

CADTH Health Technology Review

Longevity of Partial and Complete Dentures

Authors: Sara D. Khangura, Aleksandra Grobelna, Robyn Haas, Anusree Subramonian

Acknowledgement: Zahra Jafari

ISSN: 2563-6596

Disclaimer: The information in this document is intended to help Canadian health care decision-makers, health care professionals, health systems leaders, and policy-makers make well-informed decisions and thereby improve the quality of health care services. While patients and others may access this document, the document is made available for informational purposes only and no representations or warranties are made with respect to its fitness for any particular purpose. The information in this document should not be used as a substitute for professional medical advice or as a substitute for the application of clinical judgment in respect of the care of a particular patient or other professional judgment in any decision-making process. The Canadian Agency for Drugs and Technologies in Health (CADTH) does not endorse any information, drugs, therapies, treatments, products, processes, or services.

While care has been taken to ensure that the information prepared by CADTH in this document is accurate, complete, and up-to-date as at the applicable date the material was first published by CADTH, CADTH does not make any guarantees to that effect. CADTH does not guarantee and is not responsible for the quality, currency, propriety, accuracy, or reasonableness of any statements, information, or conclusions contained in any third-party materials used in preparing this document. The views and opinions of third parties published in this document do not necessarily state or reflect those of CADTH.

CADTH is not responsible for any errors, omissions, injury, loss, or damage arising from or relating to the use (or misuse) of any information, statements, or conclusions contained in or implied by the contents of this document or any of the source materials.

This document may contain links to third-party websites. CADTH does not have control over the content of such sites. Use of third-party sites is governed by the third-party website owners' own terms and conditions set out for such sites. CADTH does not make any guarantee with respect to any information contained on such third-party sites and CADTH is not responsible for any injury, loss, or damage suffered as a result of using such third-party sites. CADTH has no responsibility for the collection, use, and disclosure of personal information by third-party sites.

Subject to the aforementioned limitations, the views expressed herein are those of CADTH and do not necessarily represent the views of Canada's federal, provincial, or territorial governments or any third-party supplier of information.

This document is prepared and intended for use in the context of the Canadian health care system. The use of this document outside of Canada is done so at the user's own risk.

This disclaimer and any questions or matters of any nature arising from or relating to the content or use (or misuse) of this document will be governed by and interpreted in accordance with the laws of the Province of Ontario and the laws of Canada applicable therein, and all proceedings shall be subject to the exclusive jurisdiction of the courts of the Province of Ontario, Canada.

The copyright and other intellectual property rights in this document are owned by CADTH and its licensors. These rights are protected by the Canadian *Copyright Act* and other national and international laws and agreements. Users are permitted to make copies of this document for non-commercial purposes only, provided it is not modified when reproduced and appropriate credit is given to CADTH and its licensors.

About CADTH: CADTH is an independent, not-for-profit organization responsible for providing Canada's health care decision-makers with objective evidence to help make informed decisions about the optimal use of drugs, medical devices, diagnostics, and procedures in our health care system.

Funding: CADTH receives funding from Canada's federal, provincial, and territorial governments, with the exception of Quebec.

Questions or requests for information about this report can be directed to Requests@CADTH.ca

Table of Contents

Abbreviations	5
Key Messages	6
Context and Policy Issues	6
Research Questions	7
Methods	7
Literature Search Methods.....	7
Selection Criteria and Methods	7
Exclusion Criteria.....	8
Critical Appraisal of Individual Studies	8
Summary of Evidence	8
Quantity of Research Available.....	8
Summary of Study Characteristics.....	8
Summary of Critical Appraisal.....	10
Summary of Findings	11
Limitations	13
Conclusions and Implications for Decision- or Policy-Making	14
References	16
Appendix 1: Selection of Included Studies	17
Appendix 2: Characteristics of Included Publications	18
Appendix 3: Critical Appraisal of Included Publications	21
Appendix 4: Main Study Findings	23
Appendix 5: References of Potential Interest	32

List of Tables

Table 1: Selection Criteria.....	7
Table 2: Characteristics of Included Systematic Reviews.....	18
Table 3: Strengths and Limitations of Systematic Reviews Using AMSTAR 2 ¹⁴	21
Table 4: Summary of Duration of Survival in Years – Complete Dentures	23
Table 5: Summary of Survival Rates Across Study Follow-Up – Complete Dentures	24
Table 6: Summary of Failure Rates Across Study Follow-Up – Complete Dentures	28
Table 7: Summary of Duration of Survival in Years – Metal Partial Dentures	30
Table 8: Summary of Survival Rates Across Study Follow-Up – Metal Partial Dentures.....	30
Table 9: Summary of Failure Rates Across Study Follow-Up – Metal Partial Dentures.....	31

List of Figures

Figure 1: Selection of Included Studies	17
---	----

Abbreviations

SD	standard deviation
SR	systematic review

Key Messages

- Removable complete dentures may last for an average of 10.06 years, with most complete dentures lasting for at least 5 years.
- Most metal partial dentures may last for at least 5 years.
- We did not identify any studies that met inclusion criteria for our report describing the longevity of removable plastic partial dentures.
- The included studies did not report populations, interventions, and outcomes clearly or consistently. This made some of the findings difficult to interpret.

Context and Policy Issues

Tooth loss is a problem that can affect people of all ages, although it is often associated with advanced age.¹ Tooth loss can be partial or complete (also known as *edentulism*) and can impede speaking and eating, causing deleterious effects to the activities of daily life.^{2,3} In addition, tooth loss can affect aesthetics, which can negatively affect quality of life.¹ Tooth loss may also be associated with a variety of comorbidities, including malnutrition, heart disease, and osteoporosis.⁴

Although decreasing incidence of tooth loss has been observed among industrialized countries in the past several decades, aging populations in these countries continue to drive the need for treatment.⁵ As the proportion of Canada's population with advanced age increases, estimates indicate that the need for dental care to treat tooth loss will similarly increase.¹

Tooth loss can be treated in a variety of ways depending on the extent of loss and other factors. Possible treatment options include fixed prostheses, such as implants and dental bridges, or removable dental prostheses, such as complete or partial dentures.^{6,7} Removable dentures are designed to be supported by the surrounding soft and/or hard tissues of the oral cavity or may be supported by dental implants.⁸ Removable dentures can be made of various materials, including metals or plastics, such as cast alloy or acrylic.⁹ Removable dentures offer the benefits of being minimally invasive and a less costly treatment option compared with fixed dental prostheses.^{4,10} Affordability can be an important feature of dental care interventions, which are not often covered by public health plans in Canada.¹¹ Some of the potential disadvantages of removable dentures include the need for regular removal and cleaning, which can make dentures susceptible to wear and/or damage and can impact longevity.^{7,12}

A previous CADTH report was published in 2015 that identified available evidence describing the longevity of removable prosthodontics.¹³ In that report, there was high variability in the findings of the included studies; therefore, the need for robust clinical evidence to support informed decision-making about the use of dentures was identified.¹³ This report aims to update and summarize the available evidence on the longevity of removable dentures that has been published since the previous 2015 CADTH report.¹³

Research Questions

1. What is the clinical evidence on the longevity of removable complete dentures?
2. What is the clinical evidence on the longevity of removable plastic partial dentures?
3. What is the clinical evidence on the longevity of removable metal partial dentures?

Methods

Literature Search Methods

A limited literature search was conducted by an information specialist on key resources including MEDLINE, the Cochrane Database of Systematic Reviews, the International HTA Database, the websites of Canadian and major international health technology agencies, as well as a focused internet search. The search strategy comprised both controlled vocabulary, such as the National Library of Medicine’s MeSH (Medical Subject Headings), and keywords. The main search concepts were longevity of complete and partial dentures. CADTH-developed search filters were applied to limit retrieval to health technology assessments, systematic reviews (SRs), meta-analyses, or indirect treatment comparisons and randomized controlled trials, controlled clinical trials, or any other type of clinical trial. If possible, retrieval was limited to the human population. The search was completed on January 24, 2023, and limited to English-language documents published since January 1, 2015.

Selection Criteria and Methods

One reviewer screened citations and selected studies. In the first level of screening, titles and abstracts were reviewed and potentially relevant articles were retrieved and assessed for inclusion. With the aim of updating the evidence presented in a previous CADTH report published in 2015,¹³ articles were included if they were published after the previous search date and were not included in the earlier CADTH report. The final selection of full-text articles was based on the inclusion criteria presented in [Table 1](#).

Table 1: Selection Criteria

Criteria	Description
Population	People with tooth loss
Intervention	Q1: Removable complete dentures (any materials) Q2: Removable plastic partial dentures (e.g., acrylic, nonacrylic) Q3: Removable metal partial dentures (e.g., vitallium)
Comparator	Q1: Alternative types of removable complete dentures; no comparator Q2 to Q3: Alternative types of removable partial dentures; no comparator
Outcomes	Longevity (e.g., time to replacement, denture survival rates)
Study designs	Health technology assessments, systematic reviews

Q = question.

Exclusion Criteria

Articles were excluded if they did not meet the selection criteria outlined in [Table 1](#), were duplicate publications, or were published before 2015. SRs in which all relevant studies were captured in other more recent or more comprehensive SRs were excluded.

Critical Appraisal of Individual Studies

The included SRs were critically appraised by 1 reviewer using the AMSTAR (A Measurement Tool to Assess Systematic Reviews 2) tool.¹⁴ Summary scores were not calculated for the included SRs; rather, the strengths and limitations observed among the included SRs were summarized and described narratively.

Summary of Evidence

Quantity of Research Available

A total of 730 citations were identified in the literature search. Following screening of titles and abstracts, 669 citations were excluded and 61 potentially relevant reports from the electronic search were retrieved for full-text review. Two potentially relevant publications were retrieved from the grey literature search for full-text review. Of these potentially relevant articles, 55 publications were excluded for various reasons, and 8 SRs met the eligibility criteria for inclusion in this report. [Appendix 1](#) presents the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)¹⁵ flow chart that outlines study selection.

Additional references of potential interest are provided in [Appendix 5](#).

Summary of Study Characteristics

Eight SRs were included and summarized in this report.¹⁶⁻²³ Seven^{16,17,19-23} of the 8 SRs had inclusion criteria that were broader than the current review. Specifically, these SRs reported results from included primary studies on outcomes other than those relevant to longevity,^{16,17,19-23} and 1 SR also did not specify the material from which the removable partial dentures were constructed for some of the included primary studies.²² Only the characteristics and results for the subset of relevant primary studies in the included SRs were described in this report.

Additional details regarding the characteristics of included publications are provided in [Appendix 2](#).

Study Design

The 8 SRs were published between 2016 and 2022, with search strategies that spanned publication dates from 1919 to April 2022.¹⁶⁻²³ There were 114 primary studies of relevance to this review included in the 8 eligible SRs, spanning publication dates between 1967 and 2020.¹⁶⁻²³ Overlap between the primary studies of relevance described in the SRs included in this report was minimal (i.e., 1 of 114 primary studies overlapped across 2 included SRs^{17,19}); thus, a tabulated characterization of overlap was not included.

Details describing the designs of primary studies included in the SRs were not reported, but primary study designs, as referred to in the SRs, included randomized controlled trials and prospective and retrospective clinical studies.¹⁶⁻²³

Country of Origin

Of the 8 SRs, first authors were based in Saudi Arabia,¹⁶ the UK,¹⁷ Australia,¹⁸ the Republic of Korea,¹⁹ Brazil,^{20,21} Germany,²² and the US.²³ Five of the SRs did not report the country of origin for included primary studies,^{16,19-21,23} whereas 3 reported primary studies from multiple countries throughout the world,^{17,18,22} including 1 that reported the inclusion of relevant primary studies from Canada.¹⁸

Patient Population

Of the 5 SRs that clearly reported the number of study patients included in all relevant primary studies, the range of patients with eligible outcome data reported across SRs was between 15 and 1,656.^{16,17,19,20,23} Two of the SRs reported the numbers of patients observed for some, but not all, of the relevant primary studies.^{21,22} One SR reported numbers for “sample size” for each included primary study in a table that included data on both patients and dentures; thus, it was unclear whether these data were specific to patients or dentures.¹⁸

There were few details included describing the patient study populations, with most SRs indicating that they sought and included studies investigating dental patients with edentulism and/or those with partial tooth loss.¹⁶⁻²³ Five SRs reported data describing mean age for included primary studies, which ranged among the relevant primary studies from 59.5 years to 71.1 years.^{16-18,20,21} Two of the SRs included information describing sex, with 1 indicating that 58.2% of the patients from the primary studies included in the SR were female,¹⁸ and another describing 318 females and 311 males among the patient study populations included in relevant primary studies.²⁰ No information was reported on socioeconomic or other demographic variables.

Interventions and Comparators

Six of the SRs described complete removable dentures,^{16-18,20,21,23} and 2 described partial removable dentures.^{19,22} The type and design of dentures as described in the SRs were interpreted as reported by the authors of the publications (i.e., SRs describing dentures as complete or full-arch were included as complete dentures; dentures described as partial dentures were included as partial removable dentures).

Of the 6 SRs describing complete removable dentures, 2 SRs reported the total number of dentures observed across the relevant primary studies,^{16,18} which ranged between 15 and 3,023 dentures; the other SRs describing complete removable dentures did not include or report the numbers of dentures observed across some or all the relevant primary studies.^{17,20,21,23} Dentures were described as complete dentures by 1 SR,¹⁸ complete overdentures by 1 SR,²¹ maxillary overdentures by 2 SRs,^{16,23} and full-arch dentures by 2 SRs.^{17,20} The material that the dentures were constructed of was specified in 1 SR as polyetheretherketone (PEEK),¹⁶ but it was not described in the other 5 SRs.^{17,18,20,21,23} Five SRs described complete dentures that were supported by implants^{16,17,20,21,23} — 1 of which also described complete dentures that were supported by teeth¹⁷ — and 1 SR did not specify the mechanism(s) of attachment.¹⁸

Both SRs on partial removable dentures described dentures constructed of metal.^{19,22} One SR reported relevant data on 394 implant-supported removable dentures²² and the other reported relevant data on 1,587 dentures (with attachment mechanisms not consistently described).¹⁹

Although comparators were described by some SRs for some primary studies, these data were not reported consistently, with no relevant comparative data on denture longevity reported by any of the included SRs.¹⁶⁻²³

Outcomes

All SRs included in this report described outcomes of relevance to longevity.¹⁶⁻²³ Specifically, 2 of the included SRs reported data on the mean number of years that dentures survived,^{18,22} 5 of the included SRs reported data on the numbers and/or proportions of dentures that failed across study follow-up,^{16,18,20-22} and 5 of the SRs reported on the numbers and/or proportion of dentures that survived across study follow-up.^{17,19,20,22,23} The durations of study follow-up for relevant primary studies across the 8 SRs included in this review ranged between 1 and 25 years.¹⁶⁻²³

Definitions of survival and/or failure were not provided for 6 of the included SRs.^{16,18,20-23} Of the 2 SRs that defined prosthesis survival, 1 described it as the prosthesis remaining in situ and not requiring replacement at a follow-up clinical examination.¹⁷ Another SR described survival as dentures that required only repair and could remain in service, whereas failure was defined as dentures that required refabrication.¹⁹

Six of the SRs summarized findings from relevant primary studies narratively, with no pooled results included,^{16,17,19,21-23} whereas 2 of the SRs reported findings both from individual relevant primary studies as well as pooled findings from across relevant primary studies.^{18,20}

Summary of Critical Appraisal

The SRs included in this review demonstrated both strengths and limitations.¹⁶⁻²³ Strengths common to all the SRs included a clear description of the research questions being posed, as well as key criteria informing study selection.¹⁶⁻²³ A review protocol was produced a priori for 5 of the included SRs.^{16-18,20,21} Six of the SRs described methods satisfying the requirements of a comprehensive search strategy,^{16-18,20-22} which is a key feature of SR methods that can increase confidence that the review has captured a sufficient breadth of available, eligible literature. Study selection methods were robust for 6 SRs with duplicate screening performed,¹⁷⁻²² duplicate data abstraction was done for 5 of the SRs.^{16-18,20,21} Study exclusions were clearly described for 5 of the SRs,^{16,17,19-21} and risk of bias assessments for the included primary studies were described for 5 SRs.^{16-18,20,21} Of the 2 SRs that reported on quantitative syntheses of data, both reported the use of appropriate methods for pooling data^{18,20} and 1 was explicit about the potential impact of risk of bias on the findings generated by the meta-analyses (i.e., sensitivity analyses were conducted to elucidate the extent to which risk of bias may have affected the findings, demonstrating no change to the results).¹⁸ Finally, 5 of the SRs also were explicit about sources of funding and any conflicts of interest that could affect the conduct and/or findings of the reviews,^{16,17,20-22} with 1 SR reporting a source of funding but providing no information on potential conflicts of interest.¹⁸ Providing this information is essential to ensure transparency and allow an assessment of the potential for undue external influence on the reviews.

Although 1 SR satisfied all the relevant criteria of the AMSTAR assessment,¹⁷ multiple limitations across the remaining 7 SRs were observed.^{16,18-23} Clarity in reporting was limited;

important details describing the populations, interventions, and outcomes summarized in the included SRs were missing, making interpretation of the methods and findings challenging.¹⁶⁻²³ An important inconsistency was observed in the 1 relevant primary study that overlapped between 2 of the included SRs: 1 SR described full-arch dentures¹⁷ and the other described removable partial dentures.¹⁹ A review of the relevant primary study that overlapped these 2 SRs was explicit in describing patients with edentulism, which suggests that the dentures under investigation in this primary study were complete dentures.²⁴ Because it concerns the particular SRs included in this review,^{17,19} as well as the broader implications concerning terminology and definitions for the literature on removable dentures in general, this discrepancy indicates the potential for a critical lack of clarity in reporting and definitions which poses a threat to the interpretability and utility of the evidence in this topic area. Six of the SRs did not provide a clear justification for their inclusion criteria related to study design and did not explicitly account for risk of bias in the interpretation of the findings.^{16,18-20,22,23} Four of the SRs did not provide a clear or comprehensive description of potential reasons for heterogeneity in findings across primary studies (e.g., the variability among methods and interventions used).^{16,19-21} Of the 2 SRs that performed quantitative syntheses of data, neither included a comprehensive consideration of publication bias and its potential impact on the pooled findings of the reviews.^{18,20} Finally, 7 of the included SRs did not report sources of funding for included primary studies.^{16,18-23} These missing details and methodological features make it difficult for the reader to assess the extent to which the findings of the SRs are reliable and/or valid; for instance, a clear and explicit strategy informing the selection of studies by design is essential to informing an interpretation of the extent to which the included primary studies in an SR can answer the research question being posed.¹⁴ In the case of publication bias (i.e., the propensity for studies with null findings to go unpublished), it is essential that this risk is assessed carefully and that any identification of this risk is considered in the context of the findings generated by the SR.¹⁴ Sources of funding for included primary studies are important for understanding the extent to which these may have introduced a risk of bias in the findings of the studies and the interpretation of their results (i.e., studies funded by private industry bear a greater risk of bias in favour of the intervention under study).¹⁴

A tabulated summary of the strengths and limitations of included SRs are provided in [Appendix 3](#).

Summary of Findings

Longevity of Complete Dentures

Duration of Denture Survival

One SR reported duration of survival for complete dentures; pooled findings across 27 studies representing a total of 3,023 dentures found a weighted mean survival time of 10.06 years (standard deviation [SD] = 4.03 years).¹⁸ The range of mean years of survival for all complete denture types across the 27 relevant primary studies was 4.5 to 20 years.¹⁸ Subgroup analyses included those limited to maxillary dentures (n = 589), producing a weighted mean survival time of 10.26 years (SD = 3.80 years); mandibular dentures (n = 864 years), producing a weighted mean survival time of 8.63 years (SD = 2.63 years); and pairs of maxillary and mandibular dentures (n = 1,570), generating a weighted mean survival time of 10.76 years (SD = 4.68 years).¹⁸ Authors reported no statistical difference between types of dentures when mean years of survival were compared by independent t tests.¹⁸

Survival Rates of Dentures Across Study Follow-Up

Three SRs reported on survival of complete dentures across study follow-up.^{17,20,23} Two of these SRs reported survival results from 22 primary studies with less than 5 years of follow-up, with rates ranging between 62% and 100%.^{17,23} All 3 SRs reported on complete denture survival at 5 years of follow-up or more across 26 relevant primary studies, with rates ranging from 38% to 100%.^{17,20,23}

Failure Rates of Dentures Across Study Follow-Up

Four SRs reported on the failure of complete dentures across study follow-up,^{16,18,20,21} 2 reported findings from individual relevant primary studies only,^{16,21} 1 reported only pooled findings from across relevant primary studies,²⁰ and 1 reported both pooled findings across relevant primary studies as well as findings from individual, relevant primary studies.¹⁸ One of the SRs described the majority of its results in terms of survival; its pooled findings for survival were interpreted as failure rates in this report based on reporting of weighted event rates (with “events” more likely to pertain to failure) and inconsistencies observed between the event rates that were pooled and the survival results that were reported from individual, relevant primary studies.²⁰

One of the SRs pooled findings across 17 studies representing follow-up from 1 to more than 10 years, reporting that 21% (95% CI, 15% to 28%) of dentures failed by the end of follow-up.¹⁸ Subgroup analyses of failure rates by number of years of study follow-up were also performed. Findings from 3 relevant primary studies reporting on 1 to 2 years of study follow-up produced a pooled failure rate of 5% (95% CI, 0% to 10%) among maxillary and mandibular pairs of dentures.¹⁸ Findings from 7 relevant primary studies describing unpaired maxillary and mandibular dentures that reported on 5 to 6 years of follow-up generated a pooled failure rate of 12% (95% CI, 8% to 16%).¹⁸ Findings from 7 relevant primary studies describing failure of paired and unpaired maxillary and mandibular dentures at a study follow-up of more than 10 years produced a pooled rate of 41% (95% CI, 28% to 53%).¹⁸

Another SR with pooled findings reported weighted event rates of failure across studies with durations of study follow-up of 5 years or more for implant-supported full-arch dentures with either fewer than 5 implants, or 5 or more implants per denture.²⁰ Across 6 studies of dentures with fewer than 5 implants, the pooled weighted event rate of failure was reported at 1.5% (95% CI, 0.6% to 3.7%).²⁰ The pooled, weighted event rate of failure across 5 studies of full-arch dentures with 5 implants or more was 9% (95% CI, 5% to 15.38%).²⁰

Ranges of failure rates across 2 of the SRs that reported rates for relevant, individual primary studies varied widely.^{16,18} There were a total of 6 relevant primary studies across the 2 SRs (3 of which provided results that were also included in meta-analyses¹⁸) that described complete denture failure as before 5 years of follow-up, with rates ranging between 0% and 20%.^{16,18} In 1 of the SRs, 10 relevant primary studies reported follow-up of 5 to less than 20 years and reported ranges of failure rates between 0% and 79.2%.¹⁸ The same SR also included 2 relevant primary studies that reported on follow-up of more than 20 years, and found failure rates of 23.5% and 50%.¹⁸ The remaining SR reported absolute numbers of failed dentures without clear denominators (i.e., denominators were reported as numbers of patients, and it is unclear whether these correlate precisely with the numbers of dentures observed in the studies).²¹ Due to this lack of clarity, no further narrative summary was provided.

Longevity of Plastic Partial Dentures

We did not identify any studies that reported findings for partial dentures that were explicitly described as being constructed of plastic materials.

Longevity of Metal Partial Dentures

Duration of Denture Survival

One SR reported that 33 removable, partial metal dentures from 1 relevant primary study (published in 1982) survived a mean number of 8 years (SD not reported).²²

Survival Rates of Dentures Across Study Follow-Up

Two SRs reported numbers and/or proportions of partial metal dentures that survived across study follow-up for 20 relevant primary studies.^{19,22} Across the 2 SRs, 5 relevant primary studies reported on survival throughout study follow-up of less than 5 years, with proportions ranging from 93.3% to 100%.^{19,22} Across the 2 SRs, 15 relevant primary studies reported on survival throughout study follow-up of 5 years or more, with proportions ranging from 13 of 33 dentures observed to 100%.^{19,22}

Failure Rates of Dentures Across Study Follow-Up

One SR reported numbers and/or proportions of partial metal dentures that failed across study follow-up among 4 relevant primary studies.²² Of 3 relevant primary studies that reported on failure across study follow-up of less than 5 years, 2 found failure rates of 3.2% and 3.8%, with 1 relevant primary study that reported 2 dentures failed from an unclear subgroup of a total 60 dentures observed in the study.²² The same SR also reported failure at 5 years or more of follow-up from 3 relevant primary studies that reported ranges between 2 of 26 dentures observed and 15 of 30 dentures observed.²²

[Appendix 4](#) presents the main study findings.

Limitations

This review was limited in its capacity to summarize relevant data describing the longevity of removable dentures due to a lack of detail about the type of dentures being investigated (e.g., fixed versus removable, complete versus partial, and the material from which dentures were constructed). Of the literature that clearly described removable dentures, many studies reported on the longevity of implants used to support the prostheses, with no (or limited) data provided on the longevity of the prostheses themselves.

Similarly, of the studies identified reporting on the longevity of removable partial dentures, many were not explicit about the material from which the partial dentures were constructed, precluding their inclusion in this review because its focus was on research questions specific to metal or plastic partial dentures. The lack of clear reporting identified in the literature contributed to a key limitation of this review, namely the lack of any eligible SRs explicitly describing the longevity of removable partial dentures constructed of plastic materials. Related to this, there were 2 SRs identified that clearly described removable partial dentures constructed of metal, and both demonstrated important risks of bias as well as limited available data.^{19,22}

Lack of clarity was also observed in the variable use of terminology among the SRs included in this review that described complete dentures. Complete dentures were described as “complete dentures” by 1 SR,¹⁸ “complete overdentures” by 1 SR,²¹ “maxillary overdentures” by 2 SRs^{16,23} and “full-arch dentures” by 2 SRs.^{17,20} This variable terminology and consequent lack of clarity made ascertainment of the features of interventions under study unclear; for instance, the only 2 SRs which demonstrated any overlap (across 3 relevant primary studies) described the interventions in the same studies as “full-arch dentures”¹⁷ and “removable partial dentures,”¹⁹ respectively. This suggests that the terminology and/or eligibility criteria applied to primary studies was sufficiently unclear to be potentially inconsistent across SRs.

One limitation of the outcome data on longevity identified in this report was the potential for reliance on patient memory when measuring longevity in primary studies, which was explicitly acknowledged in 1 of the SRs.¹⁸ This method is limited in its accuracy, so it could affect the reliability and/or validity of SRs that include primary studies using it. Although the method of measurement for longevity was not clearly described in 5 other SRs included in this report,¹⁹⁻²³ this potential methodological limitation should be considered. Another limitation of the outcome data on longevity was the preponderance of data describing survival at a given length of follow-up as opposed to an open-ended duration of survival or time to failure (i.e., this presentation of longevity limits this report’s ability to provide specific insight into the anticipated time to replacement for complete and partial dentures).

Although the 8 SRs summarized in this report demonstrated both strengths and limitations in their methods,¹⁶⁻²³ 4 of the SRs identified important methodological limitations in the primary research evidence they summarized,^{16,17,20,21} indicating that risk of bias among the primary research is likely to be present and could affect the reliability and/or validity of the evidence informing the longevity of complete and partial dentures. Importantly, 3 of the SRs did not report an assessment of risk of bias for included primary studies (2 of which were the only SRs included in this review describing partial removable dentures), which represents a considerable limitation of these SRs.^{19,22,23}

Finally, there was very limited overlap identified among the relevant primary studies summarized in the SRs included in this report; there was also no overlap among the SRs included in this report and the primary studies identified as references of potential interest. This further corroborates the suggestion that there appears to be a large body of literature describing this topic that is – as discussed previously – variable in its focuses of interest (e.g., populations, interventions, and study outcomes), methods, and quality, which limits the extent to which it can be effectively interpreted and synthesized.

Conclusions and Implications for Decision- or Policy-Making

This review identified 8 SRs that reported clinical evidence describing the longevity of complete or partial removable dentures and were eligible for inclusion.¹⁶⁻²³

As was observed in the 2015 CADTH report,¹³ variable findings about the longevity of complete and partial removable dentures were found, with 1 SR that reported a pooled weighted mean of 10.06 years of survival for complete dentures¹⁸ and another that reported a mean of 8 years of survival for metal partial dentures (based on data from 1 primary study).²²

Rates of survival ranged between 38% and 100% across study follow-up ranges between 1 and 20 years or more for complete dentures.^{17,20,23} Rates of survival ranged between 48% and 100% across study follow-up ranges between 1 and 20 years or more for partial dentures constructed of metal.^{19,22} Rates of failure for complete dentures ranged between 0% and 79.2% across study follow-up ranges between 1 and 20 years or more.^{16,18,20,21} Rates of failure for partial metal dentures were 3.8% and 3.2% at 2 and 4 years of study follow-up, respectively.²²

These variable findings may reflect considerable differences across the SRs included in this review, and the relevant primary studies that they summarize regarding intervention (i.e., various types of dentures) and study objectives and methods (i.e., broader or variable focuses of interest, variable quality of reporting, and variable primary study designs and sample sizes). Because the SRs included in this report did not consistently report details about the populations nor provide consistent or clear definitions for measures of longevity, the variability across findings may also be attributable to these unknown variables. Nonetheless, the data on survival of complete and partial dentures at 5 years suggests that the majority of dentures are likely to demonstrate longevity across this time frame.

Similar to the 2015 CADTH report,¹³ the potential for risk of bias among the included studies in the review was identified.¹⁶⁻²³ In addition to the assessment of risk of bias conducted during the current review, several of the SRs included in this report acknowledged risk of bias identified among the primary research studies that they summarized.^{16,17,20,21} This suggests that the evidence base informing the longevity of complete and partial dentures may still be characterized by limited methodological rigour (e.g., retrospective and other nonrandomized study designs, including small sample sizes)^{16,18-21,23} and risk of bias (e.g., serious potential for confounding, selection, classification and reporting bias, as well as a lack of clarity in reporting).^{17,22}

Finally, the generalizability of the findings summarized in this report may be limited in their application to the Canadian context because the relevant primary studies described in the included SRs represented a broad range of populations by country of origin, with only 1 describing any relevant primary studies conducted in Canada.¹⁸ Nonetheless, the extent to which studies from other countries bear relevance on the longevity of complete and partial dentures in the Canadian context remains unclear.

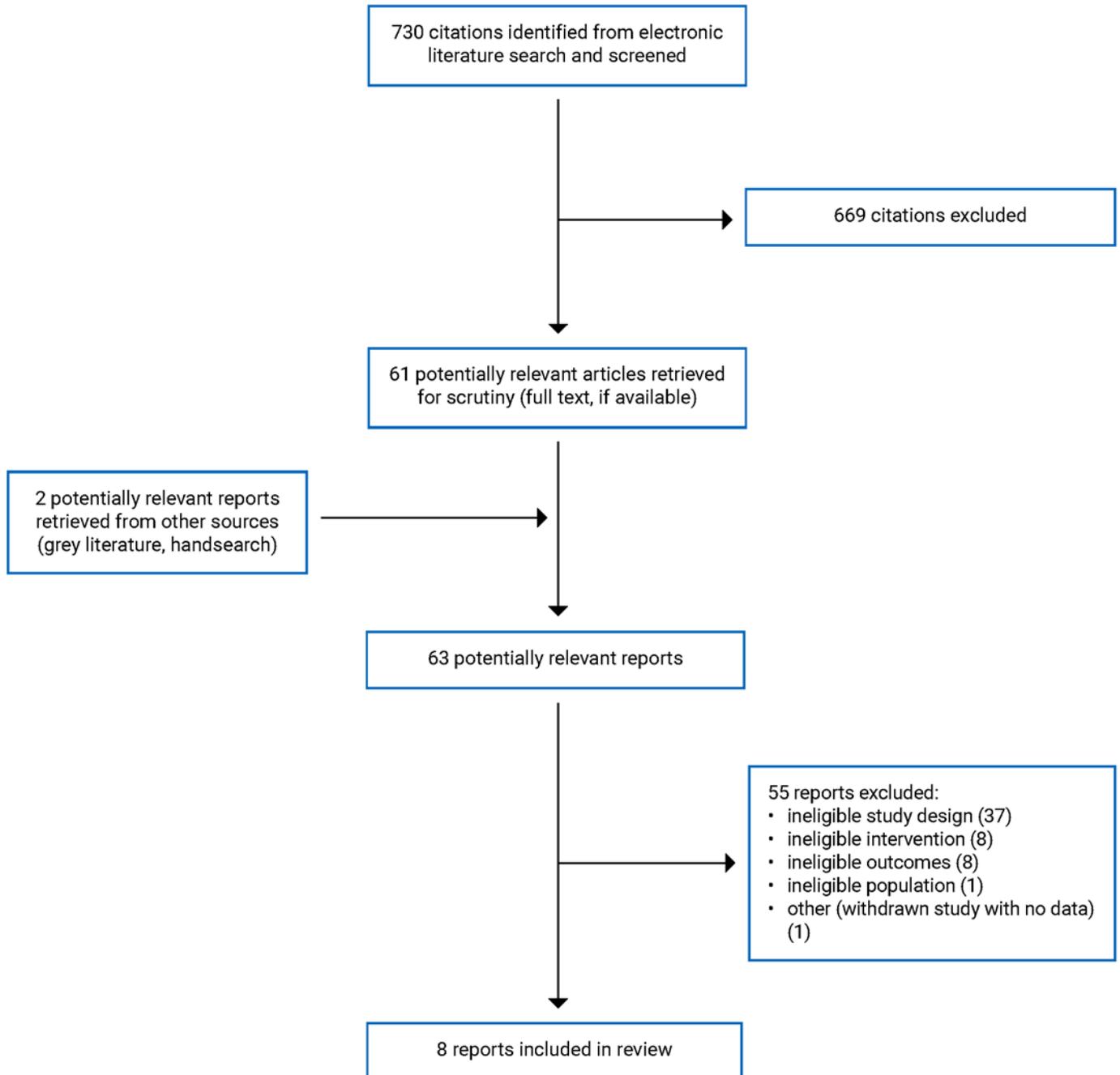
The wide range of findings, variability, and lack of clarity in reporting of the key study features described across the SRs included in this review indicate a continued need for clarity and consistency in the research informing the longevity of complete and partial dentures. Future research, ideally with prospective study designs and long-term follow-up, should aim for increased clarity and transparency in reporting of the populations, interventions (including types of materials from which dentures are constructed), and outcome definitions used in studies investigating the longevity of complete and partial dentures.

References

1. Al-Rafee MA. The epidemiology of edentulism and the associated factors: a literature review. *J Family Med Prim Care*. 2020;9(4):1841-1843. [PubMed](#)
2. Estrin N, Nam K, Romanos GE, Saragossi J, Iacono VJ, Bassir SH. Clinical outcomes of metal-ceramic versus metal-acrylic resin implant-supported fixed complete dental prostheses: a systematic review and meta-analysis. *Int J Prosthodont*. 2022;06:06.
3. Kutkut A, Bertoli E, Frazer R, Pinto-Sinai G, Fuentealba Hidalgo R, Studts J. A systematic review of studies comparing conventional complete denture and implant retained overdenture. *J Prosthodont Res*. 2018;62(1):1-9. [PubMed](#)
4. Santiago JB, de Souza Leao R, Pellizzer EP, do Egito Vasconcelos BC, Dantas de Moraes SL. Evaluation of masticatory function, satisfaction, and quality of life among users of complete dentures relined with resilient materials - a systematic review. *Int J Prosthodont*. 2022;06:06.
5. Molinero-Mourelle P, Bischof F, Yilmaz B, Schimmel M, Abou-Ayash S. Clinical performance of tooth implant-supported removable partial dentures: a systematic review and meta-analysis. *Clin Oral Investig*. 2022;26(10):6003-6014. [PubMed](#)
6. Yetman D. 3 options for replacing missing teeth. *Healthline.com* 2021; <https://www.healthline.com/health/dental-and-oral-health/missing-teeth>. Accessed 2023 Feb 21.
7. Gotter A. False teeth: what you should know. *Healthline.com* 2018; <https://www.healthline.com/health/false-teeth>. Accessed 2023 Feb 21.
8. Canadian Dental Association. Dentures. 2023; http://www.cda-adc.ca/en/oral_health/procedures/bridges_dentures/dentures.asp. Accessed 2023 Feb 21.
9. Denture World. Kinds of dentures. 2023; <https://denture-world.co.uk/kinds-of-dentures/>. Accessed 2023 Feb 21.
10. Janeva NM, Kovacevska G, Elencevski S, Panchevska S, Mijoska A, Lazarevska B. Advantages of CAD/CAM versus conventional complete dentures - a Review. *Open Access Maced J Med Sci*. 2018;6(8):1498-1502. [PubMed](#)
11. Canadian Association of Public Health Dentistry. Government dental programs. [date unknown]; <https://caphd.ca/programs-resources/government-dental-programs/#:~:text=In%20Canada%2C%20general%20oral%20health,covered%20through%20government%20dental%20programs>. Accessed 2023 Feb 21.
12. Higuera V. 3 options for replacing missing teeth. *Healthline.com* 2019; <https://www.healthline.com/health/dental-and-oral-health/missing-teeth>. Accessed 2023 Feb 21.
13. CADTH. Longevity of removable prosthodontics: a review of the clinical evidence. (*Health technology review: summary with critical appraisal*). Ottawa (ON): CADTH; 2015: <https://www.cadth.ca/longevity-removable-prosthodontics-review-clinical-evidence>. Accessed 2023 Jan 26.
14. Shea BJ, Reeves BC, Wells G, et al. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. *BMJ*. 2017;358:j4008. [PubMed](#)
15. Liberati A, Altman DG, Tetzlaff J, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *J Clin Epidemiol*. 2009;62(10):e1-e34. [PubMed](#)
16. Khurshid Z, Nedumgottil BM, Ali RMM, Bencharit S, Najeeb S. Insufficient evidence to ascertain the long-term survival of PEEK dental prostheses: a systematic review of clinical studies. *Polymers (Basel)*. 2022;14(12):16. [PubMed](#)
17. Donos N, Andre Mezzomo L, Mardas N, Goldoni M, Calciolari E. Efficacy of tooth-supported compared to implant-supported full-arch removable prostheses in patients with terminal dentition. A systematic review. *J Clin Periodontol*. 2022;49 Suppl 24:224-247. [PubMed](#)
18. Taylor M, Masood M, Mnatzaganian G. Longevity of complete dentures: a systematic review and meta-analysis. *J Prosthet Dent*. 2021;125(4):611-619. [PubMed](#)
19. Seo JG, Cho JH. Clinical outcomes of rigid and non-rigid telescopic double-crown-retained removable dental prostheses: an analytical review. *J Adv Prosthodont*. 2020;12(1):38-48. [PubMed](#)
20. de Luna Gomes JM, Lemos CAA, Santiago Junior JF, de Moraes SLD, Goiato MC, Pellizzer EP. Optimal number of implants for complete-arch implant-supported prostheses with a follow-up of at least 5 years: a systematic review and meta-analysis. *J Prosthet Dent*. 2019;121(5):766-774.e763. [PubMed](#)
21. Lemos CA, Verri FR, Batista VE, Junior JF, Mello CC, Pellizzer EP. Complete overdentures retained by mini implants: A systematic review. *J Dent*. 2017;57:4-13. [PubMed](#)
22. Moldovan O, Rudolph H, Luthardt RG. Clinical performance of removable dental prostheses in the moderately reduced dentition: a systematic literature review. *Clin Oral Investig*. 2016;20(7):1435-1447. [PubMed](#)
23. Sadowsky SJ, Zitzmann NU. Protocols for the maxillary implant overdenture: a systematic review. *Int J Oral Maxillofac Implants*. 2016;31 Suppl:s182-191. [PubMed](#)
24. Zou D, Wu Y, Huang W, Zhang Z, Zhang Z. A 5- to 8-year retrospective study comparing the clinical results of implant-supported telescopic crown versus bar overdentures in patients with edentulous maxillae. *Int J Oral Maxillofac Implants*. 2013;28(5):1322-1330. [PubMed](#)

Appendix 1: Selection of Included Studies

Figure 1: Selection of Included Studies



Appendix 2: Characteristics of Included Publications

Note that this table has not been copy-edited.

Table 2: Characteristics of Included Systematic Reviews

Study citation, country, funding source	Study designs and numbers of primary studies included	Population characteristics	Intervention and comparator(s)	Clinical outcomes, length of follow-up
<p>Kurshid, 2022¹⁶ Saudi Arabia Funding source: Deanship of Scientific Research, Vice Presidency for Graduate Studies and Scientific Research, King Faisal University</p>	<p>Total studies included: 12 Total studies relevant to this review: 1 prospective clinical study published in 2019</p>	<p>Population included: Dental patients, range of N across studies = 1 to 43 Age in yr, mean (SD), range: 59.96 (NR), 32 to 85 Sex: NR Population relevant to this review: Dental patients, N = 15 Age in yr, mean (SD): 68.8 (4.7)</p>	<p>Interventions included: Fixed and removable dental prostheses constructed of PEEK Interventions relevant to this review: Removable, implant-supported maxillary overdenture constructed of PEEK, N = 15 Comparator: NR</p>	<p>Outcome measure relevant to this review: Failure rate Follow-up: 1 yr</p>
<p>Donos, 2021¹⁷ UK Funding source: NR</p>	<p>Total studies included: 26 Total studies relevant to this review: 17 prospective and retrospective clinical studies published between 1984 and 2020</p>	<p>Population included: Adult patients ≥ 18 yr with terminal dentition or edentulous, N = NR Age in yr, mean (SD): NR Sex: NR Population relevant to this review: Adult patients ≥ 18 yr with terminal dentition or edentulous, N = 1,250 Age in yr, range of mean (where reported/clearly reported): 57.6 to 68</p>	<p>Interventions included and relevant to this review: Implant-supported full-arch dentures, N = 139 Tooth-supported full-arch dentures, N = 1,320 + NR Comparator: NR</p>	<p>Outcome measure: Survival rate Follow-up: Ranging between 12 months and ≥ 20 yr</p>
<p>Taylor, 2021¹⁸ Australia Funding source: NR</p>	<p>Total studies included: 42 Total studies relevant to this review:</p>	<p>Population included and relevant to this review: Edentulous patients, N = NR</p>	<p>Intervention included and relevant to this review: Removable complete dentures, N = 3,023</p>	<p>Outcome measures: Longevity, measured as: • duration of survival • failure rate</p>

Study citation, country, funding source	Study designs and numbers of primary studies included	Population characteristics	Intervention and comparator(s)	Clinical outcomes, length of follow-up
	42; 22 cross-sectional clinical studies (published 1982 to 2017), 19 longitudinal clinical studies (published 1967 to 2019); 1 reporting both cross-sectional and longitudinal results (published 2003)	Age in yr, mean (SD): 61.8 (8.5) Sex, % female: 58.2	Comparator: NR	Follow-up: Range from 1 to 15 yr
Seo, 2020 ¹⁹ Republic of Korea Funding source: NR	Total studies included: 25 Total studies relevant to this review: 15; 1 RCT (published 2015), 3 prospective clinical studies (published 2012 to 2019), 11 retrospective clinical studies (published 2001 to 2019)	Population included: Patients with tooth loss, N = NR Age: NR Sex: NR Population relevant to this review: Patients with tooth loss, N = 1,363	Intervention included and relevant to this review: Double-crown-retained removable partial dentures, N = 1,587 Comparator: NR	Outcome measure: Survival rate Follow-up: Mean follow-up ranging between 3 and 15 yr
de Luna Gomes, 2019 ²⁰ Brazil Funding source: NR	Total studies included: 18 ^a Total studies relevant to this review: 12; 2 RCTs (published 2013 and 2016), 10 prospective clinical studies (published 2000 to 2017)	Population included: Edentulous patients, N = 1,006 Age in yr, mean (SD): 61.44 (NR) Patients relevant to this review: Edentulous patients, N = 645 Age in yr, range of mean (where reported): 53 to 75.7 Sex, n patients: Female = 318 Male = 311	Intervention included and relevant to this review: Implant-supported full-arch dentures, N = NR Comparator: NR	Outcome measures: Survival and/or failure rate Follow-up: Minimum 5 yr Mean follow-up, prostheses supported by < 5 implants per jaw (all studies): 6 yr Mean follow-up, prostheses supported by > 4 implants per jaw (all studies): 7.63 yr
Lemos, 2016 ²¹ Brazil Funding source: NR	Total studies included: 24 Total studies relevant to this review: 7; 1 RCT (published	Population included: Edentulous patients, N = 1,273 Age, mean yr (SD): 65.93 (NR)	Intervention included and relevant to this review: Complete overdentures supported by mini implants, N = NR	Outcome measure: Survival rate Follow-up: Range from 1 to 7 yr

Study citation, country, funding source	Study designs and numbers of primary studies included	Population characteristics	Intervention and comparator(s)	Clinical outcomes, length of follow-up
	2015), 6 prospective clinical studies (published 2012 to 2016)	Sex: NR Population relevant to this review: Edentulous patients, N = 240 + NR Age in yr, range of mean (where reported): 59.5 to 71.1	Comparator: Conventional or other dentures, no comparator	
Moldovan, 2016 ²² Germany Funding source: German Society of Dental, Oral, and Craniomandibular Sciences	Total studies included: 19 Total studies relevant to this review: 5; 4 RCTs (published between 1987 and 2012), 1 retrospective clinical study (published across 5 papers between 1971 and 1995)	Population included: Patients with “moderately reduced dentition,” N = NR Age, mean yr: NR Sex: NR Population relevant to this review: Patients with “moderately reduced dentition,” N = 140 + NR	Intervention included and relevant to this review: Removable, metal partial dentures, N = 394 Comparator: NR	Outcome measures: Duration of survival and survival rate Follow-up: Range from 2 to 25 yr
Sadowsky, 2016 ²³ US Funding source: NR	Total studies included: 20 Total studies relevant to this review: 15; 1 RCT (published in 2013), 11 prospective clinical studies (published 1997 to 2015) 3 retrospective clinical studies (published 1997 to 2009)	Population included: Edentulous patients, N = 530 Age, mean yr: NR Sex: NR Population relevant to this review: Edentulous patients, N = 420	Intervention included and relevant to this review: Implant-supported maxillary overdentures, N = NR Comparator: NR	Outcome measure: Survival rate ^b Follow-up: Range from 2 months to 22 yr

mo = month(s); NR = not reported; PEEK = polyetheretherketone; RCT = randomized controlled trial; SD = standard deviation; yr = year(s)

^aThe SR reports inclusion of 19 studies; there were 19 papers from primary studies included representing 18 studies.

^bIt is unclear from the study report of findings whether survival is reported for implants and prostheses together.

Appendix 3: Critical Appraisal of Included Publications

Note that this table has not been copy-edited.

Table 3: Strengths and Limitations of Systematic Reviews Using AMSTAR 2¹⁴

AMSTAR item	Khurshid (2022) ¹⁶	Donos (2021) ¹⁷	Taylor (2021) ¹⁸	Seo (2020) ¹⁹	de Luna Gomes (2019) ²⁰	Lemos (2017) ²¹	Moldovan (2016) ²²	Sadowsky (2016) ²³
Did the research questions and inclusion criteria for the review include the components of PICO?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Did the report of the review contain an explicit statement that the review methods were established before the conduct of the review and did the report justify any significant deviations from the protocol?	Yes	Yes	Yes	No	Yes	Yes	No	No
Did the review authors explain their selection of the study designs for inclusion in the review?	Unclear	Yes	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear
Did the review authors use a comprehensive literature search strategy?	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Did the review authors perform study selection in duplicate?	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Did the review authors perform data extraction in duplicate?	Yes	Yes	Yes	No	Yes	Yes	No	No
Did the review authors provide a list of excluded studies and justify the exclusions?	Yes	Yes	No	Yes	Yes	Yes	No	No
Did the review authors describe the included studies in adequate detail?	Unclear	Yes	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear
Did the review authors use a satisfactory technique for assessing the RoB in individual studies that were included in the review?	Yes	Yes	Yes	No	Yes	Yes	No	No
Did the review authors report on the sources of funding for the studies included in the review?	No	Yes	No	No	No	No	No	No

AMSTAR item	Khurshid (2022) ¹⁶	Donos (2021) ¹⁷	Taylor (2021) ¹⁸	Seo (2020) ¹⁹	de Luna Gomes (2019) ²⁰	Lemos (2017) ²¹	Moldovan (2016) ²²	Sadowsky (2016) ²³
If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?	NA	NA	Yes	NA	Yes	NA	NA	NA
If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	NA	NA	Yes	NA	No	NA	NA	NA
Did the review authors account for RoB in individual studies when interpreting/ discussing the results of the review?	No	Yes	No	No	Unclear	Yes	No	No
Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	No	Yes	Yes	No	Unclear	No	Yes	Yes
If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	NA	NA	Unclear	NA	No	NA	NA	NA
Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	Yes	Yes	Unclear	No	Yes	Yes	Yes	No

AMSTAR 2 = A Measurement Tool to Assess Systematic Reviews 2; NA = not applicable; PICO = population, intervention, comparator, outcome; RoB = risk of bias.

Appendix 4: Main Study Findings

Note that this table has not been copy-edited.

Table 4: Summary of Duration of Survival in Years – Complete Dentures

Primary study data source	Complete denture type (N)	Longevity, mean yr (SD)
Taylor, 2021¹⁸		
Pooled findings from 27 studies	All dentures (3,023)	Weighted = 10.06 (4.03)
Pooled subgroup analyses from n = NR studies	Maxillary denture (589)	Weighted = 10.26 (3.80)
	Mandibular denture (864)	Weighted = 8.63 (2.63)
	Maxillary and mandibular pair of dentures (1,570)	Weighted = 10.76 (4.68)
Primary studies included in the SR and reporting relevant data:		
Agerberg and Viklund, 1989	Maxillary and mandibular pair of dentures (100)	12 (NR)
Al-Zubeidi and Thomson, 2012	Maxillary and mandibular pair of dentures (106)	10.2 (NR)
Baer, 1992	Maxillary and mandibular pair of dentures in male patients (14)	9.9 (NR)
	Maxillary and mandibular pair of dentures in female patients (15)	3.8 (NR)
Berg, 1984	Maxillary denture (74)	16.8 (NR)
	Mandibular denture (74)	14.1 (NR)
Boerrigter, 1995	Maxillary denture (90)	8.7 (NR)
	Mandibular denture (90)	7.9 (NR)
Cerutti-Kopplin, 2017	Maxillary and mandibular pair of dentures (117)	11.4 (NR)
Davis and Watson, 1993	Maxillary and mandibular pair of dentures (68)	12.3 (NR)
De Caxias, 2018	Maxillary and mandibular pair of dentures (15)	17 (NR)
Garrett, 1996	Maxillary and mandibular pair of dentures (21)	19.2 (NR)
Geertman, 1996	Maxillary denture (151)	7.0 (NR)
	Mandibular denture (151)	7.0 (NR)
Gunne, 1982	Maxillary and mandibular pair of dentures (19)	9.2 (NR)
Heyink, 1986	Maxillary and mandibular pair of dentures (131)	19.0 (NR)
Joanna, 2017	Maxillary and mandibular pair of dentures (50)	10.8 (NR)
Kamalakidis, 2016	Maxillary and mandibular pair of dentures (20)	13.9 (NR)
Kimoto, 2006	Maxillary and mandibular pair of dentures (28)	4.5 (NR)
Kimoto, 2010	Maxillary and mandibular pair of dentures (74)	8.4 (NR)
Kimoto, 2013	Maxillary denture (62)	8.1 (NR)

Primary study data source	Complete denture type (N)	Longevity, mean yr (SD)
	Mandibular denture (62)	7.2 (NR)
Meijer, 2003	Mandibular denture (121)	7.5 (NR)
Mengatto, 2017	Maxillary denture (20)	12.5 (NR)
	Mandibular denture (20)	13.4 (NR)
Miranda, 2014	Maxillary and mandibular pair of dentures (104)	20.0 (NR)
Morin, 1998	Maxillary and mandibular pair of dentures (410)	6.0 (NR)
Pan and Awad, 2008	Maxillary and mandibular pair of dentures (256)	9.6 (NR)
Petola, 1997	Maxillary denture (42)	17.0 (NR)
	Mandibular denture (42)	14.0 (NR)
Raustia, 1997	Maxillary and mandibular pair of dentures (64)	12.0 (NR)
Salonen, 1994	Maxillary denture (150)	9.9 (NR)
	Mandibular denture (150)	9.2 (NR)
Torres, 2017	Maxillary and mandibular pair of dentures (32)	6.9 (NR)
Zhang, 2019	Mandibular denture (80)	5.7 (NR)

Table 5: Summary of Survival Rates Across Study Follow-Up – Complete Dentures

Primary study data source	Follow-up	Complete denture type (N, dentures or patients)	Survival, n (%)
Donos, 2021¹⁷			
< 5 yr study follow-up			
Chhabra, 2019	48 to 60 months	Tooth-supported, maxillary and mandibular, full-arch dentures (97)	NR (100)
Rinke, 2019	48 to 60 months	Tooth-supported, full-arch denture (263)	NR (62, 95% CI 55 to 69)
Glibert, 2018	12 months	Implant-supported, maxillary, full-arch denture (21)	NR (100)
Yao, 2013	24 months	Tooth-supported, mandibular, full-arch denture (30)	NR (100)
Van Assche, 2012	24 months	Implant-supported, maxillary, full-arch denture (12)	NR (100)
Eccellente, 2011	24 months	Implant-supported, maxillary, full-arch denture (45)	NR (100)
Hug, 2006	24 months	Implant-supported, maxillary and mandibular, full-arch dentures (20)	NR (95)
		Tooth-supported, maxillary and mandibular, full-arch dentures (21)	NR (95.23)
Widbom, 2004	48 to 60 months	Tooth-supported, maxillary and mandibular, full-arch dentures (75)	NR (96)
Coca, 2000	48 to 60 months	Tooth-supported, maxillary and mandibular, full-arch dentures (106)	NR (100)

Primary study data source	Follow-up	Complete denture type (N, dentures or patients)	Survival, n (%)
Budtz-Jørgensen, 1995	48 to 60 months	Tooth-supported, maxillary and mandibular, full-arch dentures (NR)	NR (87.1)
Ericson, 1990	24 months	Tooth-supported, maxillary and mandibular, full-arch dentures (26)	NR (100)
	36 months	Tooth-supported, maxillary and mandibular, full-arch dentures (24)	NR (100)
5 yr to < 20 yr study follow-up			
Yoshino, 2020	6 to 12 yr	Tooth-supported, maxillary and mandibular, full-arch dentures (213)	NR (94.7)
Rinke, 2019	6 to 12 yr	Tooth-supported, full-arch dentures (263)	NR (38, 95% CI 30 to 45)
Zou, 2013	6 to 12 yr	Implant-supported, maxillary, full-arch denture (41)	NR (100)
Coca, 2000	6 to 12 yr	Tooth-supported, maxillary and mandibular, full-arch dentures (106)	NR (100)
Keltjens, 1994	6 to 12 yr	Tooth-supported, maxillary and mandibular, full-arch dentures (181)	NR (89)
Shaw, 1984	6 to 12 yr	Tooth-supported, maxillary and mandibular, full-arch dentures (25)	NR (40)
Toolson and Taylor, 1989	6 to 12 yr	Tooth-supported, maxillary and mandibular, full-arch (33)	NR (78.57)
≥ 20 yr study follow-up			
Yoshino, 2020	≥ 20 yr	Tooth-supported, maxillary and mandibular, full-arch (213)	NR (70.8)
Eisenburger, 2000	≥ 20 yr	Tooth-supported, maxillary and mandibular, full-arch (250)	NR (86.4)
de Luna Gomes, 2019²⁰			
Relevant studies describing survival, pooled results	≥ 5 yr (N studies = NR)	Implant- supported (< 5), maxillary full-arch denture, (NR)	NR (100)
		Implant- supported (≥ 5), maxillary full-arch denture, (NR)	NR (99.5)
		Implant- supported (< 5), mandibular full-arch denture (NR)	NR (99.5)
		Implant- supported (≥ 5), mandibular full-arch denture (NR)	NR (100)
		Implant-supported (< 5), maxillary and mandibular pair, full-arch dentures (NR)	NR (89.62)
		Implant-supported (≥ 5), maxillary and mandibular pair, full-arch dentures (NR)	NR (89.62)

Primary study data source	Follow-up	Complete denture type (N, dentures or patients)	Survival, n (%)
Primary studies included in the SR and reporting relevant data:			
Ayna, 2017	7 yr	Patients treated with implant-supported, mandibular full-arch denture (16)	NR (100)
Cannizzaro, 2016	5 yr	Patients treated with implant-supported, mandibular full-arch denture (80)	NR (97.5)
Tallarico, 2016	5 yr	Patients treated with implant-supported, maxillary full-arch denture (40)	NR (100)
Shigehara, 2015	5 yr	Patients treated with implant-supported, maxillary and mandibular full-arch paired dentures (27)	NR (100)
Tealdo, 2014	6 yr	Patients treated with implant-supported, maxillary full-arch denture, (NR), group 1 (fewer implants)	NR (82.4)
		Patients treated with implant-supported, maxillary full-arch denture, (NR) group 2 (more implants)	NR (73.3)
Fischer, 2013	10 yr	Patients treated with implant-supported, maxillary full-arch denture, (24)	NR (82)
Francetti, 2012	6 yr	Patients treated with implant-supported, maxillary and mandibular full-arch paired dentures (47)	NR (100)
Mertens, 2011	8 yr	Patients treated with implant-supported, maxillary full-arch denture (17)	NR (82.4)
Agliardi, 2010	5 yr	Patients treated with implant-supported, maxillary full-arch denture (NR)	NR (100)
		Patients treated with implant-supported, mandibular full-arch denture (NR)	NR (100)
Gallucci, 2009	5 yr	Patients treated with implant-supported, mandibular full-arch denture (45)	NR (100)
Jemt, 2002	5 yr	Patients treated with implant-supported, maxillary full-arch denture, (NR), group 1 (not described)	NR (96.4)
		Patients treated with implant-supported, maxillary full-arch denture (NR) group 2 (not described)	NR (93.3)
Eliasson, 2000	> 5 yr	Patients treated with implant-supported, mandibular full-arch denture (53)	NR (100)
Sadowsky, 2016²³			
Primary studies included in the SR with < 5 yr follow-up and reporting relevant data:			
Slot, 2014	12 months	Patients treated with implant-supported, maxillary overdenture (50)	NR (98)
Slot, 2013	1 yr	Patients treated with implant-supported (4 implants), maxillary overdenture (NR of 49)	NR (100)

Primary study data source	Follow-up	Complete denture type (N, dentures or patients)	Survival, n (%)
		Patients treated with implant-supported (6 implants), maxillary overdenture (NR of 49)	NR (99)
Zou, 2013	36 months	Patients treated with implant-supported, maxillary overdenture (30)	NR (100)
Bernhart, 2012	2 yr	Patients treated with implant-supported, maxillary overdenture (12)	NR (78)
Pieri, 2009	12 months	Patients treated with implant-supported, maxillary overdenture (22)	20 (97)
Krennmair, 2008	42 months	Patients treated with implant-supported (4 implants), maxillary overdenture (NR of 34)	NR (98.4)
		Patients treated with implant-supported (6 to 8 implants), maxillary overdenture (NR of 34)	NR (97.4)
Raghoobar, 2003	12 months	Patients treated with implant-supported, maxillary overdenture (10)	NR (95.6)
Narhi, 2001	32 to 54 months	Patients treated with implant-supported, maxillary overdenture (16)	NR (92)
de Albuquerque, 2000	2 months	Patients treated with implant-supported, maxillary overdenture (13)	NR (96.7)
Zitzman and Marinello, 2000	27 months	Patients treated with implant-supported, maxillary overdenture (10)	NR (94)
Naert, 1998	48 months	Patients treated with implant-supported, maxillary overdenture (13)	NR (88.6)
Primary studies included in the SR with ≥ 5 yr follow-up and reporting relevant data:			
Visser, 2008	10 yr	Patients treated with implant-supported, maxillary overdenture (39)	NR (86)
Smedberg, 1999, 1993	82 months	Patients treated with implant-supported, maxillary overdenture (28)	NR (84 to 85)
Watson, 1997	5 yr	Patients treated with implant-supported, maxillary overdenture (16)	NR (78)
Ekfeldt, 1997	Mean 30 months	Patients treated with implant-supported, maxillary overdenture, instead of fixed denture (NR of 38)	NR (56.4)
		Patients treated with implant-supported, maxillary overdenture, as originally planned (NR of 38)	NR (99.3)

CI = confidence interval; mo = month(s); NR = not reported; SD = standard deviation; SR = systematic review; yr = year(s)

^aThese rates were reported as pooled weighted event rates of survival; due to the inconsistency observed across rates of survival reported for individual primary studies, these pooled data have been interpreted in this report as pooled weighted event rates of failure.

^bResults state survival as "100% (not specifically indicated)" (p. s189).

^cResults are reported for multiple subgroups without details as to group numbers or characteristics.

Table 6: Summary of Failure Rates Across Study Follow-Up – Complete Dentures

Primary study data source	Follow-up	Complete denture type (N, dentures or patients)	Failure, n (%)
Khurshid, 2022¹⁶			
Mangano, 2019	1 yr	Implant-supported, removable maxillary overdenture (15)	NR (20)
Taylor, 2021¹⁸			
Relevant studies describing failure, pooled results	1 to 2 yr (3 studies)	Maxillary and mandibular pair of dentures (NR)	NR (5, 95% CI, 0 to 10%) P = NR
	5 to 6 yr (7 studies)	Maxillary and mandibular, unpaired dentures (NR)	NR (12, 95% CI, 8 to 16) P = 0.03
	> 10 yr (7 studies)	Maxillary and mandibular paired and unpaired dentures (NR)	NR (41, 95% CI, 28 to 53) P < 0.001
Relevant studies describing failure, pooled results	1 to > 10 yr (17 studies)	Maxillary and mandibular paired and unpaired dentures (NR)	NR (21, 95% CI 15 to 28) P = NR
Primary studies included in the SR with < 5 yr follow-up and reporting relevant data:			
Kapur, 1998	2 yr	Maxillary and mandibular pair of dentures (37)	2 (5.4)
Karkazis and Lambadakis, 1994	4 yr	Maxillary and mandibular pair of dentures (14)	0 (0)
Berg, 1988	2 yr	Maxillary and mandibular pair of dentures (38)	0 (0)
Bergman and Carlsson, 1972	1 yr	Maxillary and mandibular pair of dentures (54)	1 (1.9)
Korduner and Marken, 1967	2 yr	Maxillary and mandibular pair of dentures (68)	7 (10.3)
Primary studies included in the SR with 5 to < 20 yr follow-up and reporting relevant data:			
McGlumphy, 2019	5 yr	Maxillary denture (24)	1 (4.2)
	10 to 15 yr		9 (37.5)
	≥ 15 yr		19 (79.2)
Zhang, 2019	5 yr	Maxillary denture (53)	6 (11.3)
Kawai, 2018	10 yr	Maxillary and mandibular pair of dentures (54)	19 (3.5)
Kimoto, 2013	6.25 yr	Mandibular denture (35)	6 (17.1)
Dorner, 2010	5 yr	Maxillary denture (94)	NR (3.8)
		Mandibular denture (94)	NR (6.0)
	10 yr	Maxillary denture (94)	NR (10.3)

Primary study data source	Follow-up	Complete denture type (N, dentures or patients)	Failure, n (%)
		Mandibular denture (94)	NR (14.8)
Meijer, 2003	5 yr	Maxillary denture (100)	7 (7)
		Mandibular denture (100)	15 (15)
	10 yr	Maxillary denture (95)	28 (29.5)
		Mandibular denture (95)	34 (35.8)
Polychronakis, 2003	5 yr	Maxillary and mandibular pair of dentures (17)	0 (0)
Visser, 2002	5 yr	Maxillary denture (88)	10 (11.4)
		Mandibular denture (88)	20 (22.7)
Kalk, 1991	5 yr	Maxillary and mandibular pair of dentures (19)	0 (0)
Magnusson, 1986	5 yr	Maxillary and mandibular pair of dentures (30)	0 (0)
Primary studies included in the SR with ≥ 20 yr follow-up and reporting relevant data:			
Ellinger, 1989	20 yr	Maxillary and mandibular pair of dentures (34)	8 (23.5)
Bergman and Carlsson, 1985	21 yr	Maxillary and mandibular pair of dentures (18)	9 (50)
de Luna Gomes, 2019²⁰			
Relevant studies describing failure, pooled event rates	≥ 5 yr (6 studies)	Implant-supported, < 5 full-arch dentures (NR)	Weighted event rate = 1.5% (95% CI, 0.6 to 3.7%) P = 0.677 ^a
	≥ 5 yr (5 studies)	Implant-supported, ≥ 5 full-arch dentures (NR)	Weighted event rate = 9% (95% CI, 5 to 15.8%) P = 0.304 ^a
Lemos, 2016²¹			
Primary studies included in the SR with < 5 yr follow-up and reporting relevant data:			
Temizel, 2016	2 yr	Patients treated with implant-supported, mandibular overdentures (32)	0 (0%)
Mangano, 2015	4 yr	Patients treated with implant -supported, mandibular overdentures (NR)	2 (NR)
Souza, 2015	1 yr	Patients treated with implant -supported, mandibular overdentures (120)	4 (NR)
Preoteasa, 2014	3 yr	Patients treated with implant -supported, maxillary or mandibular overdentures(23)	7 (NR)
Šćepanovic, 2012	1 yr	Patients treated with implant -supported, mandibular overdentures(30)	2 (NR)

Primary study data source	Follow-up	Complete denture type (N, dentures or patients)	Failure, n (%)
Primary studies included in the SR with \geq 5 yr follow-up and reporting relevant data:			
Elsyad, 2016	5 yr	Patients treated with implant -supported, mandibular overdentures(28)	8 (NR)
Catalan, 2015	7 yr	Patients treated with implant -supported, mandibular overdentures (7)	0 (0%)

CI = confidence interval; mo = month(s); NR = not reported; SD = standard deviation; SR = systematic review; yr = year(s)

^aThese rates were reported as pooled weighted event rates of survival; due to the inconsistency observed across rates of survival reported for individual primary studies, these pooled data have been interpreted in this report as pooled weighted event rates of failure.

^bResults state survival as "100% (not specifically indicated)" (p. s189).

^cResults are reported for multiple subgroups without details as to group numbers or characteristics.

Table 7: Summary of Duration of Survival in Years – Metal Partial Dentures

Primary study data source	Partial denture type (N)	Longevity, mean yr (SD)
Moldovan, 2016²²		
Bergman, 1982	Cast-framework dentures (33)	8 (NR)

Table 8: Summary of Survival Rates Across Study Follow-Up – Metal Partial Dentures

Primary study data source	Follow-up	Partial denture type (N)	Survival, n (%)
Seo, 2020¹⁹			
Primary studies included in the SR with < 5 yr follow-up and reporting relevant data:			
Zou, 2013a	Mean (SD) yr = 3 (NR)	Implant-supported denture (10)	NR (100)
Krennmair, 2012	Mean (SD) yr = 3 (NR)	Implant-supported denture (25)	NR (100)
Wenz, 2001	Mean (SD) yr = 4.1 (NR)	Tooth-supported denture (125)	NR (100)
Primary studies included in the SR with \geq 5 yr follow-up and reporting relevant data:			
Kern, 2019	Mean (SD) yr = 11.3 (NR)	Tooth-/implant-supported denture (33)	NR (91)
Guarnieri, 2018	Mean (SD) yr = 15 (NR)	Tooth-/implant-supported denture (36)	NR (100)
Zierden, 2018	5 yr	Tooth-supported denture (572)	NR (96.1)
	10 yr		NR (84)
Frisch, 2015a	Mean (SD) yr = 5.64 (NR)	Implant-supported denture (20)	NR (100)
Frisch, 2015b	Mean (SD) yr = 6.12 (NR)	Tooth-/implant-supported denture (23)	NR (100)
Rinke, 2015	Mean (SD) yr = 5.84 (NR)	Tooth-/implant-supported denture (14)	NR (100)
Rinke, 2015	Mean (SD) yr = 5.9 (NR)	Implant-supported denture (18)	NR (100)

Primary study data source	Follow-up	Partial denture type (N)	Survival, n (%)
Stober, 2015	Mean (SD) yr = 6 (NR)	Tooth-supported denture (60)	NR (87)
Frisch, 2013	Mean (SD) yr = 14.1 (NR)	Implant-supported denture (22)	NR (77.3)
Zou, 2013b	Mean (SD) yr = 6.05 (NR)	Implant-supported denture (20)	NR (100)
Romanos, 2012	Mean (SD) yr = 5.13 (NR)	Tooth-/implant-supported denture (55)	NR (100)
Wöstmann, 2007	Mean (SD) yr = 5.3 (NR)	Tooth-supported denture (554)	NR (95.3)
Moldovan, 2016²²			
Primary studies included in the SR with < 5 yr follow-up and reporting relevant data:			
Stober, 2012	3 yr	Cast denture (30)	NR (100)
		Electroplate denture (30)	NR (93.3)
Bergman 1971	2 yr	—	NR (100)
Primary studies included in the SR with ≥ 5 yr follow-up and reporting relevant data:			
Bergman 1995	25 yr	Cast-framework denture (33)	13 (NR)
Kapur, 1994	5 yr	Ring clasp denture (NR of 60)	NR (71.3)
		T-shape clasp denture (NR of 60)	NR (76.6)
Bergman 1982	10 yr	Cast-framework denture (33)	16 (NR)

N/n = number(s); NR = not reported; SD = standard deviation; yr = year(s)

Table 9: Summary of Failure Rates Across Study Follow-Up – Metal Partial Dentures

Primary study data source	Follow-up	Partial denture type (N, dentures or patients)	Failure, n (%)
Moldovan, 2016²²			
Primary studies included in the SR with < 5 yr follow-up and reporting relevant data:			
Stober, 2012	3 yr	Electroplate denture (NR of 60)	2 (NR)
Budtz-Jørgensen, 1987	2 yr	Cast-framework denture (26)	1 (3.8)
Bergman 1977	4 yr	Cast-framework denture (33)	NR (3.2)
Primary studies included in the SR with ≥ 5 yr follow-up and reporting relevant data:			
Thomason, 2007	5 yr	Cast-framework denture (30)	15 (NR)
Budtz-Jørgensen, 1990	5 yr	Cast-framework denture (26)	2 (NR)
Bergman 1977	6 yr	Cast-framework denture (33)	NR (9.6)

N/n = number(s); NR = not reported; SD = standard deviation; yr = year(s)

Appendix 5: References of Potential Interest

Primary Studies

- Hinz S, Bomicke W, Schweyen R, Bense T. Ten-year clinical performance of non-precious metal double crowns with friction pins in severely reduced dentitions-a retrospective study. *Clin Oral Investig*. 2022 Nov 21;21:21. [PubMed](#)
- Taylor M, Masood M, Mnatzaganian G. Complete denture replacement: a 20-year retrospective study of adults receiving publicly funded dental care. *J Prosthodont Res*. 2022 Jul 30;66(3):452-458. [PubMed](#)
- Zierden K, Wostmann B, Rehmann P. Which patient-related factors influence the outcome of telescopic-retained removable implant-supported dental prostheses in edentulous patients? *Int J Prosthodont*. 2022 Sep-Oct;35(5):690-696. [PubMed](#)
- Kurosaki Y, Kimura-Ono A, Mino T, et al. Six-year follow-up assessment of prosthesis survival and oral health-related quality of life in individuals with partial edentulism treated with three types of prosthodontic rehabilitation. *J Prosthodont Res*. 2021 Aug 21;65(3):332-339. [PubMed](#)
- Yoshino K, Ito K, Kuroda M, Sugihara N. Survival rate of removable partial dentures with mandibular bilateral free end saddle: a retrospective study. *Bull Tokyo Dent Coll*. 2021 Dec 04;62(4):205-214. [PubMed](#)
- Enkling N, Moazzin R, Geers G, Kokoschka S, Abou-Ayash S, Schimmel M. Clinical outcomes and bone-level alterations around one-piece mini dental implants retaining mandibular overdentures: 5-year follow-up of a prospective cohort study. *Clin Oral Implants Res*. 2020 Jun;31(6):549-556. [PubMed](#)
- Brandt S, Winter A, Weigl P, Brandt J, Romanos G, Lauer HC. Conical zirconia telescoping into electroformed gold: a retrospective study of prostheses supported by teeth and/or implants. *Clin Implant Dent Relat Res*. 2019 Apr;21(2):317-323. [PubMed](#)
- Fobbe H, Rammelsberg P, Lorenzo Bermejo J, Kappel S. The up-to-11-year survival and success of implants and abutment teeth under solely implant-supported and combined tooth-implant-supported double crown-retained removable dentures. *Clin Oral Implants Res*. 2019 Nov;30(11):1134-1141. [PubMed](#)
- Hagiwara Y, Nakabayashi S, Ikeda T, Ito R. Ceria-stabilized zirconia/alumina nanocomposite for fabricating the framework of removable dental prostheses: preliminary results from a 4-year follow-up. *Int J Prosthodont*. 2019 May/Jun;32(3):254-256. [PubMed](#)
- Klotz AL, Ott L, Krisam J, et al. Short-term performance of implant-supported restorations fitted in general dental practice: a retrospective study. *Int J Oral Maxillofac Implants*. 2019 September/October;34(5):1169-1176. [PubMed](#)
- Marotti J, Gatzweiler B, Wolfart M, Sasse M, Kern M, Wolfart S. Implant placement under existing removable dental prostheses and the effect on follow-up and prosthetic maintenance. *J Prosthodont*. 2019 Feb;28(2):e752-e763. [PubMed](#)
- Passia N, Wolfart S, Kern M. Ten-year clinical outcome of single implant-retained mandibular overdentures - a prospective pilot study. *J Dent*. 2019 03;82:63-65. [PubMed](#)
- Schlenz MA, Schmidt A, Wostmann B, Rehmann P. Clinical performance of computer-engineered complete dentures: a retrospective pilot study. *Quintessence Int*. 2019;50(9):706-711. [PubMed](#)
- Weigl P, Trimpou G, Lorenz J, Nentwig GH, Lauer HC. Prefabricated taper crowns for the retention of implant superstructures: three-year results of a prospective clinical trial. *J Prosthet Dent*. 2019 Apr;121(4):618-622. [PubMed](#)
- Yamaga E, Sato Y, Soeda H, Minakuchi S. Relationship between oral health-related quality of life and usage period of complete dentures. *Int J Prosthodont*. 2019 Jul/Aug;32(4):327-332. [PubMed](#)
- Zhang Y, Chow L, Siu A, Fokas G, Chow TW, Mattheos N. Patient-reported outcome measures (PROMs) and maintenance events in 2-implant-supported mandibular overdenture patients: a 5-year prospective study. *Clin Oral Implants Res*. 2019 Mar;30(3):261-276. [PubMed](#)
- Nogueira TE, Aguiar FMO, de Barcelos BA, Leles CR. A 2-year prospective study of single-implant mandibular overdentures: patient-reported outcomes and prosthodontic events. *Clin Oral Implants Res*. 2018 Jun;29(6):541-550. [PubMed](#)
- Ishida K, Nogawa T, Takayama Y, Saito M, Yokoyama A. Prognosis of double crown-retained removable dental prostheses compared with clasp-retained removable dental prostheses: a retrospective study. *J Prosthodont Res*. 2017 Jul;61(3):268-275. [PubMed](#)
- Gherlone EF, Cappare P, Tecco S, et al. Implant prosthetic rehabilitation in controlled hiv-positive patients: a prospective longitudinal study with 1-year follow-up. *Clin Implant Dent Relat Res*. 2016 Aug;18(4):725-734. [PubMed](#)
- Mijiritsky E, Lorean A, Mazor Z, Levin L. Implant tooth-supported removable partial denture with at least 15-year long-term follow-up. *Clin Implant Dent Relat Res*. 2015 Oct;17(5):917-922. [PubMed](#)
- Mundt T, Schwahn C, Stark T, Biffar R. Clinical response of edentulous people treated with mini dental implants in nine dental practices. *Gerodontology*. 2015 Sep;32(3):179-187. [PubMed](#)

Systematic Reviews With Interventions of Unclear Eligibility (Partial Denture Material Could Not Be Ascertained)

- Badaro, M. M., et al. Narrow-diameter implants for partial fixed and removable prostheses: a systematic review and meta-analysis. *Int J Prosthodontics*. 2022;35(6):738-751. [PubMed](#)
- Molinero-Mourelle, P., et al. Clinical performance of tooth implant-supported removable partial dentures: a systematic review and meta-analysis. *Clin Oral Invest*. 2022;26(10):6003-6014. [PubMed](#)

- Bassetti, R. G., et al. Implant-assisted removable partial denture prostheses: a critical review of selected literature. *Int J Prosthodontics*. 2018;31(3): 287-302. [PubMed](#)
- Lian, M., et al. Prognosis of combining remaining teeth and implants in double-crown-retained removable dental prostheses: a systematic review and meta-analysis. *Int Journal Oral Maxillofacial Impl*. 2018;33(2): 281-297. [PubMed](#)