

Quality Assessment of Controlled Observational Studies

Author Year	Selection bias (High, Low, Unclear)	Bias in classification of interventions (High, Low, Unclear)	Bias due to departures from intended interventions (High, Low, Unclear)	Bias due to measurement of outcomes? (High, Low, Unclear)	Bias due to confounding? (High, Low, Unclear)	Bias due to missing data? (High, Low, Unclear)	Bias in the selection of reported results (High, Low, Unclear)	Overall quality (Good, Fair, Poor)
Albert 2006 ²⁷	Low Selection based on chronic disease status unlikely to be due to intervention; 2-year period for potential periodontal tx for all ppts; no control for selection biases.	Low Intervention groups well defined; different tx groups defined by medical claims data unlikely to be influenced by knowledge of outcome	Unclear Unclear if there were any deviations from intended tx or if there were cointerventions, as groups were defined by whether they received any periodontal therapy.	Low Costs extracted from medical records (ICD-9 codes that were billed), unlikely to be influenced by knowledge of intervention	Unclear Statistical control for differences in disease burden between groups, and only those with medical & dental coverage were included in analyses. Possibility of other confounders (<i>ie</i> , whether “no dental tx” group were healthy or had periodontal disease).	Low No indication of missing data.	Low Unlikely results due to multiple analyses.	Fair Major limitation of this study is that it is unclear what proportion of people in the “no dental services” group were periodontally healthy vs had periodontal disease and were untreated.
Blaschke 2020 ²⁸	Unclear Selection based on diabetes diagnosis which in some cases was in the same index quarter as periodontal tx, so periodontal therapy could have occurred	Low Intervention groups well defined; different tx groups defined by dental & medical claims data that are unlikely to be influenced by	Unclear Unclear if there were any deviations from intended tx, drop-out, or if there were cointerventions.	Low Outcomes extracted from claims database and unlikely to be influenced by knowledge of the intervention.	High Unclear what proportion of the control group had periodontal disease which may have confounded results.	Unclear Some data missing on inpatient costs so this was imputed, limited information on imputation methods.	Low Unlikely results due to multiple analyses.	Poor Major limitation is that at least some people in the control group probably did not have periodontal disease, which may have confounded the results. Results are also limited to those with

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	before diabetes diagnosis.	knowledge of outcome.						continuous insurance enrollment, and authors note that groups were different at baseline in terms of visits to dentist and health care costs.
Hsu 2019 ³²	Low	Unclear	Unclear	Unclear	Unclear	Low	Low	Fair
	Selection based on diabetes status & glycemic control in 6 months before periodontal tx; no control for selection biases.	Intervention groups defined by whether pts said they had ever received treatment for periodontal disease - no information on what the treatment was or when it was received. Tx groups defined after intervention as it was a retrospective	Limited information on periodontal tx intervention. Cointerventions (periodontal care behaviors) well described.	Validated tools used to measure outcomes. Outcome assessors not blinded to intervention status.	Characteristics (age, sex, education, duration of diabetes, etc) of PT group and non-PT group not compared at baseline.	No indication of missing data	Unlikely results due to multiple analyses.	Major limitation is that it is unclear how similar the PT and non-PT group were at baseline.



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		study and could have been affected by knowledge of risk of outcome.						
Jeffcoat 2014 ³³	Low Selection based on chronic disease status unlikely to be due to intervention; 2-year period for potential periodontal tx & outcomes for all pts; no control for selection biases.	High Intervention group well defined, but control group is anyone who completed 1, 2, or 3 tx sessions (not 0 sessions).	High High departure from intended tx (most of those with periodontal disease only completed 1, 2, or 3 tx sessions).	Low Outcomes extracted from insurance claims unlikely to be influenced by knowledge of the intervention.	Unclear Some confounders (age, gender, T2D status) controlled for but not others (like education or SES) which could have influenced whether pts received full tx course.	High 1 year of cost data missing for those with CVD & CAD due to "technical reasons."	Low Unlikely results due to multiple analyses.	Poor Major limitation is that control group consisted of those that received 1, 2, or 3 periodontal tx, not 0.
Kucukcoskun 2013 ³⁴	Low Selection based on defined criteria before start of intervention; same intervention length for all	Low Intervention groups clearly defined at the start of prospective study.	Unclear Unclear if there were any deviations from intended tx, drop-out, or if there were cointerventions.	Unclear Unclear if outcome assessors aware of tx group; possible that outcome could have been	Unclear Groups similar at baseline in terms of periodontal disease & patient characteristics; however it's unclear how patients were allocated and if it	Unclear Unclear if there were any missing data from either group.	Low Unlikely results due to multiple analyses.	Fair Major limitation is that it is unclear how pts were assigned to groups and it's possible it was based on patient or provider



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	ppts; no control for selection biases.			influenced by knowledge of tx.	was by patient or provider choice that could confound results.			choice that could have influenced outcome.
Lee 2013 ³⁵	Low	Low	Unclear	Low	High	Low	Low	Poor
	Selection based on first diagnostic code for PD which would presumably occur before PD tx; same 10-year period for tx & outcomes; no control for selection biases.	Intervention groups well defined; different tx groups defined by medical record data that are unlikely to be influenced by knowledge of outcome.	Unclear if there were any deviations from intended tx, drop-out, or if there were cointerventions.	Outcomes extracted from medical record data and unlikely to be influenced by knowledge of the intervention.	PD patients who received intensive dental tx, dental prophylaxis, or no tx likely had differing severity of baseline periodontal disease that could have confounded the results.	No indication of missing data.	Unlikely results due to multiple analyses.	Major limitation is that PD patients who received intensive dental tx, dental prophylaxis, or no tx likely had differing severity of baseline periodontal disease that could have confounded the results.
Nasseh 2017 ³⁹	Low	Low	Unclear	Low	High	Low	Low	Poor
	Selection based on diagnostic code for T2 diabetes, periodontal tx occurred in 2 years following diagnosis; follow-up	Intervention groups well defined; different tx groups defined by dental & medical claims data	Unclear if there were any deviations from intended tx, drop-out, or if there were cointerventions.	Outcomes extracted from dental and medical claims database and unlikely to be influenced by knowledge of	Unclear what proportion of the control group had periodontal disease which may have confounded results.	No indication of missing data.	Unlikely results due to multiple analyses.	Major limitation is that at least some people in the control group probably did not have periodontal disease, which may have confounded the



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	period is the same for all pts; no control for selection biases.	that are unlikely to be influenced by knowledge of outcome.		the intervention.				results. Results are also limited to those with continuous insurance enrollment.
Peng 2017 ⁴⁰	Low	Unclear	Unclear	Low	Low	Low	Low	Fair
	Selection based on ICD-9 PD code which occurred before PD tx. Same 3-year period for tx and outcomes; no control for selection biases.	Intervention group well-defined but control group is defined as those who received any kind of therapy besides advanced periodontal tx-unclear what this was.	Excluded ppl who had < 3 periodontal tx codes which likely excluded people who did not adhere to tx. Unclear if there were cointerventions.	Outcomes extracted from medical record data and unlikely to be influenced by knowledge of the intervention.	Propensity-matching used to control for baseline confounders (age, gender, comorbidities, hypoglycemic agent, statin).	No indication of missing data.	Unlikely results due to multiple analyses.	Major limitation is lack of clarity of what non-advanced tx the control group received.
United Healthcare 2013 ⁴⁴	Unclear	Low	Unclear	Low	High	Low	Low	Poor
	Selection based on presence of chronic disease, which may have occurred before	Intervention and control groups well-defined; different tx groups defined by dental &	Authors separate results by dental compliance (whether they received cleanings or	Outcomes extracted from dental and medical claims database and unlikely to be influenced by	Unclear what proportion of the no periodontal tx group had periodontal disease or were periodontally healthy.	No indication of missing data.	Unlikely results due to multiple analyses.	Major limitation is that at least some people in the control group probably did not have periodontal disease, which may have



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	or after periodontal tx.	medical claims data that are unlikely to be influenced by knowledge of outcome.	periodontal tx). Definition of medical compliance is vague and unclear if other types of co-interventions (brushing, flossing) were adhered to.	knowledge of the intervention.				confounded the results. Participants may also have received chronic disease status designation after periodontal tx.
Smits 2020 ⁴¹	Low	Low	Unclear	Low	Unclear	Low	Low	Fair
	Selection based on diabetes diagnosis unlikely to be related to intervention; no control for selection biases.	Intervention and control groups well defined; claims data unlikely to be affected by knowledge of outcome.	Unclear adherence to periodontal tx and whether there were any cointerventions	Outcomes extracted from claims database and unlikely to be influenced by knowledge of the intervention.	Those who did and did not receive PD tx were considerably different at baseline in terms of age, sex, comorbidities which was controlled for using a fixed effects model. Possibility of other confounders (those did not receive PD treatment may or may not have had PD).	No indication of missing data.	Unlikely results due to multiple analyses.	Major limitation of this study is that it is unclear what proportion of people in the "untreated" group were periodontally healthy vs had periodontal disease and were untreated.

Tx= Treatment, Ppts= participants, ICD-9= International Classification of Diseases, 9th Edition, PT= Periodontal treatment, CVD= Cardiovascular disease, CAD= Coronary Artery Disease, PD= Periodontal disease

