International Platform of Registered Systematic Review and Meta-analysis Protocols

INPLASY

INPLASY202660032

doi: 10.37766/inplasy2026.6.0032

Received: 6 June 2026

Published: 6 June 2026

Influence of Ambient Light, Surface Wetness, and Restorative Material Optical Properties on Intraoral Scanner Accuracy: A Systematic Review and Exploratory Meta-Analysis

Saini, R; Kanji, M.

Corresponding author:
Ravinder Saini

dr_ravi_saini@yahoo.com

Author Affiliation:
King Khalid University.

ADMINISTRATIVE INFORMATION

Support - King Khalid University.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202660032

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 6 June 2026 and was last updated on 6 June 2026.

INTRODUCTION

Review question / Objective How do ambient light, saliva or surface wetness, restorative material optical properties, and scanning aids influence the accuracy of intraoral scanners?

Rationale Evidence on how light, saliva, wetness, restorative materials, and scanning aids affect intraoral scanner accuracy is scattered, so a systematic review is needed to summarize clinically useful findings.

Condition being studied Factors affecting intraoral scanner accuracy, including ambient light, saliva, surface wetness, restorative material optical properties, and scanning aids.

METHODS

Search strategy A comprehensive search will be performed in PubMed/MEDLINE, Scopus, Web of Science, Embase, Cochrane Library, and Google Scholar using terms related to intraoral scanners, accuracy, ambient light, saliva, wetness, restorative materials, optical properties, and scanning aids. Reference lists of included studies and relevant reviews will also be screened manually.

Participant or population Dentate, partially dentate, edentulous, implant-supported, typodont, cast, crown, inlay, preparation, or clinical models scanned using intraoral scanners.

Intervention Ambient light, saliva, surface wetness, humidity, restorative material properties, and scanning-aid conditions during intraoral scanning.

Comparator Dry, room-light, non-contaminated, control-material, or no-scanning-aid conditions, as defined by each included study.

Study designs to be included In vitro, ex vivo, observational clinical, and clinical trial or crossover studies reporting intraoral scanner accuracy

outcomes. Reviews, editorials, letters, case reports, protocols, and conference abstracts without usable data will be excluded.

Eligibility criteria In vitro, ex vivo, observational clinical, and clinical trial/crossover studies evaluating ambient light, saliva, surface wetness, humidity, restorative material optical properties, or scanning aids on intraoral scanner accuracy will be included. Reviews, editorials, letters, case reports, protocols, conference abstracts without usable data, face-scanning-only studies, shade-matching-only studies, wear-monitoring-only studies, and scanner-comparison-only studies without relevant exposure will be excluded.

Information sources PubMed/MEDLINE, Scopus, Web of Science, Embase, Cochrane Library, and Google Scholar were searched. Reference lists of included articles and relevant reviews were also screened manually. Citation searching was performed for key studies related to ambient light, wetness, saliva, restorative materials, and scanning aids.

Main outcome(s) IOS accuracy measured by trueness, precision, RMS deviation, mean deviation, surface deviation, linear deviation, or angular deviation.

Additional outcome(s) Secondary outcomes included scanning time, number of images, mesh quality, scan-data completeness, shade matching, and rescanning requirements when available.

Data management All records were imported into reference-management software and duplicates were removed. Titles, abstracts, and full texts were screened by two reviewers. Extracted data were entered into a standardized Microsoft Excel sheet. The sheet included study details, scanner type, model or scan region, exposure, comparator, outcomes, sample size, mean values, standard deviations, and risk-of-bias information. Any differences in extracted data were checked and resolved by discussion. The final dataset was used for narrative synthesis and meta-analysis.

Quality assessment / Risk of bias analysis Risk of bias was assessed according to study design. The QUIN tool was used for in vitro studies, the JBI critical appraisal checklist was used for clinical observational studies, and the RoB 2 tool was used for randomized or crossover clinical studies. Two reviewers assessed study quality independently, and disagreements were resolved by discussion or by consulting a third reviewer. Each study was judged as low, moderate, or high risk of bias.

Strategy of data synthesis Data were synthesized narratively and, where possible, quantitatively. Studies were grouped by exposure type, including ambient light, wetness or saliva, restorative material properties, and scanning aids. Meta-analysis was performed only when at least two studies reported comparable outcomes and extractable numerical data.

Subgroup analysis Subgroup analyses were planned to explore possible sources of heterogeneity, including scanner system, scanner technology, study setting, scan region, illuminance level, wetness condition, restorative material type, and scanning-aid type. Subgroup analyses were performed when enough comparable data were available and were interpreted as exploratory.

Sensitivity analysis Sensitivity analyses were performed when enough data were available. These included removing high-risk-of-bias studies, excluding preprints, using fixed-effect instead of random-effects models, removing one study at a time, excluding converted or incomplete data, and analyzing clinical and in vitro studies separately. These analyses were used to check whether the main findings remained stable.

Country(ies) involved Saudi Arabia.

Keywords IOS, digital impression , trueness, optical properties scanning aid.

Contributions of each author

Author 1 - RAVINDER SAINI - Conceptualization, methodology, investigation, data curation, formal analysis, writing original draft, and visualization.
Email: rsaini@kku.edu.sa
Author 2 - Masroor Kanji - Methodology, validation, risk of bias assessment, supervision, writing review and editing, and project administration.
Email: mkanji@kku.edu.sa