International Journal of Clinical Trials
Park H et al. Int J Clin Trials. 2022 Aug;9(3):183-186
http://www.ijclinicaltrials.com
pISSN 2349-3240 | eISSN 2349-3259

DOI: https://dx.doi.org/10.18203/2349-3259.ijct20221869

Protocol

Caries prevention during removable orthodontic treatment: a scoping review protocol

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Received: 12 April 2022
Revised: 11 May 2022
Accepted: 12 May 2022

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ABSTRACT

Background: Removable orthodontic treatment corrects dental and skeletal malocclusion by utilising various types of removable appliances. Although removable orthodontic treatment has a reduced risk of dental caries compared to fixed orthodontic treatment, removable appliances create niches for cariogenic microorganisms to increase their numbers and lead to an ecological shift. However, there is insufficient information on caries prevention during removable orthodontic treatment. The protocol details the research for a scoping review of caries prevention during removable orthodontic treatment.
Methods: This scoping review will be conducted according to the Preferred Reporting Items for Systemic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) and Joanna Briggs Institute (JBI) Manual for Evidence Synthesis guidelines. Published primary and secondary research studies (including reviews), guidelines, websites, and reports that are written in English until April 2022 will be searched from seven databases, including Dentistry and Oral Sciences Source, CINAHL, MEDLINE, via EBSCOHost, Scopus, Cochrane, Google, and Google Scholar. Two reviewers (HP and ZM) will analyse the retrieved articles simultaneously using the parameters and three-step strategy recommended by JBI. Obtained numbers of included and excluded identified sources will be presented in a PRISMA flow diagram and the data extraction table will demonstrate the variables from included sources.
Conclusions: The findings of this review will be summarised in a narrative description to facilitate guidance in clinical practice and research for health professionals.

Keywords: Caries prevention, Dental care, Oral health, Removable orthodontic aligner, Removable orthodontic appliance, Removable orthodontic treatment

INTRODUCTION

There have been a significant increase in the number of patients and, or parents in recent years seeking orthodontic treatment due to a range of psychosocial and aesthetic improvements rather than functional abnormalities.[1,2] Removable orthodontic treatment involves various types of removable appliances to correct dental and skeletal malocclusion for all age groups, including older patients.[3-5] Removable orthodontic appliances, such as Twin-block and clear aligners, are known to be more tolerable in terms of pain, less noticeable and less intrusive compared to braces and brackets in fixed orthodontic treatment.[5,6]

Nevertheless, removable orthodontic treatment has an increased risk of dental caries as an adverse effect.[7] According to Mathews et al the incidence of white spot lesion development is 1.2% during removable orthodontic treatment. Although this incidence is far

lower than those with fixed orthodontic appliances (26%), removable appliances are capable of changing the microbial flora of the oral cavity, which may result in dental caries.[7,8]

Lucchese et al reported that past studies have proven that there is an increase in S. mutans and Lactobacillus spp in patients using removable orthodontic appliances.[9] This may be caused by removable appliances covering all or part of tooth surfaces which affects the flushing effect of saliva, creates niches for cariogenic microorganisms to develop and persist, and leads to an ecological shift.[7,8] Therefore, caries prevention is important for oral health during removable orthodontic treatment.

At present, there seems to be no consensus available in the literature about what kind of caries preventions, interventions, and instructions are provided to patients during removable orthodontic treatment. For this reason, a scoping review is desirable to investigate effective caries prevention during removable orthodontic treatment and identify any existing gaps in knowledge.

The aim of this review was to systematically review the current literature on caries prevention during removable orthodontic treatment.

METHODS

This scoping review will be conducted by using the Preferred Reporting Items for Systemic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) and Joanna Briggs Institute (JBI) Manual for Evidence Synthesis.[10,11]

Eligibility criteria

The eligibility criteria for the existing literature are determined by the parameters of types of population, concept, context, and types of evidence sources. The PRISMA flow diagram will present any excluded studies (Figure 1).[12]

Inclusion criteria

Population

Human participants in all age groups treated with removable orthodontic appliances including aligners.

Concept

This review will focus on any research on effective caries prevention, interventions, and instructions provided to participants during removable orthodontic treatment.

Context

The context of this review will not limit any geographic location, ethnicity, cultural factors, and gender-based interests.

Types of evidence sources

The scoping review will include published primary and secondary research studies (including reviews), guidelines, websites, and reports until April 2022. Letters, blogs, book reviews and chapters, editorials, commentaries, brochures, and narrative reviews will not be recognised as inclusion criteria and will be excluded. Research studies only in English will be accepted.

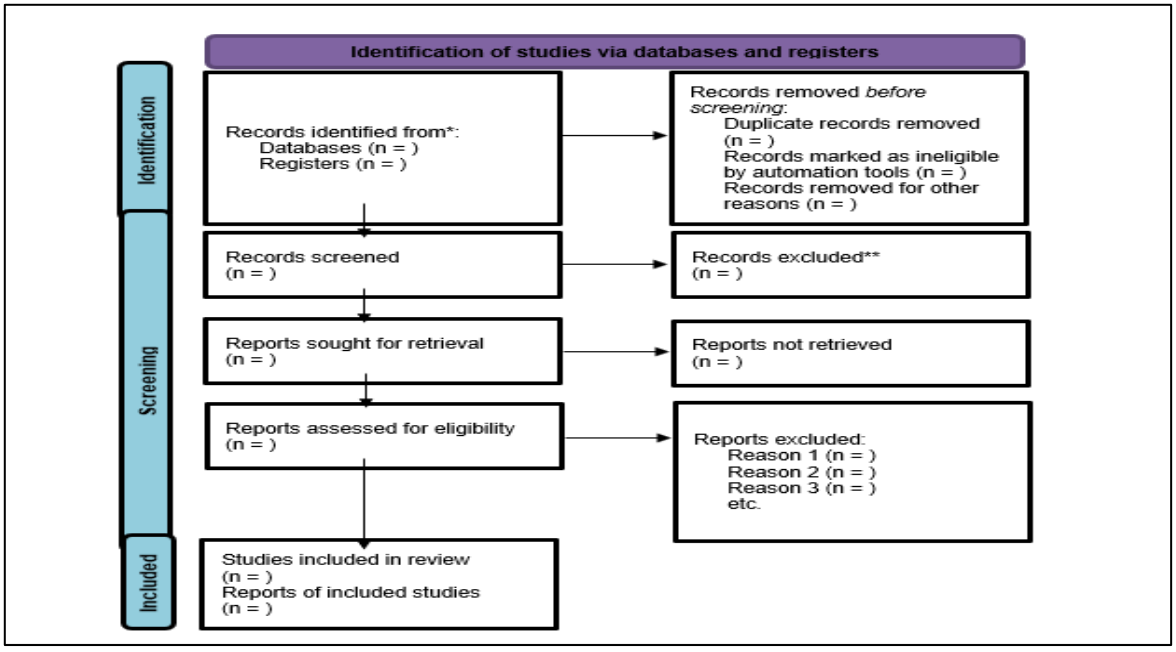

Figure 1: The PRISMA 2020 flow diagram.

Search strategy

The scoping review will utilise a three-step search strategy as JBI recommends.[11]

For an initial, limited search, the following databases were used: EBSCOHost (Dentistry and Oral Sciences Source, CINAHL, MEDLINE), and Scopus. Then, an analysis of the text words that were included in the title, abstract, and index terms of the retrieved articles was perused. Before the second search commenced, the assistance of a librarian with expertise in the health science scope was recruited. This allowed a complete search strategy to be developed with identified keywords and index terms that can be integrated into the databases for the second search utilising EBSCOHost (Dentistry and Oral Sciences Source, CINAHL, MEDLINE), Scopus, and Cochrane Library. This was to ensure consistency across databases and obtain 'fixed' numbers of identified sources, which will be presented in a PRISMA flow diagram in the final review (Figure 1).[12]

As for the third search, additional sources will be searched from the reference list of all identified reports and articles that have been included in the review.

Grey literature will be searched additionally from the following sources: Google, and Google Scholar. The first 100 items on Google and the first 100 sources on Google Scholar will be screened for eligible studies. A complete electronic search strategy for the EBSCOHost is presented in Table 1. This search strategy will be utilised for the rest of the database.

Selection of sources of evidence

The final identified sources will be exported and uploaded into EndNoteVX9 which then will be exported to RAYYAN, a web-based collaboration and research tool, and duplicates will be removed here. The reviewers will screen identified sources simultaneously with titles and abstracts first to identify potentially relevant documents. Then the full text of these potentially relevant documents will be assessed in detail by reviewers at the same time. Consensus on any disagreements on the selection of sources of evidence and data extraction will be resolved by discussion. The PRISMA-ScR flowchart will present the numbers of sources of evidence identified, screened, assessed for eligibility, and included in the review (Figure 1).[12] The flowchart will also contain brief reasons for exclusion at each stage.

Table 1: Search strategy for EBSCOHost.

Search strategy	
#1	"Removable orthodontic*" OR "removable appliance*" OR "clear align*" OR Invisalign* OR "functional appliance*" OR "removable aligner*"
#2	caries OR carious OR decay OR cavity OR cavities OR lesion*
#3	#1 AND #2

Authors considered including partial dentures in the search (#1), but decided to exclude them due to various factors such as age of users and materials used.

Data extraction

A data extraction table has been configured by the reviewers to determine which information/variables to extract from the included sources (Table 2). The first reviewer will collect specific study information/variables and the second reviewer will verify the accuracy of the data extraction process. Any disagreements between reviewers during the data extraction process will be resolved by discussion. During the process, the data extraction table may be modified, with agreement from the reviewers, if any useful additional data should be extracted. The modifications to the data extraction table will be recorded and reported in the scoping review. An assessment of the risk of bias will not be carried out as the authors intend to deliver a broad overview of existing research studies rather than be restricted by critically appraising the risk of bias in evidence.

Table 2: Data extraction table.

First author, date	Study design	Aims and objectives	Population (if applicable)	Methodology	Type of appliance	Appliances material	Data collection method	Type of prevention	Main findings	Limitations (if applicable)	Recommendations (if applicable)

Synthesis of results

The results of the included sources will be summarised in a descriptive format in relation to the review question and objective.

In addition, the characteristics of the included sources to the research question and objective will be outlined.

DISCUSSION

To our understanding, there has not yet been a scoping review investigating specifically on caries prevention

during removable orthodontic treatment. The literature search in this study was conducted in seven databases. The limitations of this protocol are that only published research articles in English will be accepted. This protocol was created in compliance with the Preferred Reporting Items for Systemic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) and Joanna Briggs Institute (JBI) guidelines. The results will be summarised and elaborated in a discussion that could benefit health professionals in clinical practice and contribute to further research into this topic.

CONCLUSION

The scoping review will provide a broad interpretation of the results concerning the review question and objective. The potential implications, such as the evidence gap, will be discussed and suggested for next steps, for example, recommendations for future research.

ACKNOWLEDGEMENTS

The authors would like to thank Andrew South, Liaison Librarian for Health at the Auckland University of Technology, for their assistance in developing the search strategy for this study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

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Cite this article as: Park H, Morse Z. Caries prevention during removable orthodontic treatment: a scoping review protocol. Int J Clin Trials 2022;9(3):182-6.