

The top 100 most-cited clinical trials and systematic reviews related to children and adolescents' oral health: A bibliometric analysis

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Aim: To identify and analyze the 100 most-cited clinical trials (CTs) and systematic reviews (SRs) related to children and adolescents' oral health.

Methods: A search was conducted in the Web of Science Core Collection (WoS-CC), using a specific search strategy. Papers were ranked in descending order, considering number of citations. Only CTs and SRs were considered. Two reviewers selected the papers and collected the bibliometric data: year of publication; number and density of citations; study designs; journals; authors; countries and institutions; topics of study; and keywords. Poisson regression was performed to verify associations between the number of citations and bibliometric parameters.

Results: The 100 most-cited papers were published between 1982 and 2018 and received a total of 8,702 citations in the WoS-CC (ranging from 52 to 177). Fifty-three papers were CTs and 47 SRs. The *American Journal of Orthodontics and Dentofacial Orthopedics* published the most papers (n=20). Twetman S contributed the highest number of papers (n=7). The United States of America was the most prolific country (n = 17), followed by the Netherlands (n=11). The University of Nijmegen (Netherlands) presented 8 papers among the most-cited. The main topic of interest was Cariology (n = 40). "Dental Caries" was the most frequent keyword (n = 20). The citations' number from WoS-CC decreased by 1.3% each year (RP: 0.987, 95%CI: 0.975–1.000, p = 0.048).

Conclusion: This bibliometric study allowed an analysis of the most-cited CTs and SRs related to children and adolescents' oral health, highlighting the most prolific authors, institutions and countries based on the number of citations.

Uniterms: Bibliometrics. Clinical Trial. Pediatric Dentistry. Systematic Review.

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INTRODUCTION

The premise of evidence-based dentistry is based on current patient-centered clinical decision-making, to encourage clinicians to use the highest-quality evidence to solve everyday dental problems¹. There is consensus that the search for ways to improve clinicians' efficiency in treating patients must be achieved through the validity, impact, and applicability of scientific evidence¹. However, it is well accepted that scientific knowledge must

be associated with the professional's clinical experience, biological characteristics, and patient expectations². In this sense, systematic reviews (SR) and randomized clinical trials (RCT) are currently considered the gold standard studies to produce high-quality evidence³.

The field of research on a given subject can be assessed using a set of bibliometric analysis methods, which covers the application of quantitative and statistical analysis of papers and their number of citations⁴. The influence of

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a paper on the development of knowledge can be indicated by the high number of citations^{5,6}. Bibliometrics help researchers identify research trends, countries, institutions, authors, and journals with the highest publishing activity⁶⁻⁸. Citations also have the power to connect academic papers, forming a network of scientific literature⁶. In recent years, there has been an increase in the production of bibliometric studies in dentistry^{4,9,10}, including specific areas such as pediatric dentistry^{7,8,11}.

Scientific progress in a field of knowledge is directly related to the production of robust evidence¹². Therefore, knowing the main characteristics of papers that stand out in the production of scientific evidence within a field of knowledge can help guide future studies that seek to conduct similar methodologies. In this sense, previous studies were conducted to identify the top 100 most-cited SRs and clinical trials (CTs) in dentistry^{4,9}. However, no study focused on the analysis of the most-cited CTs and SRs in the field of pediatric dentistry, related to the oral health of children and adolescents. Therefore, this study aimed to identify and analyze the top 100 most-cited CTs and SRs related to the oral health of children and adolescents, highlight the papers and authors that had the greatest impact over time and assess the subjects of greatest interest in these study designs.

MATERIAL AND METHODS

SEARCH STRATEGY

An electronic literature search was conducted in the Web of Science Core Collection (WoS-CC) database on November 6th, 2021. The search strategy was developed with the aid of a health sciences librarian, as follows: TS=(“randomized controlled trial*” OR “randomised controlled trial*” OR “randomized clinical trial*” OR “randomised clinical trial*” OR “clinical trial*” OR “controlled trial*” OR “systematic review*” OR “systematic*” OR “meta-analysis” OR “meta-analyses” OR “meta analysis” OR “meta analyses” OR “metanalysis” OR “metanalyses”) AND TS=(“child*” OR “child, preschool” OR “preschool child*” OR “infant*” OR “toddler*” OR “preschool*” OR “schoolchild*” OR “school child*” OR “kid*” OR “newborn*” OR “new-borns*” OR “youth*” OR “pediatric*” OR “paediatric*” OR “pedodontic*” OR “paedodontic*” OR “adolescent*” OR “adolescence” OR “teen*” OR “student*”). There were no restrictions on language or year of publication.

After the search, the identified papers were ranked in descending order according to the number of citations. The selection of the 100 most-cited papers was carried out by two reviewers independently (K.M.P. and F.C.V.). This selection was made by screening the title and abstract of the papers and interrupted when the hundredth most-cited paper was identified. Only CTs and SRs related to the oral health of children and adolescents were considered. Papers with other study topics or designs and that were not conducted in a population of children and adolescents were excluded. After selection, any discrepancies between reviewers were resolved in a consensus meeting with two experts in this research area (P.A.M.J. and M.C.). The number of citations of the 100 most-cited papers was cross-matched with their number of citations in the Google Scholar and Elsevier's Scopus databases.

BIBLIOMETRIC PARAMETERS

The following bibliometric parameters were collected from the most-cited papers: title, number and density (mean of citations received per year) of citations in the WoS-CC, Scopus, and Google Scholar databases; authors; institution, country, and continent (based on the corresponding author address); year and journal of publication; keywords; study design (RCT, non-RCT, SR, and SR with meta-analysis); and the topic of study. Two reviewers (K.M.P. and F.C.V.) collected data independently, and discrepancies were resolved by re-examining the original paper.

Concerning the areas of interest of the studies, the most-cited papers were grouped according to the Scientific Groups and Networks belonging to the International Association of Dental Research (IADR) (available at: <https://www.iadr.org/SGN>), as follows: Cariology, Craniofacial Biology, Behavioral, Epidemiologic and Health Services Research, Dental Materials, Pulp Biology & Regeneration, Oral Medicine & Pathology, and Orthodontics.

DATA ANALYSIS

The VOSviewer software (University of Leiden, South Holland, Netherlands) was used to identify bibliometric networks and create co-authorship and keyword density maps. For this purpose, the ‘authors’ and ‘keywords’ were considered as a unit of analysis and were linked based on the number of papers in which they

were present. Additionally, a statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS Statistics version 24.0; IBM Corp, Chicago, USA). A significance level of 5% was adopted. First, the Kolmogorov-Smirnov test was applied to verify the normality of data distribution ($p < 0.05$). The Spearman's rank-order correlation was applied to determine the correlation between the number of citations in WoS-CC with the number of citations in Scopus and Google Scholar databases. Poisson regression was applied to determine associations between the number of citations in the WoS-CC with the following bibliometric data (independent variables): year of publication, study design, and topic of study.

RESULTS

ANALYSIS OF CITATIONS

A total of 3,080 references were initially retrieved in WoS-CC "All Document Types". After organizing the list of papers in descending order according to the number of citations, the first 100 papers that met the eligibility criteria were selected for the top 100 most-cited. Until the top 100 were identified, 136 papers were excluded. In case of a tie, the paper's position in the ranking was based on the highest density of WoS-CC citations. The top 100 most-cited CTs and SRs related to children and adolescents' oral health are reported in Table 1.

Table 1. List of the 100 most-cited clinical trials and systematic reviews related to children and adolescents' oral health.

(continues)

Rank	Title of the paper	WoS-CC (citation density)	Scopus (citation density)	Google Scholar (citation density)
1	Chu CH; Lo ECM; Lin HC. Effectiveness of silver diamine fluoride and sodium fluoride varnish in arresting dentin caries in Chinese pre-school children. <i>Journal Of Dental Research</i> . 2002	177 (9.97)	206 (11.61)	394 (22.20)
2	Soncini JA, Maserejian NN, Trachtenberg F, Tavares M, Hayes C. The longevity of amalgam versus compomer/composite restorations in posterior primary and permanent teeth - Findings from the new England children's amalgam trial. <i>Journal of the American Dental Association</i> . 2007	174 (13.65)	203 (15.92)	308 (24.16)
3	Twetman S, Axelsson S, Dahlgren H, Holm AK, Kallestal C, Lagerlof F, Lingstrom P, Mejare I; Nordenram G, Norlund A, Petersson LG, Soder B. Caries-preventive effect of fluoride toothpaste: a systematic review. <i>Acta Odontologica Scandinavica</i> . 2003	174 (10.39)	192 (11.46)	411 (24.54)
4	Weintraub JA, Ramos-Gomez F, Jue B, Shain S, Hoover CI, Featherstone JDB, Gansky SA. Fluoride varnish efficacy in preventing early childhood caries. <i>Journal Of Dental Research</i> . 2006	173 (12.58)	204 (14.84)	425 (30.91)
5	O'Brien K, Wright J, Conboy F, Sanjie Y, Mandall N, Chadwick S, Connolly I, Cook P, Birnie D, Hammond M, Harradine N, Lewis D, McDade C, Mitchell L, Murray A, O'Neill J, Read M, Robinson S, Roberts-Harry D, Sandler J, Shaw I. Effectiveness of early orthodontic treatment with the Twin-block appliance: A multicenter, randomized, controlled trial. Part 1: Dental and skeletal effects. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> . 2003	165 (9.85)	177 (10.57)	344 (20.54)
6	Tulloch JFC, Phillips C, Proffit WR Benefit of early class II treatment: Progress report of a two-phase randomized clinical trial. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> . 1998	163 (7.49)	179 (8.23)	405 (18.62)
7	Keeling SD, Wheeler TT, King GJ, Garvan CW, Cohen DA, Cabassa S, McGorray SP, Taylor MG. Anteroposterior skeletal and dental changes after early Class II treatment with bionators and headgear. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> . 1998	157 (7.22)	177 (8.14)	362 (16.64)

8	Kim JH, Viana MAG, Graber TM, Omerza FF, BeGole EA. The effectiveness of protraction face mask therapy: A meta-analysis. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> . 1999	154 (7.42)	155 (7.47)	380 (18.31)
9	Tulloch JFC, Phillips C, Koch G, Proffit WR. The effect of early intervention on, skeletal pattern in Class II malocclusion: A randomized clinical trial. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> . 1997	149 (6.55)	158 (6.95)	387 (17.01)
10	Tulloch JFC, Proffit WR, Phillips C. Outcomes in a 2-phase randomized clinical trial of early Class II treatment. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> . 2004	144 (9.14)	157 (9.97)	375 (23.81)
11	Nguyen QV, Bezemer PD, Habets L, Prah-Andersen B. A systematic review of the relationship between overjet size and traumatic dental injuries. <i>European Journal of Orthodontics</i> . 1999	131 (6.31)	178 (8.58)	455 (21.93)
12	Llodra JC, Rodriguez A, Ferrer B, Menardia V, Ramos T, Morato M. Efficacy of silver diamine fluoride for caries reduction in primary teeth and first permanent molars of schoolchildren: 36-month clinical trial. <i>Journal of Dental Research</i> . 2005	129 (8.75)	153 (10.37)	288 (19.53)
13	Hooley M, Skouteris H, Boganin C, Satur J, Kilpatrick N. Parental influence and the development of dental caries in children aged 0-6 years: A systematic review of the literature. <i>Journal Of Dentistry</i> . 2012	123 (15.87)	134 (17.29)	315 (40.65)
14	Nyvad B, Machiulskiene V, Baelum V. Construct and predictive validity of clinical caries diagnostic criteria assessing lesion activity. <i>Journal of Dental Research</i> . 2003	120 (7.16)	128 (7.64)	242 (14.45)
15	Lang NP, Hotz P, Graf H, Geering AH, Saxer UP, Sturzenberger OP, Mecke AH. Effects of supervised chlorhexidine mouthrinses in children - a longitudinal clinical-trial. <i>Journal of Periodontal Research</i> . 1982	120 (3.18)	126 (3.34)	243 (6.44)
16	Hayden C, Bowler JO, Chambers S, Freeman R, Humphris G, Richards D, Cecil JE. Obesity and dental caries in children: a systematic review and meta-analysis. <i>Community Dentistry and Oral Epidemiology</i> . 2013	119 (17.63)	131 (19.41)	273 (40.44)
17	Plutzer K, Spencer AJ. Efficacy of an oral health promotion intervention in the prevention of early childhood caries. <i>Community Dentistry and Oral Epidemiology</i> . 2008	114 (9.70)	113 (9.62)	260 (22.13)
18	Ghafari J, Shofer FS, Jacobsson-Hunt U, Markowitz DL, Laster LL. Headgear versus function regulator in the early treatment of Class II, Division 1 malocclusion: A randomized clinical trial. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> . 1998	114 (5.24)	146 (6.71)	279 (12.83)
19	O'Brien K, Wright J, Conboy F, Sanjie Y, Mandall N. Effectiveness of treatment for Class II malocclusion with the Herbst or Twin-block appliances: A randomized, controlled trial. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> . 2003	112 (6.69)	128 (7.64)	244 (14.57)
20	Hausen H, Karkkainen S, Seppa L. Application of the high-risk strategy to control dental caries. <i>Community Dentistry and Oral Epidemiology</i> . 2000	109 (5.52)	120 (6.08)	234 (11.85)
21	Mejare I, Axelsson S, Dahlen G, Espelid I, Norlund A, Tranaeus S, Twetman S. Caries risk assessment. A systematic review. <i>Acta Odontologica Scandinavica</i> . 2014	107 (18.61)	119 (20.70)	191 (33.22)
22	Wong MCM, Clarkson J, Glenny AM, Lo ECM, Marinho VCC, Tsang BWK, Walsh T, Worthington HV. Cochrane Reviews on the Benefits/Risks of Fluoride Toothpastes. <i>Journal of Dental Research</i> . 2011	105 (12.00)	122 (13.94)	242 (27.66)
23	van't Hof MA, Frencken JE, Helderma WHV, Holmgren CJ. The Atraumatic Restorative Treatment (ART) approach for managing dental caries: A meta-analysis. <i>International Dental Journal</i> . 2006	105 (7.64)	108 (7.85)	195 (14.18)

24	Vaughn GA, Mason B, Moon HB, Turley PK. The effects of maxillary protraction therapy with or without rapid palatal expansion: A prospective, randomized clinical trial. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> . 2005	104 (7.05)	111 (7.53)	241 (16.34)
25	Yee R, Holmgren C, Mulder J, Lama D, Walker D, Helderma W. Efficacy of Silver Diamine Fluoride for Arresting Caries Treatment. <i>Journal of Dental Research</i> . 2009	103 (9.58)	121 (11.26)	232 (21.58)
26	Lagravere MO, Major PW, Flores-Mir C. Long-term skeletal changes with rapid maxillary expansion: A systematic review. <i>Angle Orthodontist</i> . 2005	101 (6.85)	116 (7.86)	239 (16.20)
27	Petren S, Bondemark L, Soderfeldt B. A systematic review concerning early orthodontic treatment of unilateral posterior crossbite. <i>Angle Orthodontist</i> . 2003	101 (6.03)	107 (6.39)	216 (12.90)
28	Harris DA, Jones AS, Darendeliler MA. Physical properties of root cementum: Part 8. Volumetric analysis of root resorption craters after application of controlled intrusive light and heavy orthodontic forces: A microcomputed tomography scan study. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> . 2006	100 (7.27)	110 (8.00)	221 (16.07)
29	Kreulen CM, Van 't Spijker A, Rodriguez JM, Bronkhorst EM, Creugers NHJ, Bartlett DW. Systematic Review of the Prevalence of Tooth Wear in Children and Adolescents. <i>Caries Research</i> . 2010	99 (10.15)	105 (10.77)	226 (23.18)
30	Mejare I, Lingstrom P, Petersson LG, Holm AK, Twetman S, Kallestall C, Nordenram G, Lagerlof F, Soder B, Norlund A, Axelsson S, Dahlgren H. Caries-preventive effect of fissure sealants: a systematic review. <i>Acta Odontologica Scandinavica</i> . 2003	99 (5.91)	115 (6.87)	267 (15.94)
31	Dimberg L, Arnrup K, Bondemark L. The impact of malocclusion on the quality of life among children and adolescents: a systematic review of quantitative studies. <i>European Journal of Orthodontics</i> . 2015	95 (20.00)	112 (23.58)	242 (50.95)
32	Lagravere MO, Carey J, Heo G, Toogood RW, Major PW. Transverse, vertical, and anteroposterior changes from bone-anchored maxillary expansion vs traditional rapid maxillary expansion: A randomized clinical trial. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> . 2015	90 (9.23)	106 (10.87)	209 (21.44)
33	Huth KC, Paschos E, Hajek-Al-Khatar N, Hollweck R, Crispin A, Hicel R, Folwaczny M. Effectiveness of 4 pulpotomy techniques - Randomized controlled trial. <i>Journal of Dental Research</i> . 2005	90 (6.10)	94 (6.37)	211 (14.31)
34	Major MP, Flores-Mir C, Major PW. Assessment of lateral cephalometric diagnosis of adenoid hypertrophy and posterior upper airway obstruction: A systematic review. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> . 2006	89 (6.47)	102 (7.42)	225 (16.36)
35	Kruse-Losler B, Gaertner C, Burger H, Seper L, Joos U, Kleinheinz J. Melanotic neuroectodermal tumor of infancy: systematic review of the literature and presentation of a case. <i>Oral Surgery Oral Medicine Oral Pathology Oral Radiology and Endodontology</i> . 2006	89 (6.47)	106 (7.71)	152 (11.05)
36	O'Brien K, Wright J, Conboy F, Chadwick S, Connolly I, Cook P, Birnie D, Hammond M, Harradine N, Lewis D, McDade C, Mitchell L, Murray A, O'Neill J, Read M, Robinson S, Roberts-Harry D, Sandler J, Shaw I, Berk NW. Effectiveness of early orthodontic treatment with the Twin-block appliance: A multicenter, randomized, controlled trial. Part 2: Psychosocial effects. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> . 2003	89 (5.31)	92 (5.49)	199 (11.88)
37	Leong PM, Gussy MG, Barrow SYL, de Silva-Sanigorski A, Waters E. A systematic review of risk factors during first year of life for early childhood caries. <i>International Journal of Paediatric Dentistry</i> . 2013	88 (13.04)	100 (14.81)	225 (33.33)

38	Salas MMS, Nascimento GG, Huysmans MC, Demarco FF. Estimated prevalence of erosive tooth wear in permanent teeth of children and adolescents: An epidemiological systematic review and meta-regression analysis. <i>Journal Of Dentistry</i> . 2015	87 (18.32)	93 (19.58)	176 (37.05)
39	Manfredini D, Restrepo C, Diaz-Serrano K, Winocur E, Lobbezoo F. Prevalence of sleep bruxism in children: a systematic review of the literature. <i>Journal of Oral Rehabilitation</i> . 2013	85 (12.59)	96 (14.22)	191 (28.30)
40	Katyal V, Pamula Y, Martin AJ, Daynes CN, Kennedy JD, Sampson WJ. Craniofacial and upper airway morphology in pediatric sleep-disordered breathing: Systematic review and meta-analysis. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> . 2013	84 (12.44)	92 (13.63)	161 (23.85)
41	Lawrence HP, Binguis D, Douglas J, McKeown L, Switzer B, Figueiredo R, Laporte A. A 2-year community-randomized controlled trial of fluoride varnish to prevent early childhood caries in Aboriginal children. <i>Community Dentistry and Oral Epidemiology</i> . 2008	84 (7.15)	84 (7.15)	134 (11.40)
42	Silva MJ, Scurrah KJ, Craig JM, Manton DJ, Kilpatrick N. Etiology of molar incisor hypomineralization - A systematic review. <i>Community Dentistry and Oral Epidemiology</i> . 2016	82 (21.87)	86 (22.93)	173 (46.13)
43	De Toffol L, Pavoni C, Baccetti T, Franchi L, Cozza P. Orthopedic treatment outcomes in Class III malocclusion - A systematic review. <i>Angle Orthodontist</i> . 2008	82 (6.98)	85 (7.23)	162 (13.79)
44	Petersson LG, Twetman S, Dahlgren H, Norlund A, Holm AK, Nordenram G, Lagerlof F, Soder B, Kallestal C, Mejare I, Axelsson S, Lingstrom P. Professional fluoride varnish treatment for caries control: a systematic review of clinical trials. <i>Acta Odontologica Scandinavica</i> . 2004	82 (5.21)	87 (5.52)	193 (12.25)
45	Zhi QH, Lo ECM, Lin HC. Randomized clinical trial on effectiveness of silver diamine fluoride and glass ionomer in arresting dentine caries in preschool children. <i>Journal Of Dentistry</i> . 2012	81 (10.45)	96 (12.39)	192 (24.77)
46	Deshpande A, Jadad AR. The impact of polyol-containing chewing gums on dental caries A systematic review of original randomized controlled trials and observational studies. <i>Journal of the American Dental Association</i> . 2008	81 (6.89)	94 (8.00)	176 (14.98)
47	Moretti ABS, Sakai VT, Oliveira TM, Fornetti APC, Santos CF, Machado MAAM, Abdo RCC. The effectiveness of mineral trioxide aggregate, calcium hydroxide and formocresol for pulpotomies in primary teeth. <i>International Endodontic Journal</i> . 2008	81 (6.89)	91 (7.74)	189 (16.09)
48	Qvist V, Laurberg L, Poulsen A, Teglers PT. Longevity and cariostatic effects of everyday conventional glass-ionomer and amalgam restorations in primary teeth: Three year results. <i>Journal of Dental Research</i> . 1997	81 (3.56)	87 (3.82)	138 (6.07)
49	Thenisch NL, Bachmann LM, Imfeld T, Minder TL, Steurer J. Are mutans streptococci detected in preschool children a reliable predictive factor for dental caries risk? A systematic review. <i>Caries Research</i> . 2006	80 (5.82)	86 (6.25)	225 (16.36)
50	Gao SS, Zhang SN, Mei ML, Lo ECM, Chu CH. Caries remineralisation and arresting effect in children by professionally applied fluoride treatment - a systematic review. <i>BMC Oral Health</i> . 2016	79 (21.07)	90 (24.00)	190 (50.67)
51	Ismail AI, Hasson H. Fluoride supplements, dental caries and fluorosis A systematic review. <i>Journal of the American Dental Association</i> . 2008	79 (6.72)	94 (8.00)	207 (17.62)
52	Mohlin B, Axelsson S, Paulin G, Pietila T, Bondemark L, Brattstrom V, Hansen K, Holm AK. TMD in relation to malocclusion and orthodontic treatment - A systematic review. <i>Angle Orthodontist</i> . 2007	78 (6.12)	89 (6.98)	219 (17.18)
53	Mickenautsch S, Yengopal V, Banerjee A. Atraumatic restorative treatment versus amalgam restoration longevity: a systematic review. <i>Clinical Oral Investigations</i> . 2010	77 (7.90)	85 (8.72)	187 (19.18)

54	Brin I, Tulloch JFC, Koroluk L, Philips C. External apical root resorption in Class II malocclusion: A retrospective review of 1-versus 2-phase treatment. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> . 2003	75 (4.48)	76 (4.54)	200 (11.94)
55	Harrison R, Benton T, Everson-Stewart S, Weinstein P. Effect of motivational interviewing on rates of early childhood caries: A Randomized trial. <i>Pediatric Dentistry</i> . 2007	74 (5.80)	92 (7.22)	169 (13.25)
56	Curnow MMT, Pine CM, Burnside G, Nicholson JA, Chesters RK, Huntington E. A randomised controlled trial of the efficacy of supervised toothbrushing in high-caries-risk children. <i>Caries Research</i> . 2002	74 (4.17)	77 (4.34)	188 (10.59)
57	van Rijkom HM, Truin GJ, van't Hof MA. A meta-analysis of clinical studies on the caries-inhibiting effect of fluoride gel treatment. <i>Caries Research</i> . 1998	74 (3.40)	91 (4.18)	174 (8.00)
58	Bishara SE, Ortho D, Cummins DM, Zaher AR. Treatment and posttreatment changes in patients with Class II, Division 1 malocclusion after extraction and nonextraction treatment. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> . 1997	73 (3.21)	81 (3.56)	219 (9.63)
59	Slade GD, Bailie RS, Roberts-Thomson K, Leach AJ, Raye I, Endean C, Simmons B, Morris P. Effect of health promotion and fluoride varnish on dental caries among Australian Aboriginal children: results from a community-randomized controlled trial. <i>Community Dentistry and Oral Epidemiology</i> . 2011	72 (8.23)	77 (8.80)	121 (13.83)
60	Chestnutt IG, Schafer F, Jacobson APM, Stephen KW. The influence of toothbrushing frequency and post-brushing rinsing on caries experience in a caries clinical trial. <i>Community Dentistry and Oral Epidemiology</i> . 1998	72 (3.31)	83 (3.82)	199 (9.15)
61	Feldens CA, Giugliani ERJ, Duncan BB, Drachler MD, Vitolo MR. Long-term effectiveness of a nutritional program in reducing early childhood caries: a randomized trial. <i>Community Dentistry and Oral Epidemiology</i> . 2010	71 (7.28)	82 (8.41)	143 (14.67)
62	Parisotto TM, Steiner-Oliveira C, Silva CMSE, Rodrigues LKA, Nobre-dos-Santos M. Early Childhood Caries and Mutans Streptococci: A Systematic Review. <i>Oral Health & Preventive Dentistry</i> . 2010	71 (7.28)	83 (8.51)	165 (16.92)
63	Hujoel PP, Cunha-Cruz J, Banting DW, Loesche WJ. Dental flossing and interproximal caries: a systematic review. <i>Journal of Dental Research</i> . 2006	70 (5.09)	93 (6.76)	232 (16.87)
64	Prahl C, Kuijpers-Jagtman AM, van 't Hof MA, Prahl-Andersen B. A randomised prospective clinical trial into the effect of infant orthopaedics on maxillary arch dimensions in unilateral cleft lip and palate. <i>European Journal of Oral Sciences</i> . 2001	70 (3.73)	79 (4.21)	130 (6.93)
65	Stecksen-Blicks C, Renfors G, Oscarson ND, Bergstrand F, Twetman, S. Caries-preventive effectiveness of a fluoride varnish: A randomized controlled trial in adolescents with fixed orthodontic appliances. <i>Caries Research</i> . 2007	69 (5.41)	70 (5.49)	176 (13.80)
66	Forss H; Saarni UM, Seppa L. Comparison of Glass-Ionomer and Resin-Based Fissure Sealants - A 2-Year Clinical-Trial. <i>Community Dentistry and Oral Epidemiology</i> . 1994	69 (2.68)	77 (2.99)	144 (5.59)
67	Flores-Mir C, Korayem M, Heo G, Witmans M, Major MP, Major PW. Craniofacial morphological characteristics in children with obstructive sleep apnea syndrome A systematic review and meta-analysis. <i>Journal of the American Dental Association</i> . 2013	68 (10.07)	75 (11.11)	144 (21.33)
68	O'Brien K, Wright J, Conboy F, Appelbe P, Davies L, Connolly I, Mitchell L, Littlewood S, Mandall N, Lewis D, Sandler J, Hammond M, Chadwick S, O'Neill J, McDade C, Oskouei M, Thiruvengkatachari B, Read M, Robinson S, Birnie D, Murray A, Shaw I, Harradine N, Worthington H. Early treatment for Class II Division 1 malocclusion with the Twin-block appliance: A multi-center, randomized, controlled trial. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> . 2009	67 (6.23)	66 (6.14)	148 (13.77)

69	Azarapazhooh A, Main PA. Pit and fissure sealants in the prevention of dental caries in children and adolescents: A systematic review. <i>Journal of the Canadian Dental Association</i> . 2008	67 (5.70)	80 (6.81)	213 (18.13)
70	Kumar S, Tadakamadla J, Johnson NW. Effect of Toothbrushing Frequency on Incidence and Increment of Dental Caries: A Systematic Review and Meta-Analysis. <i>Journal of Dental Research</i> . 2016	66 (17.60)	85 (22.67)	164 (43.73)
71	Brochner A, Christensen C, Kristensen B, Tranaeus S, Karlsson L, Sonnesen L, Twetma, S. Treatment of post-orthodontic white spot lesions with casein phosphopeptide-stabilised amorphous calcium phosphate. <i>Clinical Oral Investigations</i> . 2011	65 (7.43)	83 (9.49)	163 (18.63)
72	vanRijkom HM, Truin GJ, vantHof MA. A meta analysis of clinical studies on the caries inhibiting effect of chlorhexidine treatment. <i>Journal of Dental Research</i> . 1996	65 (2.74)	89 (3.75)	184 (7.75)
73	Bonecker M, Cleaton-Jones P. Trends in dental caries in Latin American and Caribbean 5-6- and 11-13-year-old children: a systematic review. <i>Community Dentistry and Oral Epidemiology</i> . 2003	64 (3.82)	85 (5.07)	241 (14.39)
74	Themessl-Huber M, Freeman R, Humphris G, MacGillivray S, Terzi N. Empirical evidence of the relationship between parental and child dental fear: a structured review and meta-analysis. <i>International Journal of Paediatric Dentistry</i> . 2010	62 (6.36)	65 (6.67)	154 (15.79)
75	Twetman S, Petersson LG, Axelsson S, Dahlgren H, Holm AK, Kallestal C, Lagerlof F, Lingstrom P, Mejare I, Nordenram G, Norlund A, Soder B. Caries-preventive effect of sodium fluoride mouthrinses: a systematic review of controlled clinical trials. <i>Acta Odontologica Scandinavica</i> . 2004	61 (3.87)	64 (4.06)	114 (7.24)
76	Ashmore JL, Kurland BF, King GJ, Wheeler TT, Ghafari J, Ramsay DS. A 3-dimensional analysis of molar movement during headgear treatment. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> . 2002	61 (3.44)	72 (4.06)	136 (7.66)
77	Law SLS, Southard KA, Law AS, Logan HL, Jakobsen JR. An evaluation of preoperative ibuprofen for treatment of pain associated with orthodontic separator placement. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> . 2000	61 (3.09)	82 (4.15)	167 (8.46)
78	Bongaarts CAM, van 't Hof MA, Prah-Andersen B, Dirks IV, Kuijpers-Jagtman AM. Infant orthopedics has no effect on maxillary arch dimensions in the deciduous dentition of children with complete unilateral cleft lip and palate. <i>Cleft Palate-Craniofacial Journal</i> . 2006	60 (4.36)	70 (5.09)	106 (7.71)
79	Suter VGA, Bornstein MM. Ankyloglossia: Facts and Myths in Diagnosis and Treatment. <i>Journal Of Periodontology</i> . 2009	59 (5.49)	66 (6.14)	184 (17.12)
80	Azarapazhooh A, Main PA. Fluoride varnish in the prevention of dental caries in children and adolescents: A systematic review. <i>Journal of the Canadian Dental Association</i> . 2008	59 (5.02)	71 (6.04)	169 (14.38)
81	Baratieri C, Alves M, de Souza MMG, Araujo MTD, Maia LC. Does rapid maxillary expansion have long-term effects on airway dimensions and breathing? <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> . 2011	58 (6.63)	63 (7.20)	120 (13.71)
82	Aeinehchi M, Dadvand S, Fayazi S, Bayat-Movahed S. Randomized controlled trial of mineral trioxide aggregate and formocresol for pulpotomy in primary molar teeth. <i>International Endodontic Journal</i> . 2007	58 (4.55)	65 (5.10)	154 (12.08)
83	Liu BY, Lo ECM, Chu CH, Lin HC. Randomized Trial on Fluorides and Sealants for Fissure Caries Prevention. <i>Journal of Dental Research</i> . 2012	57 (7.35)	67 (8.65)	144 (18.58)
84	Uzel A, Alparslan ZN. Long-Term Effects of Presurgical Infant Orthopedics in Patients With Cleft Lip and Palate: A Systematic Review. <i>Cleft Palate-Craniofacial Journal</i> . 2011	57 (6.51)	64 (7.31)	105 (12.00)
85	Poulsen S, Beiruti N, Sadat N. A comparison of retention and the effect on caries of fissure sealing with a glass-ionomer and a resin-based sealant. <i>Community Dentistry and Oral Epidemiology</i> . 2001	57 (3.04)	71 (3.79)	169 (9.01)

86	Wright JT, Hanson N, Ristic H, Whall CW, Estrich CG, Zentz RR. Fluoride toothpaste efficacy and safety in children younger than 6 years A systematic review. <i>Journal of the American Dental Association</i> . 2014	56 (9.74)	78 (13.57)	178 (30.96)
87	Nordstrom A, Birkhed D. Preventive Effect of High-Fluoride Dentifrice (5,000 ppm) in Caries-Active Adolescents: A 2-Year Clinical Trial. <i>Caries Research</i> . 2010	56 (5.74)	63 (6.46)	116 (11.90)
88	Klaassen MA, Veerkamp JSJ, Hoogstraten J. Young children's Oral Health-Related Quality of Life and dental fear after treatment under general anaesthesia: a randomized controlled trial. <i>European Journal of Oral Sciences</i> . 2009	56 (5.21)	54 (5.02)	103 (9.58)
89	Mandari GJ, Frencken JE, van't Hof MA. Six-year success rates of occlusal amalgam and glass-ionomer restorations placed using three minimal intervention approaches. <i>Caries Research</i> . 2003	56 (3.34)	62 (3.70)	129 (7.70)
90	Salas MMS, Nascimento GG, Vargas-Ferreira F, Tarquinio SBC, Huysmans MCDNJM, Demarco FF. Diet influenced tooth erosion prevalence in children and adolescents: Results of a meta-analysis and meta-regression. <i>Journal of Dentistry</i> . 2015	55 (11.58)	64 (13.47)	146 (30.74)
91	dos Santos VE, Vasconcelos A, Targino AGR, Flores MAP, Galebeck A, Caldas AF, Rosenblatt A. A New Silver-Bullet to treat caries in children - Nano Silver Fluoride: A randomised clinical trial. <i>Journal of Dentistry</i> . 2014	55 (9.57)	70 (12.17)	97 (16.87)
92	Gilchrist F, Rodd H, Deery C, Marshman Z. Assessment of the quality of measures of child oral health-related quality of life. <i>BMC Oral Health</i> . 2014	55 (9.57)	64 (11.13)	119 (20.70)
93	OMullane DM, Kavanagh D, Ellwood RP, Chesters RK, Schafer F, Huntington E, Jones PR. A three-year clinical trial of a combination of trimetaphosphate and sodium fluoride in silica toothpastes. <i>Journal Of Dental Research</i> . 1997	55 (2.42)	59 (2.59)	103 (4.53)
94	Arrow P, Riordan PJ. Retention And Caries-Preventive Effects of A Gic and A Resin-Based Fissure Sealant. <i>Community Dentistry and Oral Epidemiology</i> . 1995	55 (2.22)	69 (2.79)	120 (4.85)
95	Muller-Bolla M, Lupi-Pegurier L, Tardieu C, Velly AM, Antomarchi C. Retention of resin-based pit and fissure sealants: a systematic review. <i>Community Dentistry and Oral Epidemiology</i> . 2006	54 (3.93)	53 (3.85)	140 (10.18)
96	Schwendicke F, Elhennawy K, Reda S, Bekes K, Manton DJ, Krois J. Global burden of molar incisor hypomineralization. <i>Journal of Dentistry</i> . 2018	53 (30.29)	54 (30.86)	89 (50.86)
97	Welbury RR, Shaw AJ, Murray JJ, Gordon PH, McCabe JF. Clinical evaluation of paired compomer and glass ionomer restorations in primary molars: final results after 42 months. <i>British Dental Journal</i> . 2000	53 (2.68)	62 (3.14)	98 (4.96)
98	Leverett DH, Adair SM, Vaughan BW, Proskin HM, Moss ME. Randomized clinical trial of the effect of prenatal fluoride supplements in preventing dental caries. <i>Caries Research</i> . 1997	53 (2.33)	58 (2.55)	144 (6.33)
99	Prahl C, Prahl-Andersen B, van 't Hof MA, Kuijpers-Jagtman AM. Infant orthopedics and facial appearance: A randomized clinical trial. <i>Cleft Palate-Craniofacial Journal</i> . 2006	52 (3.78)	59 (4.29)	87 (6.33)
100	Bravo M, Montero J, Bravo JJ, Baca P, Llodra JC. Sealant and fluoride varnish in caries: a randomized trial. <i>Journal of Dental Research</i> . 2005	52 (0.03)	52 (3.53)	109 (7.39)

Legend: WoS-CC: Web of Science Core Collection

The 100 most-cited papers received a total of 8,702 citations in the WoS-CC, 9,210 citations in Scopus, and 20,275 citations in Google Scholar. The range of citations was between 52 to 177 in the WoS-CC, 52 to 206 in the Scopus, and 109 to 394 in Google Scholar. The range of citations' density was between 2.22 to 30.29 in the WoS-CC,

2.55 to 30.86 in the Scopus, and 4.53 to 50.95 in Google Scholar. Self-citations accounted for 1.78% of WoS-CC citations. There were strong positive correlations between the number of citations in WoS-CC and Scopus ($r = 0.964$, $p < 0.01$), in WoS-CC and Google Scholar ($r = 0.867$, $p < 0.05$), and in Scopus and Google Scholar ($r = 0.896$, $p < 0.01$).

The most-cited paper was a CT entitled “Effectiveness of silver diamine fluoride and sodium fluoride varnish in arresting dentin caries in Chinese pre-school children”, authored by Chu, Lo & Lin, published in the Journal of Dental Research in 2002, with 177 citations (9.97 density) in the WoS-CC¹³. The second-ranked paper was a RCT entitled “The longevity of amalgam versus compomer/composite restorations in posterior primary and permanent teeth - Findings from the New England children’s amalgam trial”, authored by Soncini and colleagues, published in the Journal of the American Dental Association in 2007, with 174 citations (13.65 density) in the WoS-CC¹⁴. The third-ranked paper was a SR entitled “Caries-preventive effect of fluoride toothpaste: a systematic review”, authored by Twetman and colleagues, published in the Acta Odontologica Scandinavica in 2003, with 174 citations (10.39 density) in the WoS-CC¹⁵. The

paper with the highest citation density (30.29) was a SR entitled “Global burden of molar incisor hypomineralization”, authored by Schwendicke and colleagues, and published in the Journal of Dentistry in 2018¹⁶.

YEAR OF PUBLICATION

The top 100 most-cited papers were published between 1982¹⁷ and 2018¹⁶. Most papers were published in 2003 and 2006, a total of 10 per year. The number of papers reached its zenith from 2003 to 2010 (n = 52) (Figure 1). The number of papers published by decade was 1 in the 1980s, 15 in the 1990s, 53 in the 2000s, and 31 in the 2010s. Poisson regression analysis (Table 2) showed that the number of citations from WoS-CC tended to decrease by 1.3% each year (RR: 0.987, 95% CI 0.975–1.000, p < 0.05).

Figure 1. Number of papers by year of the 100 most-cited.

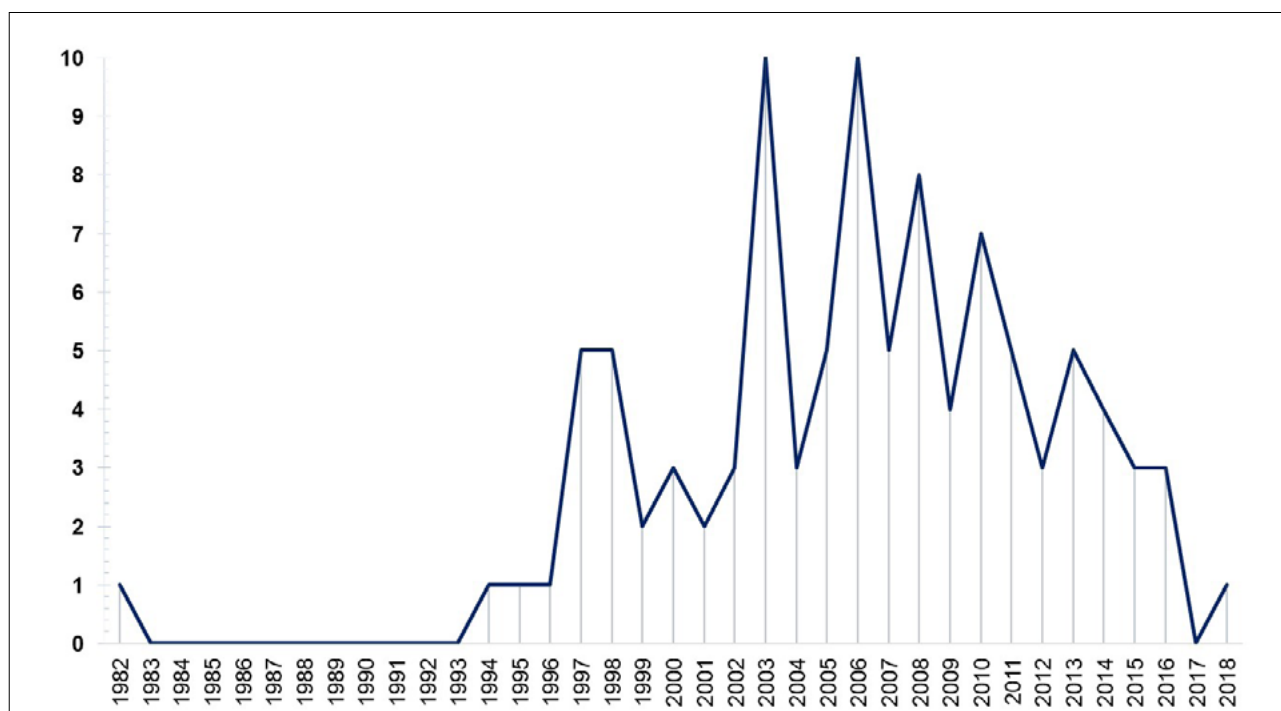


Table 2. Poisson regression between the total number of citations in the WoS-CC and independent variables.

(continues)

Independent variables	WoS-CC number of citations	
	RR (95% CI)	p-value
Topic of study		
Dental Materials	1	
Cariology	1.168 (0.961 – 1.420)	0.119
Behavioral, Epidemiologic and Health Services	0.891 (0.738 – 1.075)	0.227
Craniofacial Biology	0.894 (0.640 – 1.249)	0.511
Pulp Biology & Regeneration	0.917 (0.751 – 1.121)	0.399

Oral Medicine & Pathology	0.892 (0.686 – 1.159)	0.391
Orthodontics	0.863 (0.649 – 1.149)	0.314
Study design		
Clinical Trial	1	
Randomized clinical trial	1.001 (0.841 – 1.192)	0.988
Systematic review	0.963 (0.743 – 1.246)	0.773
Systematic review with meta-analysis	1.041 (0.851 – 1.273)	0.697
Publication Year	0.987 (0.975 – 1.000)	0.048

Legend: CI: confidence interval; RR: rate ratio; WoS-CC: Web of Science Core Collection

CONTRIBUTING AUTHORS

A total of 394 authors contributed to the top 100 most-cited papers. The major contribution of papers was from Twetman S (7 papers), followed by Van't Hof MA, Axelsson S (6 papers each), Mejare I, Norlund A, Lo ECM, and Holm AK (5 papers each). Table 3 lists the authors who appear in the authorship of the most-cited papers five times or more. Of the other authors,

22 contributed with four papers, 13 with three papers, 17 with two papers, and 335 with one paper. The major contribution as the first author was by O'Brien K (4 papers), followed by Tulloch JF (3 papers), Azarpazhooh A, Lagravere MO, Mejare I, Prah C, Salas MM, Twetman S, and van Rijkom HM (2 papers each). Other first authors (n = 79) contributed with one paper. Figure 2 shows the bibliographic coupling between authors in the top 100 most-cited papers.

Figure 2. Co-authorship map demonstrating author density and the existence of clusters among authors of the 100 most-cited papers.

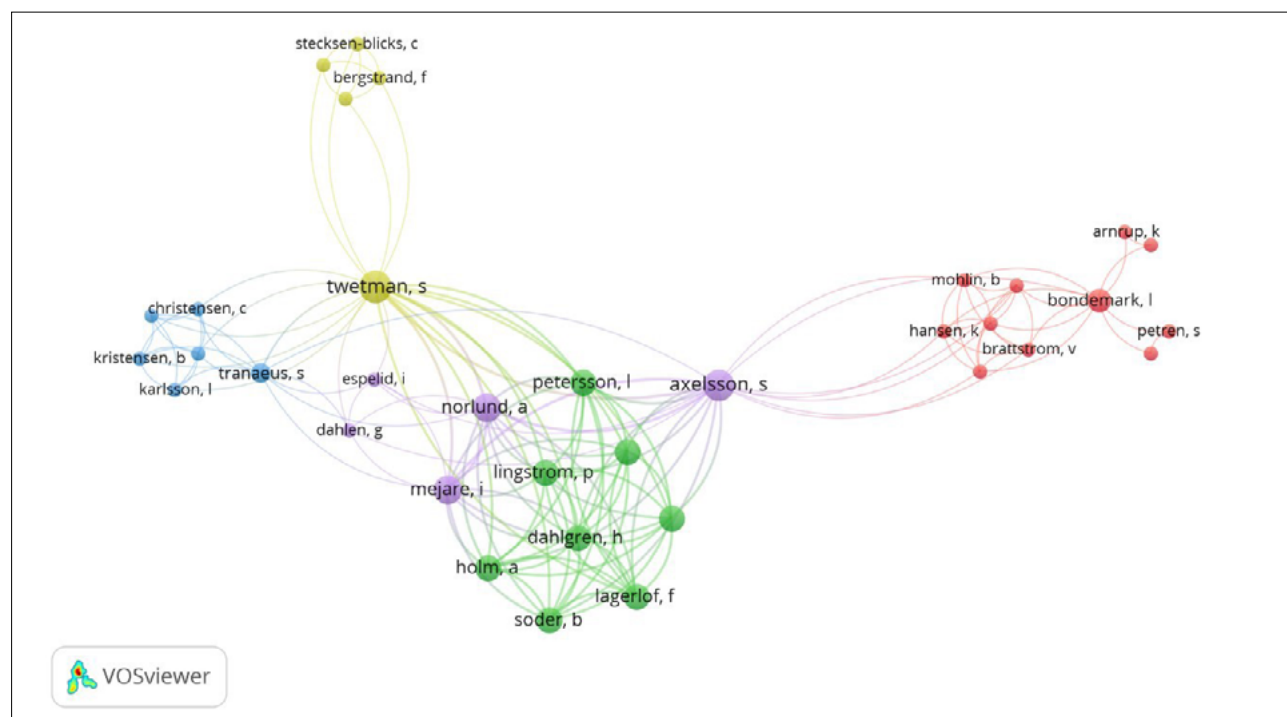


Table 3. Number of papers an author appeared as the first author and as the co-author five times or more.

Authors	as first author	as co-author	N. of papers	N. of citations WoS-CC
Twetman S	2	5	7	657
Van't Hof MA	1	5	6	417
Axelsson S	0	6	6	601
Mejare I	2	3	5	523
Norlund A	0	5	5	523
Lo ECM	0	5	5	499
Holm AK	0	5	5	494

CONTRIBUTING COUNTRIES AND INSTITUTIONS

A total of twenty-one countries contributed to the 100 most-cited papers. The top five countries were the United States of America (17 papers; 1857 citations), the Netherlands (11 papers; 871 citations), Sweden (10 papers; 922 citations), Australia (9 papers; 774 citations), and Canada (9 papers; 713 citations). Among the sixty-seven

institutions, the top five were the University of Nijmegen - Netherlands (8 papers; 633 citations), the University of North Carolina – USA (4 papers; 528 citations), the University of Hong Kong – China (4 papers; 418 citations), the University of Alberta – Canada (4 papers; 348 citations), and the University of Toronto – Canada (4 papers; 291 citations). Table 4 presents the list of contributing institutions with two or more papers.

Table 4. List of institutions with two papers or more that contributed to the 100 most-cited papers.

Institution (Country)	N. of papers	N. of citations WoS-CC
University of Nijmegen (Netherlands)	8	633
University of North Carolina (USA)	4	528
University of Hong Kong (China)	4	418
University of Alberta (Canada)	4	348
University of Toronto (Canada)	4	291
Umea University (Sweden)	3	304
University of Washington (USA)	3	235
Academic Centre for Dentistry Amsterdam (Netherlands)	2	183
University of Granada (Spain)	2	181
University of Bern (Switzerland)	2	179
University of Manchester (England)	2	179
Aarhus University (Denmark)	2	177
Royal Children's Hospital (Australia)	2	170
Federal University of Pelotas (Brazil)	2	142
University of Gothenburg (Sweden)	2	134
University of Iowa (USA)	2	134

Legend: WoS-CC: Web of Science Core Collection

JOURNAL OF PUBLICATION

A total of twenty-four journals contributed to the 100 most-cited papers (Table 5). The top five journals were The American Journal of Orthodontics and Dentofacial Orthopedics

(20 papers; 2,109 citations), Journal of Dental Research (14 papers; 1,343 citations), Community Dentistry and Oral Epidemiology (13 papers; 1,022 citations), Caries Research (8 papers; 561 citations), and Journal of Dentistry (6 papers; 454 citations).

Table 5. Journal of publication of the 100 most-cited papers.

(continues)

Journal	N. of papers	N. of citations WoS-CC
American Journal of Orthodontics and Dentofacial Orthopedics	20	2,109
Journal of Dental Research	14	1,343
Community Dentistry and Oral Epidemiology	13	1,022
Caries Research	8	561
Journal of Dentistry	6	454
Acta Odontologica Scandinavica	5	523
Journal of the American Dental Association	5	458
The Angle Orthodontist	4	362
The Cleft Palate-Craniofacial Journal	3	169
European Journal of Orthodontics	2	226

International Journal of Paediatric Dentistry	2	150
Clinical Oral Investigations	2	142
International Endodontic Journal	2	139
BMC Oral Health	2	134
European Journal of Oral Sciences	2	126
Journal of the Canadian Dental Association	2	126
Journal of Periodontal Research	1	120
International Dental Journal	1	105
Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology and Endodontology	1	89
Journal of Oral Rehabilitation	1	85
Pediatric Dentistry	1	74
Oral Health and Preventive Dentistry	1	71
Journal of Periodontology	1	59
British Dental Journal	1	53

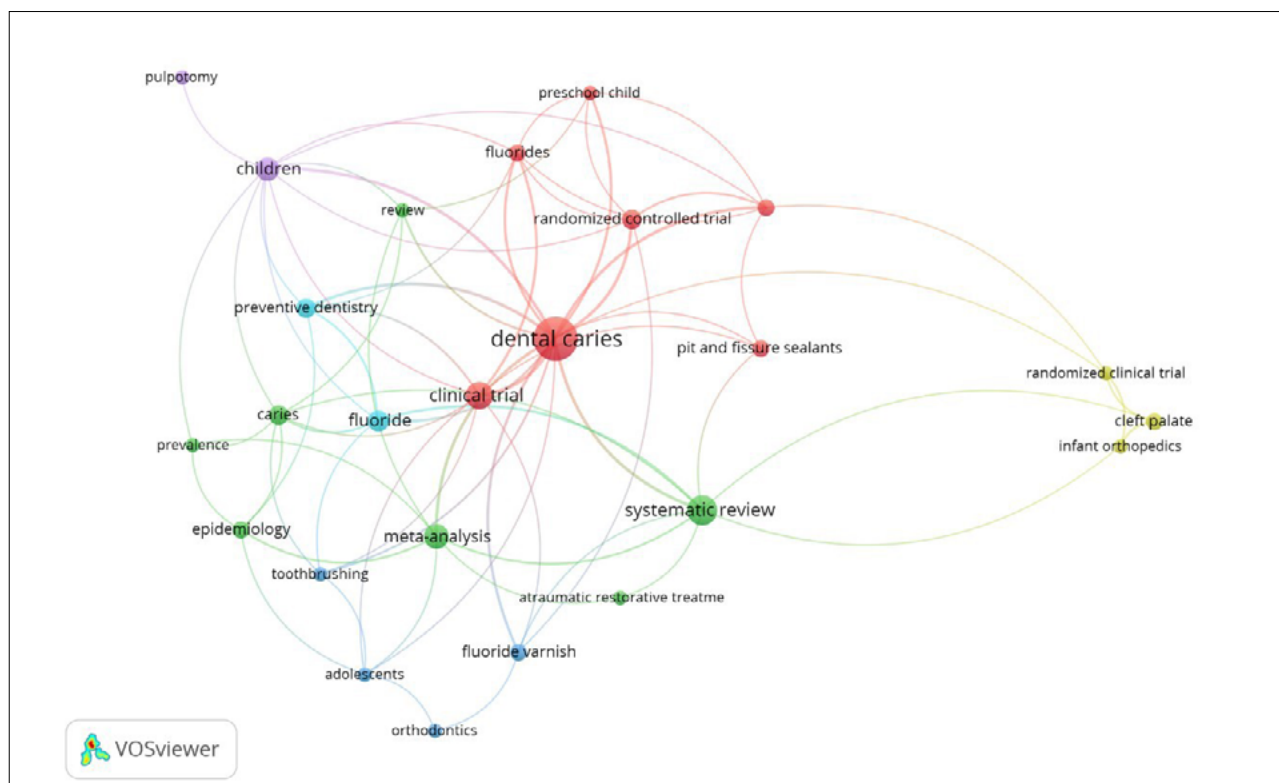
Legend: WoS-CC: Web of Science Core Collection

MAIN TOPICS AND KEYWORDS

The main topics of interest in the 100 most-cited papers were Cariology (40 papers), Orthodontics (21 papers), and Behavioural, Epidemiologic and Health Services Research (14 papers). The Poisson regression analysis showed that the number of citations was not influenced by the study topic (Table 2).

A total of 172 keywords were identified. "Dental caries" (20 papers) was mentioned most frequently, followed by "cephalometry" (16 papers), "tooth, deciduous" (12 papers), "cariostatic agents" (11 papers), "malocclusion", "meta-analysis", and "systematic review" (8 papers each). Figure 3 shows the bibliometric coupling among keywords with at least three occurrences.

Figure 3. Main keywords (three or more occurrences) and the existence of clusters among the 100 most-cited papers.



STUDY DESIGN

Fifty-three of the most-cited papers were CTs, of which 36 were RCTs. These papers received a total of 4,771 (WoS-CC), 5,345 (Scopus), and 10,244 (Google Scholar) citations. The citation density was 90.01 in WoS-CC. The largest number of CTs was from the USA (13 papers). The University of North Carolina (USA) and the University of Nijmegen (Netherlands) were the greatest contributors to the most-cited CTs (3 papers each). The American Journal of Orthodontics and Dentofacial Orthopedics was the main contributing journal (15 papers) and Cariology was the main topic of study (24 papers).

Forty-seven of the most-cited papers were SRs, of which 10 had meta-analyses. The SRs received a total of 3,929 (WoS-CC), 4,466 (Scopus), and 9,549 (Google Scholar) citations. The citation density was 83.59 in WoS-CC. The largest number of SRs was from Sweden (13 papers). The University of Nijmegen (Netherlands) was the institution with the major contribution of SRs (4 papers). The Acta Odontologica Scandinavica was the main contributing journal (5 papers), and Orthodontics was the main topic of study (15 papers).

The Poisson regression analysis showed that the number of citations was not influenced by the study design (Table 2).

DISCUSSION

This bibliometric study analyzed the top 100 most-cited CTs and SRs papers related to children and adolescents' oral health. There was a slightly larger number of CTs than SRs. In the last few decades, there has been an increase in the number of SRs and CTs in dentistry, based on the definition of 'evidence-based dentistry' in the mid-90s¹. Accordingly, in the present study, 99% of the studies were carried out after 1994, with 84% of them published after 2000. Additionally, twenty-eight papers received at least 100 citations. While highly cited papers are generally those cited 400 times or more, in fields or topics with lower research activity, 100 citations are considered an adequate threshold^{7,18}. Thus, twenty-eight of the 100 most-cited CTs and SRs papers qualify as highly cited papers.

It was observed that older publications usually tend to receive more citations than recent ones¹⁹. Therefore, it is interesting to analyze the papers' citation density, providing an average number of citations that the paper receives each year. The most recent paper¹⁶, published

in 2018 about molar incisor hypomineralization (MIH), received the highest citation density when analyzing this metric. It is interesting to note that the paper with the second-highest citation density is also about MIH. In fact, this subject has been extensively researched in recent years as it represents a current public health concern²⁰.

The top 100 papers were distributed among all continents, but overall, most papers were from Europe. Africa had the lowest number of articles and citations, with only two papers and two SRs, indicating limited support for research in this region²¹. When analyzing countries, the USA had both the most papers and citations in the top 100, aligning with other bibliometric studies^{7,8,10}. The USA's high funding budget across all research areas allows the country to build research capacity and publish high-quality papers in various fields¹¹. Countries prioritizing and conducting focused research on children and adolescents can have better professional training and patient results²². The University of Nijmegen (Netherlands) was the institution with the top 100 papers. This institution is considered the 136th-best university in the world, according to the Times Higher Education 2021.

Various authors co-authored the 100 most-cited papers, but only six authors published four or more papers. Twetman S was the author with both most papers and citations, publishing five SRs and two CTs, all of them on the Cariology topic, specifically on fluoride prevention and application. Twetman is a pediatric dentist and Professor Emeritus of Cariology at the University of Copenhagen, Denmark, with over 250 peer-reviewed articles and numerous international awards, including the IADR Distinguished Scientist Award. Axelsson S, Mejare I, Norlund A and Holm AK, all from Sweden, stood out for the number of papers published, with a connection between the publications as shown in Figure 2.

Regarding the topics of interest of the top 100, a few papers focused on the 'Oral Medicine and Pathology' and 'Pulp Biology and Regeneration' areas. This suggests that these areas may be promising and should be explored in future research due to the small number of articles found in this bibliometric review. The most frequent topic was 'Cariology', which includes research on etiology, epidemiology, risk assessment, pathogenesis, diagnosis, prevention, and treatment of dental caries. A recent bibliometric study on the top 100 most-cited papers in Pediatric Dentistry journals also found that cariology was the most frequent topic⁷. Another recent similar bibliometric study

that selected performed CTs among children and adolescents also found that most articles were in the thematic of cariology²¹. Dental caries is still the most prevalent oral condition in children and adolescents and remains among the most common chronic conditions of childhood²³. Its management accounts for a large proportion of children and adolescents' dentistry interventions, as confirmed in this bibliometric review, with two of the three most-cited studies focusing on strategies to prevent caries through fluoride, one CT¹³ and one SR¹⁵. Despite several studies in cariology, the question remains of how to disseminate these discoveries to people or implement public policies that can effectively reduce their high prevalence.

Some articles influenced research and clinical practice in Pediatric Dentistry, from the 5th to the 10th, emphasizing the importance of early treatment of skeletal class II and III, improving the prognosis of cases. The 14th is related to the Nyvad index, which is very important and used to assess caries activity. The 22nd is a Cochrane SR on the benefits of fluoridated toothpaste, underscoring the importance of using fluoride concentrations above 1000 ppm. The 23rd is a meta-analysis on ART (Atraumatic Restorative Treatment), showing high survival rates of these single-surface restorations using high-viscosity glass ionomer in the primary and permanent dentition. The 31st is an SR indicating the negative impact of malocclusion on quality of life. Finally, the 42nd highlights the role of childhood diseases in the etiology of MIH.

When comparing the specific metrics of CTs and SRs, it was observed that they showed some similar aspects. Although the absolute number of CTs' citations was higher, the citation range and mean number of citations were similar to SRs papers. This highlights the importance given by researchers and journal editors to these study designs. However, some differences were noted. CTs were mainly published by the USA, while Sweden published most SRs. CTs are expensive and often require adequate infrastructure for development, and as mentioned above, the USA has a high funding budget, allowing more funding for CTs²⁴. A recent bibliometric study investigating the top 100 most-cited CTs and SRs in the field of endodontics showed similar results, presenting 45 CTs and 55 SRs²⁵. It also showed a similarity, with the USA having the largest number of publications, concerning RCTs and SRs²⁵.

Each database has a unique method of registering and quantifying citations. Google

Scholar, for example, includes citations from books, open-access online journals, and non-academic sources. Given this, the total number of citations was higher in this database. However, more citations of papers from selected journals with peer review were retrieved from WoS and Scopus^{26,27}. During the quantification of citations, self-citations were not distinguished, but they should not be automatically criticized. Although misconduct can occur in some papers, self-citations are also used to save space when referring to a method since research involving few researchers is likely to cite their work²⁸.

CONCLUSION

The present study provides a historical perspective on the scientific progress of studies conducted with children and adolescents in dentistry and reports the main trends in clinical practice research. This study has revealed homogeneity in the number of CTs and SRs among the top 100 most-cited papers. Cariology and Orthodontics were the main topics of research. The USA holds the first position as the country with the most papers in the top 100 most-cited list, while the University of Nijmegen (Netherlands) was the most prolific institution. Twetman S contributed the highest number of papers.

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AUTHOR CONTRIBUTIONS

KMP and MC conceived the idea for this review. KMP and FCV performed the literature

search. KMP, FCV and PSS extracted the data and conducted the data analyses. MB, PAM, MC and CMS contributed to the writing and review. All authors discussed the results, drafted and critically revised the manuscript.

CONFLICT OF INTEREST

No conflict of interest to declare.

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Os 100 ensaios clínicos e revisões sistemáticas mais citados relacionados à saúde bucal de crianças e adolescentes: uma análise bibliométrica

Objetivo: Esta revisão analisou os 100 ensaios clínicos (EC) e revisões sistemáticas (RS) mais citados relacionados à saúde bucal de crianças e adolescentes.

Métodos: Realizou-se uma busca na base de dados Web of Science Core Collection (WoS-CC), utilizando uma estratégia de busca específica. Os artigos foram classificados em ordem decrescente, considerando o número de citações. Foram incluídos apenas ECs e RSs. Dois revisores selecionaram os artigos e coletaram os seguintes dados bibliométricos: ano de publicação; número e densidade de citações; desenhos de estudo; periódico; autores; países e instituições; tópicos de estudo; e palavras-chave. Regressão de Poisson foi conduzida para verificar associações entre o número de citações e os parâmetros bibliométricos.

Resultados: Os 100 artigos mais citados foram publicados entre 1982 e 2018 e receberam um total de 8.702 citações na WoS-CC (variando de 52 a 177). Cinquenta e três artigos eram ECs e 47 RSs. O *American Journal of Orthodontics and Dentofacial Orthopaedics* publicou a maioria dos artigos ($n = 20$). Twetman S contribuiu com o maior número de artigos ($n = 7$). Os Estados Unidos da América foram o país mais prolífico ($n = 17$), seguido pelos Países Baixos ($n = 11$). A Universidade de Nijmegen (Holanda) apresentou 8 artigos entre os mais citados. O principal tema de interesse foi Cariologia ($n = 40$). “Cárie dentária” foi a palavra-chave mais frequente ($n = 20$). O número de citações na WoS-CC diminuiu 1,3% a cada ano (RP: 0,987, IC 95%: 0,975–1,000, $p = 0,048$).

Conclusão: Este estudo bibliométrico permitiu analisar os ECs e RSs mais citados relacionadas à saúde bucal de crianças e adolescentes, destacando os autores, instituições e países mais prolíficos com base no número de citações.

Descritores: Bibliometria. Ensaio Clínico. Odontopediatria. Revisão Sistemática.