

# PRISMA 2020 Main Checklist

Topic	No.	Item	Location where item is reported
<b>TITLE</b>			
<b>Title</b>	1	Identify the report as a systematic review.	Page 1, Lines 1-2: "Patient-Specific Implants Versus Autogenous Grafts in Mandibular Reconstruction: A Systematic Review and Meta-Analysis of Clinical, Functional Outcomes and Complications"
<b>ABSTRACT</b>			
<b>Abstract</b>	2	See the PRISMA 2020 for Abstracts checklist	
<b>INTRODUCTION</b>			
<b>Rationale</b>	3	Describe the rationale for the review in the context of existing knowledge.	Pages 3-8, Sections 1.1-1.1.7: Historical background, current evidence for autogenous grafts (success rate 98.3%), dental implants, fixation outcomes, symphysis morphology, temporomandibular disorders, and evidence gap.
<b>Objectives</b>	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Page 8, Section 1.2: Primary objective: To compare clinical and functional outcomes of patient-specific implants versus autogenous bone grafts in mandibular reconstruction. PICO format specified.
<b>METHODS</b>			
<b>Eligibility criteria</b>	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Pages 8-9, Section 2.2: Inclusion criteria (adults, mandibular reconstruction, studies 2000-2025, English language, specific designs) and exclusion criteria (case reports <5, animal studies, etc.). Studies grouped by intervention type (PSI vs autograft) and donor site.
<b>Information sources</b>	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Page 9, Section 2.3: PubMed, Scopus, Web of Science, CENTRAL, LILACS, Google Scholar (first 300 results), ClinicalTrials.gov, ICTRP, reference lists, key journals (5 journals). Last search: February 10, 2025.

Topic	No.	Item	Location where item is reported
<b>Search strategy</b>	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Pages 9-10, Section 2.4: Detailed table with MeSH terms and keywords for each concept (mandibular reconstruction, patient-specific implants, autografts) with Boolean operators. Example PubMed strategy provided, with filters (humans, adults, 2000-2025).
<b>Selection process</b>	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Page 10, Section 2.5: Two reviewers independently screened titles, abstracts, and full texts. Disagreements resolved by discussion or third reviewer. No automation tools used.
<b>Data collection process</b>	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Page 10, Section 2.6: Two reviewers used a standardized, piloted data extraction form (Microsoft Excel). Data extracted independently, disagreements resolved by consensus or third reviewer. Study authors contacted for missing data.

Topic	No.	Item	Location where item is reported
<b>Data items</b>	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Pages 10-11, Section 2.7: Primary outcome: reconstruction success rate (graft/flap survival, osseointegration). Secondary outcomes: complications (infection, exposure, hardware failure, non-union), dental implant survival (1,3,5 years), functional outcomes (diet, speech), operative time, donor site morbidity, quality of life, reconstructive accuracy. All reported measures and time points collected.
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Pages 10-11, Section 2.7: Study characteristics (author, year, design, sample size, follow-up), participant characteristics (age, sex, indication, defect location, radiotherapy), intervention details (PSI type, manufacturing method, autograft type, donor site, fixation method). Funding sources recorded when reported. No assumptions made; unclear information treated as missing.
<b>Study risk of bias assessment</b>	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Pages 11-12, Section 2.8: Two reviewers independently assessed risk of bias using: Cochrane RoB 2.0 for RCTs; Newcastle-Ottawa Scale for cohort/case-control; ROBINS-I for non-randomized studies; JBI checklist for case series and cross-sectional; AMSTAR-2 for systematic reviews. Disagreements resolved by discussion.
<b>Effect measures</b>	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Page 12, Section 2.9: Dichotomous outcomes: risk ratio (RR) with 95% CI using Mantel-Haenszel. Continuous outcomes: mean difference (MD) or standardized mean difference (SMD). Odds ratio (OR) for specific outcomes.

Topic	No.	Item	Location where item is reported
<b>Synthesis methods</b>	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item 5)).	Pages 12-13, Sections 2.9-2.10: Studies grouped by intervention type (PSI vs autograft) and donor site (fibula, iliac crest, etc.). Characteristics tabulated in Table 1 and compared with planned groups in item 5.
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Page 12, Section 2.9: Authors contacted for missing data. Medians and ranges converted to means and SDs using Hozo et al. (2005) formulas. Variances calculated from available data where possible.
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Page 12, Section 2.9: Individual study results displayed in Table 1 and in forest plots for each meta-analysis using RevMan 5.4.
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Page 12, Section 2.9: Random-effects models (DerSimonian and Laird) used a priori due to anticipated heterogeneity. Heterogeneity assessed using $I^2$ and $\text{Chi}^2$ test. Software: RevMan 5.4 and Stata v.16.
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	Pages 12-13, Section 2.10: Subgroup analyses planned for 11 potential factors: donor site, graft type, fixation technique, indication, defect location, radiation history, skeletal pattern, TMD subtype, follow-up duration.

Topic	No.	Item	Location where item is reported
<b>Reporting bias assessment</b>	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	Page 13, Section 2.10: Sensitivity analyses performed: excluding high-risk-of-bias studies, excluding small studies (<10 patients), fixed-effect vs random-effects models.
	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Page 12, Section 2.9: For outcomes with $\geq 10$ studies, funnel plots constructed and visually inspected; Egger's test performed using Stata v.16.
<b>Certainty assessment</b>	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Page 13, Section 2.11: GRADE approach used to assess certainty for primary outcomes based on 5 domains (risk of bias, inconsistency, indirectness, imprecision, publication bias). GRADEpro GDT software used.
<b>RESULTS</b>			
<b>Study selection</b>	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Pages 13-14, Section 3.1 and Figure 1: 1,426 records identified; after removing 468 duplicates, 958 screened; 124 full-text assessed; 31 studies (2,143 patients) included; 26 included in meta-analysis. PRISMA flow diagram in Figure 1.
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Page 14, Figure 1: Exclusion reasons listed: 38 no direct comparison, 24 insufficient data, 16 case series <10, 8 overlapping populations, 7 not limited to mandible. Full list of excluded studies in Supplementary Material.
<b>Study characteristics</b>	17	Cite each included study and present its characteristics.	Pages 14-15, Table 1: Characteristics of 31 studies (e.g., Khayat 2024, Faverani 2025, Wüster 2025, etc.) presented in table with design, sample size, follow-up, intervention type, key outcomes.
<b>Risk of bias in studies</b>	18	Present assessments of risk of bias for each included study.	Pages 15-16, Table 2 and summary: RoB assessments: 2 RCTs (one low risk, one some concerns); mean NOS 6.7; 77% studies low/moderate risk of bias. Detailed in Supplementary Material.

Topic	No.	Item	Location where item is reported
<b>Results of individual studies</b>	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Pages 16-21, Sections 3.4.1-3.4.5 and Tables 3-7: Individual study results presented in text and tables with effect estimates and CIs. E.g., DBFF survival 98.3% (95% CI 96.2-99.1%); 5-year implant survival 91.8% (95% CI 88.1-94.5%).
<b>Results of syntheses</b>	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Pages 17-21: For each meta-analysis, number of contributing studies, sample sizes, designs, and risk of bias summarized (e.g., implant survival meta-analysis: 4 studies, 257 implants, moderate risk of bias).
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Pages 17-21 and Figures 2-5: Meta-analysis results presented with pooled estimates, 95% CIs, and heterogeneity measures. E.g., DBFF vs SBFF graft failure RR=0.76 (95% CI 0.52-1.11), I <sup>2</sup> =34%; radiotherapy effect on implant survival: 73.8% vs 95.5% at 5 years.
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Page 22, Section 3.6 and Table 8: Subgroup analysis results presented with interaction p-values. E.g., fixation type (3D plates vs mini-plates) on complications: OR=0.15 (95% CI 0.08-0.28).
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	Page 22, Section 3.7: Sensitivity analyses (excluding high-risk studies, small studies, using fixed-effect models) showed results remained robust.

Topic	No.	Item	Location where item is reported
<b>Reporting biases</b>	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Page 22, Section 3.5: Funnel plots symmetrical for main outcomes; Egger's test non-significant ( $p=0.32$ for symphysis, $p=0.41$ for complications).
<b>Certainty of evidence</b>	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Pages 23-24, Table 9: GRADE ratings: DBFF flap survival (High), SBFF vs DBFF graft failure (Low), implant survival 5 years (Moderate), fixation complications (Moderate), symphysis dimensions (Moderate), MAD TMD pain (Low), PBM pain reduction (Moderate). Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.
<b>DISCUSSION</b>			
<b>Discussion</b>	23a	Provide a general interpretation of the results in the context of other evidence.	Pages 24-25, Sections 4.1-4.2: Interpretation of main findings (DBFF success 98.3%, implant survival 91.8%, radiotherapy effect, 3D plates superiority, symphysis dimensions) and comparison with previous literature.
	23b	Discuss any limitations of the evidence included in the review.	Page 26, Section 4.4: Limitations: no RCTs directly comparing PSI vs autograft, mostly observational studies, heterogeneity in outcome definitions and follow-up, variable evidence quality.
	23c	Discuss any limitations of the review processes used.	Page 26, Section 4.4: Review limitations: language restriction to English, limited direct comparison data, inability to meta-analyze some outcomes due to heterogeneity, potential unpublished studies.
	23d	Discuss implications of the results for practice, policy, and future research.	Pages 26-27, Section 4.5 and Table 10: Clinical recommendations (use DBFF for large defects, vascularized grafts for irradiated patients, 3D plates for fixation). Future research recommendations (9 points).
<b>OTHER INFORMATION</b>			
<b>Registration and protocol</b>	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Page 1 and Section 2.1: Registered in PROSPERO (CRD420261309002).
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Page 8, Section 2.1: Protocol available at PROSPERO website ( <a href="https://www.crd.york.ac.uk/PROSPERO/view/CRD420261309002">https://www.crd.york.ac.uk/PROSPERO/view/CRD420261309002</a> ).

Topic	No.	Item	Location where item is reported
<b>Support</b>	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Page 8, Section 2.1: No amendments made to the registered protocol.
	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Page 1 and Page 25: No external funding. Supported by Taiz University through library resources and time. Funders had no role in design, analysis, or writing.
<b>Competing interests</b>	26	Declare any competing interests of review authors.	Page 1 and Page 25: Authors declare no conflicts of interest.
<b>Availability of data, code and other materials</b>	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Page 25, Data Availability statement: All data presented in tables and figures. Data extraction forms and analytic code available from corresponding author upon reasonable request.

## PRISMA Abstract Checklist

Topic	No.	Item	Reported?
<b>TITLE</b>			
<b>Title</b>	1	Identify the report as a systematic review.	Yes
<b>BACKGROUND</b>			
<b>Objectives</b>	2	Provide an explicit statement of the main objective(s) or question(s) the review addresses.	Yes
<b>METHODS</b>			
<b>Eligibility criteria</b>	3	Specify the inclusion and exclusion criteria for the review.	Yes
<b>Information sources</b>	4	Specify the information sources (e.g. databases, registers) used to identify studies and the date when each was last searched.	Yes
<b>Risk of bias</b>	5	Specify the methods used to assess risk of bias in the included studies.	Yes
<b>Synthesis of results</b>	6	Specify the methods used to present and synthesize results.	Yes
<b>RESULTS</b>			
<b>Included studies</b>	7	Give the total number of included studies and participants and summarise relevant characteristics of studies.	Yes
<b>Synthesis of results</b>	8	Present results for main outcomes, preferably indicating the number of included studies and participants for each. If meta-analysis was done, report the summary estimate and confidence/credible interval. If comparing groups, indicate the direction of the effect (i.e. which group is favoured).	Yes
<b>DISCUSSION</b>			
<b>Limitations of evidence</b>	9	Provide a brief summary of the limitations of the evidence included in the review (e.g. study risk of bias, inconsistency and imprecision).	Yes
<b>Interpretation</b>	10	Provide a general interpretation of the results and important implications.	Yes
<b>OTHER</b>			
<b>Funding</b>	11	Specify the primary source of funding for the review.	Yes
<b>Registration</b>	12	Provide the register name and registration number.	Yes

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. MetaArXiv. 2020, September 14. DOI: 10.31222/osf.io/v7gm2. For more information, visit: [www.prisma-statement.org](http://www.prisma-statement.org)

## Table 2: Full Search Strategies for All Databases

Database 1: PubMed (MEDLINE)

Date of search: February 10, 2025

Strategy:

```
...  
(((("Mandibular Reconstruction"[Mesh] OR "mandibular reconstruction"[tiab] OR "mandible  
reconstruction"[tiab] OR "mandibular continuity defect"[tiab] OR "segmental mandibulectomy"[tiab]  
OR "mandibular defect"[tiab])  
AND  
(("Patient-Specific Implants"[tiab] OR "PSI"[tiab] OR "Custom-Made Implants"[tiab] OR  
"CAD/CAM"[tiab] OR "computer-aided design"[tiab] OR "computer-aided manufacturing"[tiab] OR  
"3D-printed implants"[tiab] OR "Customized implants"[tiab] OR "Titanium mesh"[tiab] OR "PEEK  
implant"[tiab] OR "patient-specific plate"[tiab] OR "custom plate"[tiab] OR "patient-specific surgical  
plates"[tiab] OR "PSSP"[tiab] OR "3D plate"[tiab]))  
AND  
(("Autografts"[Mesh] OR "autograft"[tiab] OR "autogenous bone"[tiab] OR "autologous graft"[tiab] OR  
"bone graft"[tiab] OR "bone flap"[tiab] OR "vascularized graft"[tiab] OR "vascularised graft"[tiab] OR  
"non-vascularized graft"[tiab] OR "non-vascularised graft"[tiab] OR "free flap"[tiab] OR "free tissue  
transfer"[tiab] OR "Fibula"[Mesh] OR "fibula flap"[tiab] OR "fibular flap"[tiab] OR "double-barrel  
fibula"[tiab] OR "DBFF"[tiab] OR "iliac crest"[tiab] OR "scapula flap"[tiab] OR "DCIA"[tiab] OR "deep  
circumflex iliac artery"[tiab] OR "rib graft"[tiab] OR "radial forearm flap"[tiab] OR "osteocutaneous  
radial forearm"[tiab])))  
...
```

Additional search terms for symphysis morphology:

```
...  
("mandibular symphysis"[tiab] OR "symphysis dimensions"[tiab]) AND ("craniofacial pattern"[tiab] OR  
"skeletal pattern"[tiab] OR "sagittal"[tiab] OR "vertical"[tiab])  
...
```

Additional search terms for temporomandibular outcomes:

```
...  
("temporomandibular disorders"[tiab] OR "TMD"[tiab]) AND ("mandibular reconstruction"[tiab] OR  
"mandibular advancement"[tiab])  
...
```

Filters applied:

· Language: English

- Publication dates: January 1, 2000 – February 10, 2025
- Species: Humans
- Age: Adults (≥18 years)

Results retrieved: Not available separately (combined total across databases: 1,426)

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Database 2: Scopus

Date of search: February 10, 2025

Strategy:

```

```
TITLE-ABS-KEY ( ("mandibular reconstruction" OR "mandible reconstruction" OR "mandibular continuity defect" OR "segmental mandibulectomy" ) ) AND  
TITLE-ABS-KEY ( ("patient-specific implants" OR "PSI" OR "custom-made implants" OR "CAD/CAM" OR "computer-aided design" OR "3D-printed implants" OR "titanium mesh" OR "PEEK implant" OR "patient-specific plate" OR "3D plate" ) ) AND  
TITLE-ABS-KEY ( ("autograft" OR "autogenous bone" OR "bone graft" OR "bone flap" OR "vascularized graft" OR "free flap" OR "fibula flap" OR "iliac crest" OR "scapula flap" OR "radial forearm flap" ) )
```

```

Filters applied:

- Language: English
- Publication years: 2000-2025
- Document type: Article, Review
- Subject area: Medicine, Dentistry

Results retrieved: Not available separately (combined total across databases: 1,426)

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Database 3: Web of Science (Core Collection)

Date of search: February 10, 2025

Strategy:

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```
TS=(((("mandibular reconstruction" OR "mandible reconstruction" OR "mandibular continuity defect" OR "segmental mandibulectomy")) AND  
(("patient-specific implants" OR "PSI" OR "custom-made implants" OR "CAD/CAM" OR "computer-
```

aided design" OR "3D-printed implants" OR "titanium mesh" OR "PEEK implant" OR "patient-specific plate" OR "3D plate")) AND  
(("autograft" OR "autogenous bone" OR "bone graft" OR "bone flap" OR "vascularized graft" OR "free flap" OR "fibula flap" OR "iliac crest" OR "scapula flap" OR "radial forearm flap"))  
` `` `

Filters applied:

- Language: English
- Publication years: 2000-2025
- Document type: Article, Review
- Web of Science Categories: Surgery, Dentistry Oral Surgery & Medicine

Results retrieved: Not available separately (combined total across databases: 1,426)

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Database 4: Cochrane Central Register of Controlled Trials (CENTRAL)

Date of search: February 10, 2025

Strategy:

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#1 MeSH descriptor: [Mandibular Reconstruction] explode all trees

#2 ("mandibular reconstruction" OR "mandible reconstruction" OR "mandibular continuity defect" OR "segmental mandibulectomy"):ti,ab,kw

#3 #1 OR #2

#4 ("patient-specific implants" OR "PSI" OR "custom-made implants" OR "CAD/CAM" OR "computer-aided design" OR "3D-printed implants" OR "titanium mesh" OR "PEEK implant" OR "patient-specific plate"):ti,ab,kw

#5 MeSH descriptor: [Autografts] explode all trees

#6 ("autograft" OR "autogenous bone" OR "bone graft" OR "bone flap" OR "vascularized graft" OR "free flap" OR "fibula flap" OR "iliac crest"):ti,ab,kw

#7 #5 OR #6

#8 #3 AND #4 AND #7

`` `

Filters applied:

- Publication years: 2000-2025
- Trials only

Results retrieved: Not available separately (combined total across databases: 1,426)

