**PROTOCOL FOR SCOPING REVIEW**

**1. Title: Eating advice for people who wear dentures: A scoping review of health education literature**

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**3. Background**

Tooth loss directly causes reduced chewing and eating function (Michael 1990) and denture wearers report problems with chewing and eating (Hyland et al 2009). Observational studies report that tooth loss is associated with a poor diet with lower intakes of fruits and vegetables (Tsakos et al 2010; Nakamura et. al 2019), dietary fibre (Iwasaki et al 2016), and protein (Iwasaki et al 2016; Mendonca et al. 2018), and higher intakes of saturated fat (Lee et al 2004) and increased risk of undernutrition (Ritchie et al 2000; De-Andrade et al 2014). Despite significantly improving chewing function, the majority of evidence indicates that prosthetic rehabilitation in the absence of dietary intervention does not result in consumption of a healthier diet (Moynihan et al 2000; Hamada et. al 2001; Madhuri 2014). However, McKenna et al reported a significant improvement in nutritional status following provision of partial dentures (McKenna et al 2012). A recent narrative evidence synthesis of interventions to promote healthier eating delivered concurrently with dental prosthetic restoration identified 8 studies that reported at least one positive outcome regarding healthier eating for all studies and indicated support for healthy eating interventions coupled with oral rehabilitation. Meta- analysis on the impact of dietary interventions on fruit and vegetable intake for three studies showed in a standardized mean difference (SMD) of 0.29 [CI -0.54, 1.12], p=0.49, but with marked heterogeneity (p=0.0007) (McGowan et al 2019).

Improving chewing and biting function through the provision of dentures improves eating function but not to the extent of a dentate person with 20+ natural teeth (Moynihan et al 2020). Dental prostheses do not fully restore eating function to the previously dentate level. Research has indicated that people that wear dentures have reduced eating-related quality of life (Hyland et al 2009; Al-Sultani et al 2018) and experience problems with biting, chewing, pain on eating, denture related stomatitis and sore mouth, reduced flavour perception, embarrassment caused by foods sticking to dentures and limitations in food choice (Hyland et al 2009; Kelly et al 2012; Al-Sultani 2018).

Most research concerned with dietary intervention in those with tooth loss, known to the authors, has focused on promoting healthier eating or preventing malnutrition as opposed to a specific focus on the practical and functional issues around eating that denture wearers face. Advice on eating with dentures is likely to be available in the health education literature, and through websites, but its content and effectiveness at overcoming eating problems, improving nutrition, and increasing eating-related quality of life is unknown.

**4. Aims and objective**

The overall aim is to scope the body of literature pertaining to approaches to dietary intervention specifically addressing eating problems caused by wearing dentures.

The specific aims are:

* To identify the types of health education/intervention information available and whether it is evidence-based or based on clinical experience
* to determine if the effectiveness of the advice available has been tested
* To identify the implications of the findings for evidence-based advice for improving eating experience with dentures in dental practice

A preliminary search for existing scoping reviews on the topic of dietary interventions to address eating problems with dentures identified one systematic review on a related area (McGowan et al 2019). This systematic review explored evidence for the effectiveness of contemporaneous dietary and prosthetic rehabilitation in edentulous and partially patients. The current scoping review will be broader through inclusion of grey literature. Moreover, it will include dietary advice for existing denture wearers irrespective of whether it is delivered in conjunction with prosthetic rehabilitation. The current review will have a specific focus on intervention content and whether it is evidence-based (or experience-based).

The overall review question is ‘What eating advice/interventions exist that address improving eating ability in denture wearers? Secondary questions are:

* Is the advice based on scientific evidence or clinical experience (or both)?
* to what extent has the effectiveness of this advice/intervention (e.g., on eating ability, user experience, dietary intake, cost effectiveness) been evaluated and what type of evaluation measures have been used.

The **objective** is to examine and map existing information on eating advice to address problems eating with dentures regarding:

* Types and volume of information
* Geographical location (country)
* Origin (i.e., place of intervention dental practice, general health care, online advice)
* Mode, place and means of delivery of intervention
* Key content (nutrition and behavioural, evidence-based) and intensity/frequency of delivery of intervention content
* means of evaluation

**5. Inclusion Criteria**

1. **Types of participants**

Health education information or eating intervention targeted at adult male and females, aged 18 and over that wear dentures (convention or implant supported, full or partial) from any country of the world and includes new denture wearers and existing denture wearers of any duration. Information and or interventions that are targeted at patients in acute hospital setting and people living in residential care where they do not have control over their food provision and or preparation are excluded.

1. **Concept**

Eating/dietary advice/intervention specifically targeted at people who wear dentures including one-to-one counselling and the provision of information through written materials and websites.

***Including***: Food-based intervention aimed at overcoming eating problems inherent to wearing dentures.

***Excluded*** are interventions based exclusively on:

* Provision of healthy eating advice
* Provision of nutritional supplements, enteral and parenteral nutritional support
1. **Context**

Global, healthcare settings (non-acute), online website providing health education information on the topic.

**6. Types of information**

Included is peer-reviewed intervention studies (RCT, non-randomised trial, quasi-experimental studies, reviews, and opinion pieces) and grey literature (i.e., government guidelines; online advice from recognised healthcare profession/health care companies and guidelines of healthcare and relevant professional organisations). Excluded are articles written by lay press, including online information. Articles will be included if they include an abstract in English.

**7. Search strategy**

**Search strategy**

The PCC (Population/Concept/Context) was used to define the basic ‘foreground’ search objectives in such a way as to provide credible and useful search results. This guided the later development of approaches for the academic and grey components of the search strategy.

This led to the generation of initial search terms, the development of a search string with appropriate Boolean syntax. An initial academic database scoping search was performed on Medline using PubMed using MeSH thesaurus terms and/or common terms to determine the search sensitivity and the need for search term/concept synonyms and variations. This was followed by an analysis of the text words contained in the title and summary of retrieved articles, and of the index terms used to describe the articles. This provided an opportunity to adjust search string syntax to optimise search sensitivity.

Moreover, the references lists of all included publications were reviewed for additional relevant publications for inclusion.

An optimised academic database search string was then used to search two academic databases: Medline (via the PubMed interface) and CINAHL to capture peer-reviewed articles. After several iterations, the final search string combined two sets of synonyms; one listing alternative words for dentures, the other listing various alternative words relating to diet or quality of life, see below:

**PubMed search string**
("denture" OR "removable prosthodontics" OR “dentition” OR “Edentate” OR “partially dentate” OR “edentulism” OR “edentulous” OR "removable partial denture")
**AND**
("nutrition" OR “nutritional” OR “diet” OR “soft diet” OR “food” OR “soft food” OR “healthy eating” OR “dietary” OR “dietary advice” OR “eating advice” OR “eating” OR “quality of life” OR “health-related quality of life” OR “QoL” OR “HRQoL” OR “patient-reported outcome” OR “PRO”)

In parallel, optimised grey database search strings were used to search three grey databases/sources of information, OpenGrey, GreyMatters, WorldWideScience. In addition, where appropriate, each of these databases, was the subject of targeted searches, with specific additional filters or alternative search strings, to identify anticipated sources of information. These were initially directed at documenting identified relevant national government documents and communications of prominent learned dental societies, oral health product manufacturers and other dental organisations. This process helped to identify which type of bodies develop this type of nutrition guidance and where the gaps in information provision exist. Due to limitations in their search functions OpenGrey and GreyMatters were unable to be searched using the same compound search as PubMed – and instead employed the simplest search available using the term: “denture”. However, they produced limited hits – none of which were relevant and therefore these databases were removed from the search strategy. WorldWideScience was searched using the same compound search as PubMed – but with PubMed Central and Europe PubMed Central removed from the list of database sources to avoid redundancy with PubMed search.

A similar scoping search was performed on Google, with the objective of similarly optimising search terms, and determining search sensitivity. Google searching required a different set of search terms and approaches than utilised for academic/grey literature databases and required the definition of a series of filtering criteria at the level of the search. Ultimately, the Google search strategy used the ‘advanced search’ function to identify sites that contained ‘all these words’:

**Google search string**

Sites with all these words: "denture" "eat" “diet” “food” “advice”

Due to the limitations of Google as a search engine, it was not possible to create a compound search string that matched that which was used for PubMed, CINAHL and WorldWideScience. Accordingly, a broader approach was employed that used five ‘common language’ key terms. However, as Google has no limitations on number of hits, it was decided to restrict Google searches to a maximum of 100 results per individual search string.

Moreover, Google requires searches identify their ‘region’ (which typically defaults to country in which the search is performed). In order, to get a broad geographic representation of relevant hits the first 20 hits from the five principal English-speaking Google ‘regions’: The United States, The United Kingdom, Canada, Australia and New Zealand were taken. Each hit was required to be unique, accordingly any repeat hits were omitted and the next in the list selected.

The targeted learned societies (catering primarily to the prosthodontics speciality and addressing clinical and patient aspects around denture provision) for grey searching were identified as:

FDI (Federation Dentaire Internationale);

International Association Dental research (IADR);

American College of Prosthodontists;

European Prosthodontic Association;

International College of Prosthodontists;

American Dental Association;

Mouth Healthy;

Oral Health Foundation;

Authority Dental Organization.

The targeted commercial organisations (as consumer facing companies that manufacture and address products designed for caring for denture wearer needs) for grey searching were initially identified as:

Denture Living

My Denture Care

Fitty Dent

Steradent

Steradent

Those sites were searched for individual elements of the Google search string ("denture" "eat" “diet” “food” “advice”) using the Google advanced search function to ‘search within site’.

Single dental practice-based content, from Google searches, consistent with the research question was also identified: using Google the first 20 dental practices for each of the five English-speaking Google regions (USA, UK, CAN, AUS, NZ) –were identified using the search term ‘dental practice’ – to list 100 dental practices in total. These sites were then searched for the words: "denture" "eat" “diet” “food” “advice”, using the Google advanced search function to ‘search within site’.

The date limits were 2010 to April 2021 for peer-reviewed literature and other grey information, in order to capture recent evidence, guidance and health information on nutrition.

­­­**8. Screening**

Titles and summaries of all records identified in the electronic search will be reviewed and obviously different topic articles were eliminated by one reviewer. A random 10% sample of titles and summaries will be double screened by a second reviewer and inter-rater reliability assessed. Any differences between the reviewers’ decisions will be resolved by discussion and, if when consensus was not reached, a third reviewer (PM) will be consulted.

When the articles apparently meet the inclusion criteria or when there is not enough information in the abstract/summary, two reviewers will review the full article. Any differences between the reviewers’ decisions will be resolved by discussion and when consensus cannot be reached, a third reviewer (PM) will be consulted.

The reasons for exclusion of articles at this phase will be logged. The reference list of identified reports and articles will be searched for additional studies.

Extracting and charting results will be undertaken by one reviewer and checked by a second reviewer. Disagreements between the review authors will be resolved by consensus with involvement of a third reviewer (PM) where necessary.

The reviewers will contact authors of primary studies or reviews for further information, where relevant.

Results will be displayed in a PRISMA flow diagram for scoping reviews.

**9. Extracting and charting results**

The data pertaining to the key elements addressing the research question will be extracted and charted. This will initially include information on:

* Author/year
* Geographical location (country)
* Origin/setting of dietary information/intervention i.e., dental practice, general healthcare, online advice
* Types and volume of information: peer-reviewed versus grey literature
* Study design (e.g., RCT, non-randomised trial, quasi-experimental, quantitative, qualitative) (if relevant)
* Aims/purpose of article
* Study population and sample size (if relevant)
* Mode of information/intervention
* Duration of the intervention (if relevant)
* Key content (nutritional and or behavioural change techniques, evidence- or experience-based) and intensity/frequency of delivery of intervention content
* How the outcome of the intervention was measured (if relevant)

The charting of information will be trialled of at least one of each of a) a peer reviewed article; b) a grey literature report; c) a website. The form for charting results will be modified in an iterative way throughout charting.

**10. Presentation of results**

The overall types of articles identified will be tabulated to present the number of included information sources by a) country; b) peer reviewed (total number and sub divided by type of article); c) grey literature (total number and sub divided by origin of material i.e. government, professional organisation; dental health provider, oral care company). A second table will summarise the content of the identified advice, including key messages, different modes of advice, the summary tables a narrative of the findings will be provided including the implications of the findings for policy, practice and for future research.

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