists are not providing dietary advice to prevent ECC. These findings are a concern given the critical role that diet plays in the development of ECC (Kawashita, 2011).

Factors affecting the content or frequency of dietary advice

The literature identifies a number of different issues influencing dental practitioners' practices in providing dietary advice. Factors identified as having the biggest effect on whether US dentists incorporated nutrition counselling into the dental practice included time, the competence of staff, the importance of nutrition in the dentist's own life, the perceived importance of nutrition to patients, the relevance to dentistry and the view that the dentist was providing a service to patients (McKinney *et al.*, 1996). Interestingly here, lack of insurance reimbursements and other financial considerations did not appear to be of great concern to most dentists surveyed. Alternatively, lack of cost-effectiveness (62%) and lack of reimbursement by health insurance companies (55%) were identified as barriers by dental hygienists in Oregon (Levy and Raab, 1993). In addition, dietary advice conflicting with regular appointment scheduling was identified as a barrier by 86% of these dental hygienists.

Manski and Parker (2010) report that dental hygienists with more working hours per week were more likely to know of appropriate nutritional counselling practices than those working fewer hours. Dental hygienists who were members of the American Dental Hygienists Association (ADHA) for over 5 years were also more likely to provide nutritional counselling to control ECC. These researchers have suggested that this positive relationship may be due to the members being more likely to read ADHA literature, and therefore being more up-to-date with current practice recommendations. There was also a non-significant tendency reported by Sarmadi *et al.* (2011) for boys to receive more

dietary information than girls. These findings are interesting, given that dental hygienists reported providing fluoride treatment, toothbrush instruction and oral hygiene information to more girls than boys. It appears, therefore, that dental hygienists may consider boys to require dietary advice to a greater extent than girls.

There appears to be a correlation between dental practitioners' training and provision of dietary advice, however these findings vary significantly. McKinney *et al.* (1996) reported that only about one-third of dentists surveyed felt confident providing nutrition counselling to patients, despite the majority of respondents having had some form of nutrition education during their studies. Similarly, 60% of Oregon dental hygienists surveyed reported that dietary counselling skills were not adequately developed in their training though dental hygienists who graduated more recently were slightly more confident in providing dietary advice, however this association was weak (Levy and Raab, 1993). Alternatively, McKinney *et al.* (1996) reported that no significant relationships were found between provision of dietary advice and dentists' year of graduation or received hours of nutrition training.

The literature suggests that the decision of whether or not to provide dietary advice is influenced to a great extent by the opinions and knowledge of dental practitioners (Levy and Raab, 1993). Not surprisingly a significant positive relationship was observed between whether hygienists believed nutrition and dietary advice were important to oral health and whether dietary advice was provided. Furthermore, those dental hygienists who were confident in nutrition counselling also appear to provide dietary advice to a more often. In addition, a weak relationship was detected in that study between nutrition knowledge and quality of dietary advice.

Discussion

The results from this literature review indicate that dietary advice is provided to a limited extent by dental practitioners and when provided, is often brief. These findings mirror the results from the previous review carried out by (Levy and Raab, 1993). This literature review provides a useful background to the topic of provision of dietary advice by dental practitioners, however, the findings show that this topic is poorly researched, with only a small number of high quality studies identified in the search.

The results from this literature review indicate that many dental practitioners feel that dietary advice is a valuable service (Källestål *et al.*, 1999; McKinney *et al.*, 1996), however it appears that few dental practitioners regularly provide dietary advice (Levy and Raab, 1993; Manski and Parker, 2010; McKinney *et al.*, 1996; Sarmadi *et al.*, 2011). The literature suggests that many dentists in the US do not provide dietary advice to patients (McKinney *et al.*, 1996). These findings also appear to apply to dental hygienists many of whom do not regularly provide dietary advice (Levy and Raab, 1993). When dietary advice is provided, it appears to be brief and unspecific, with diet intake records or diet analysis rarely used (Levy and Raab, 1993; McKinney *et al.*, 1996). Dietary assessment is important because it guides dental professionals when providing dietary advice, allowing them to tailor their advice to suit different patients (Paxton *et al.*, 2011). It may be interesting to undertake further study to determine what dental professionals and dieticians consider to be the core elements of dietary advice and assessment.

While it is difficult to draw conclusions from the results of only one study, the literature indicates that under two-thirds of dental hygienists provide dietary advice for young children who are at a high risk of experiencing ECC (Manski and Parker, 2010; Sarmadi *et al.*, 2011). Furthermore, for many dental hygienists dietary advice is not seen as a priority in ECC prevention (Sarmadi *et al.*, 2011). Given the strong relationship between diet and ECC it seems apparent that dietary advice should be a major component of preventive care for reducing ECC. The findings from this review indicate that dental hygienists may benefit from continued professional development courses specific to ECC and suggest a need to review dental curricula to ensure that ECC is thoroughly covered. As no studies relating to elderly people were identified in the review, further research into provision of dietary advice specific to elderly people may be useful.

In addition, the findings from this literature review have established that dental practitioners are influenced by a range of factors in whether or not they deliver dietary advice to patients. The major factors identified in the research included financial considerations, time limitations, number of working hours per week, limited extent of nutritional training and being a member of a professional association (Levy and Raab, 1993; Manski and Parker, 2010). Interestingly, Levy and Raab reported that recent graduates were more confident in providing dietary advice, while Manski and Parker found that dental hygienists with more experience had better knowledge relating to nutritional counselling. One area not examined in the literature in any great detail is whether patient factors such as age or gender impact on whether dietary advice is provided by dental practitioners. This is an area which may require investigating to determine if dental practitioners provide dietary advice to high risk groups more often.

The findings from the review have highlighted that there may be barriers for dental practitioners providing dietary advice, which may indicate a need for this to be addressed in dental curricula (Levy and Raab, 1993; McKinney *et al.*, 1996). It is essential that dental practitioners not only receive sufficient and appropriate training, but are also able to apply their skills throughout the course of their studies (Levy and Raab, 1993). Training of dental practitioners should focus on educating practitioners about recognising when in-depth dietary counselling is indicated, for instance in the prevention of acid erosion in adolescents. Additionally, Manski and Parker (2010) have emphasised the importance of educating dental hygienists about the role that diet plays in ECC so that dietary advice becomes a major focus in its prevention. Dental practitioners may also benefit from continued professional development courses relevant to dietary advice.

While most of included studies measured practitioners' dietary advice practices (Manski and Parker, 2010; McKinney *et al.*, 1996; Sarmadi *et al.*, 2011), one study measured the percentage of patients receiving dietary advice (Källestål *et al.*, 1999). It is therefore difficult to draw comparisons between the studies, as different outcome measures were assessed. It may be useful to create a standardised tool for measuring provision of dietary advice to aid in future comparative studies. Additionally, as most of the studies in the review relied on self-reporting it is likely that the provision of dietary advice was over-reported by respondents. However, self-reporting is a convenient and efficient

method of obtaining data (Bowling, 2007). Sarmadi *et al.* (2011) relied on data obtained from clinicians' notes which may be a more reliable source of information. However, the reliability of the data from clinical notes is dependent on the quality of the records, and if the treatments provided do not match the records noted then this could potentially bias the results. A prospective study might not provide accurate results, as the results may be influenced by the Hawthorne effect; with the potential for practitioners to alter their practices, subsequently influencing the results of the study (Bowling, 2007). Therefore, self-reporting and data from clinical notes appear to be appropriate data collection methods.

Response bias was identified as an issue by some of the studies included in the review (Levy and Raab, 1993; Manski and Parker, 2010). Response bias may have affected the results, with dental practitioners who were more familiar with dietary advice recommendations or practitioners who treated mainly children being more likely to respond to surveys. It is also possible that sampling bias was present in the included studies. For instance, Källestål *et al.* (1999) used randomly selected participants from a sample of public dental clinics in Sweden. It may be that dietary advice practices of dental practitioners working in public and private practices vary due to financial reasons and differences in patient bases. Unpublished articles and studies not published in English were excluded from this review, potentially introducing publication bias into the results. However, a systematic protocol was adhered to, to ensure that the selection process was methodical and unbiased.

Conclusion

This study aimed to examine the frequency of provision of dietary advice by dentists, dental hygienists and dental students, considering high risk groups. The study also aimed to investigate any factors influencing the content or frequency of dietary advice. This review found that many dental practitioners do not provide dietary advice to patients and that, when provided, dietary advice is often limited. The small number of studies identified in the review highlights a gap in research into provision of dietary advice, particularly in regard to dental erosion and dietary advice specific to vulnerable groups such as elderly patients. Further research may be required to examine provision of dietary advice specific to prevention of dental erosion and to assess the frequency of provision of dietary advice to elderly patients. It may also be valuable to review the content of dental curricula and to examine dietary advice practices of dental students to ensure that dental practitioners are adequately trained and experienced in providing dietary advice.

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