



## The 100 Most Cited Articles on Dental Anomalies: A Bibliometric Analysis

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### Review

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### ABSTRACT

**Objectives:** To identify and analyze the 100 most-cited articles in the field of dental anomalies.

**Materials and Methods:** A search was performed in the Thompson Reuters Web of Science (WOS) database on May 31, 2021. The search strategy was performed using keywords obtained from the Medical Subject Headings (MeSH) index. The following data were extracted and analyzed: number of citations, title, authors, year of publication, title of scientific journals, type of study and subject area.

**Results:** The search strategy resulted in 69,014 articles and the most cited studies were concentrated between 1945-2012. Twenty-four percent of all articles were published in orthodontic journals. The number of citations ranged from 98 to 482 and The United States was the most prolific country. Numerical anomalies and structural changes were the most studied thematic fields (79 articles) and laboratory studies were the most cited type of study. **Conclusions:** Numerical anomalies and structural changes were the most studied thematic fields. There was a predominance of laboratory studies and The United States was responsible for most of the articles included.

**Keywords:** Bibliometrics; Citation analysis; Dental anomalies.

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### Introduction

Dental anomalies (DA) are changes in the number, shape, structure, size and pattern of tooth eruption resulting from disturbances during the morphodifferentiation stages of tooth germ development.<sup>1</sup>

Different prevalence rates have been reported, however this wide range of values reflects the differences in race and age of the samples, as well as the diagnostic criteria used in research.<sup>2,3</sup> The etiology of DA is multifactorial, multilevel and multidimensional.<sup>4</sup> Complex interactions between genetic, epigenetic and environmental factors seem to explain the emergence of these abnormalities.<sup>5</sup>

From a clinical point of view, changes in the size, number, and pattern of tooth eruption can lead to the development of malocclusions.<sup>6</sup> Moreover, changes in morphology and color can compromise patients' esthetics.<sup>7,8</sup> Early diagnosis, combined with proper treatment are essential to achieve occlusal, functional and esthetic harmony.<sup>9</sup>

Several studies have been published evaluating the prevalence, etiology and treatment of the most varied types of dental anomalies. This high scientific production has generated new knowledge, improved technologies

and encouraged the critical and reflective spirit of professionals.<sup>10</sup> In this scenario, bibliometric studies emerge as a macroscopic and voluminous view of scientific literature, and help to identify authors, journals, countries, institutions and the most influential research themes in the areas studied.<sup>11</sup>

Bibliometrics is a scientific mapping method for applying quantitative and statistical analysis to monitor and analyze the structure and growth of science.<sup>12,13</sup> The number of citations of an article is a bibliometric tool that has been used to assess and describe the impact of a research publication over time.<sup>14,15</sup> Furthermore, this number may express the capacity of this article to generate changes in clinical practice and also to guide future researches.<sup>16</sup>

At present, there are no studies evaluating research related to DA, so the aim of this study was to use these bibliometric resources to identify the 100 most cited articles on this topic.

A bibliometric study was conducted to identify and analyze the 100 most cited articles on dental anomalies. The studies were selected by means of a search performed in the Thompson Reuters Web of Science (WOS) database, owned by Clarivate Analytics on May 31, 2021. An additional search was performed in the

Scopus database, for use in making comparisons at a later stage with regard to the total number of citations.

The search strategy was performed using the keywords obtained from the Medical Subject Headings (MeSH) index and combined with the TS field tag (Topic) and the Boolean OR operator, using the advanced search tool in the section "All databases" (Table 1).

## Materials and Methods

A universal micro-hybrid resin composite (Z250; Filtek Z250, 3M ESPE, St Paul, MN, USA), two resin-based bulk-fill restoratives (FOB; Filtek One Bulk Fill, 3M ESPE, St Paul, MN, USA and EBF; Estelite Bulk-Fill Flow, Tokuyama Dental Corporation, Tokyo, Japan), a glass ionomer-based bulk-fill restorative (Equia FF; Equia Forte Fil, GC Dental Products Corp, Tokyo, Japan), a bulk-fill alkasite restorative (CN; Cention N) and an indirect composite resin (Gradia P; Gradia Plus, GC Dental Products Corp, Tokyo, Japan) were tested in the present study. The shades of the materials were A2 except for HB-DA2 was used in Gradia Plus group. The composition and polymerization or setting procedures of the materials are described in Table 1.

The filter "Dentistry, Oral Surgery & Medicine" was applied to direct the search, however no restrictions were placed on the year of publication or the language. Inclusion criteria were full articles focused on dental anomalies, so editorials and conference articles were excluded. The articles were selected independently by two researchers (MEFS and GVS) and differences of opinion were resolved by consensus.

The search retrieved a total of 69,014 items that were ranked in descending order according to the total number of citations. Articles with the same number of citations were ranked taking into account the year of publication, so that more recent studies received higher ranking. The evaluation stopped at the 100th most cited article.

For each item selected, the following data were extracted and stored in an Excel spreadsheet (Microsoft Office for Mac 2011 package): (a) number of citations; (b) title; (c) authors (name, number, order of authorship, country); (d) year of publication; (e) title of scientific journals; (f) type of study; (g) subject field and (h) keywords. Study designs were classified this way: literature reviews, laboratory studies (in vitro, in vivo, in situ, ex vivo), epidemiological study, controlled clinical trial, prevalence and incidence study, randomized clinical trial, clinical practice guide, control case, diagnostic study, tracking study, experimental research and observational study.

Thematic fields included the following themes: (a) structural alteration (amelogenesis imperfecta, osteogenesis imperfecta, invaginated tooth, dentinogenesis imperfecta, MIH and enamel hypoplasia); (b) eruption trajectory (palatally displaced canine, transposition, ectopic eruption of permanent first molars, ankylosis); (c) change in number (supernumerary and tooth agenesis); (d) changes in the number of roots; (e)

odontogenic tumors (odontoma); (f) changes in shape (fusion and twinning) and (g) changes in size (microdontia and macrodontia).

Statistical analysis was performed using IBM® SPSS® (Statistical Package for the Social Sciences) version 20.0; Statsoft, Tulsa, Okla for frequency of descriptive measures. VOSviewer software was used to generate keyword co-occurrence networks.

## Results

The search strategy resulted in 69,014 articles in Web of Science and 62,542 articles in Scopus. Articles found in Web of Science were ranked. Table 2 shows the ranking of the 100 most cited articles, in descending order of number of citations, ranging from 98 to 482 and totaling 17,230 citations, with an annual average of 226.71. The most cited article was by Vastardis, Heleni et al., with 482 citations, published in the United States in 1986, which addresses the genetic etiology of tooth agenesis. Relative to study designs, 23% were laboratory studies, 16% literature reviews and 11% epidemiological studies which, when added together, represented half of all articles included in the list (Table 3).

In total, 324 authors were involved in the articles retrieved, with each publication having an average of 4.05 authors per article. The contribution of 17 authors with more than three studies on the list amounted to 39 articles, and 7711 citations. Simmer, JP was the author with the largest number of articles included, totaling seven studies and 879 citations (Table 4).

The most cited studies were concentrated between 1945-2012. Figure 1 shows the years in which there were more than three publications with a high citation rate, showing a low production between 1940 and 1980. In addition, the highest productivity per year was observed in 2001 (nine studies).

The articles selected were published in 42 different journals. Figure 2 shows the list of 13 journals with the most articles included in the ranking, and which accounted for 66% of all citations. American Journal of Orthodontics and Dentofacial Orthopedics (AJO-DO) (13), The Angle Orthodontist (6), Journal of Dental Research (6) and Nature Genetics (6) were the journals with the greatest contribution to the list, totaling 5,740 citations.

Number anomalies and structural changes were the most studied thematic fields, totaling 79 articles (Figure 3). Of all the articles on number of anomalies, 90.63% assessed tooth agenesis and 9.37% supernumerary teeth. While, of the total of 47 studies on structural alteration, more than 50% were on Amelogenesis imperfecta (15), Enamel hypoplasia (11) and Molar-Incisor Hypomineralization (6).

A total of 389 keywords were identified, with Hypodontia, Oligodontia, Expression and Dental anomalies being the most expressive ones (Figure 4). Only five countries accounted for almost 80% of the articles with the highest number of citations. The United States contributed 40% of all publications listed and 7,108

citations. Subsequently, Sweden, Finland, England and Australia collaborated with a total of 38 publications and 6,399 citations (Figure 5).

## Discussion

To the best of the authors' knowledge, this is a pioneer and unique bibliometric research in this area. The sample size was defined in 100 studies to provide a manageable and significant number of articles to be analyzed, according to several previously published works.<sup>17-21</sup>

Generally, a highly cited article is seen as a milestone and can positively influence research and clinical practice.<sup>22</sup> Our search resulted in 69,014 articles in the Web of Science and 62,542 articles in Scopus. Articles that exceed the limit of 100 citations are arbitrarily considered as "classics".<sup>23</sup> Of all the articles included, 98% had more than 100 citations, and 27% were cited more than 200 times, which showed a high scientific impact. The two studies that led the ranking had 482 and 473 citations, and both addressed tooth agenesis as the main theme.

The articles were published between 1945 and 2012, however a higher concentration of studies (53%) was published after the 2000s, which may represent a late consolidation of research on the subject. The largest number of articles per year was found in 2001 (nine), with 66.66% on structural anomalies. This increase observed on this date was due to the fact that MIH was first described in this year, which prompted a higher quantity of researches on the subject.

Laboratory studies (23%) and literature reviews (16%) were the most cited types of studies. Reviews play an important role in gathering information on a specific topic, and laboratory studies are the basis for research in any biomedical area.<sup>24</sup> In the analyzed articles, the laboratory studies included in the list focused on the investigation of the etiology of tooth agenesis (34%), in several studies gene investigations and *in vitro* analyzes were carried out. These studies add to the evidence that agenesis and its associated abnormalities are under genetic control.<sup>25</sup>

Furthermore, literature reviews especially addressed structural anomalies (50%), such as enamel hypoplasia and amelogenesis imperfecta. No systematic review of dental anomalies was highly cited. Considering that these types of studies are the basis for research and clinical practice in evidence-based dentistry, the lack of research with a higher level of scientific rigor is clear.

According to the results, the 100 most cited articles were published in a total of 42 journals, 60% were published in dental journals, 26% in journals in the field of Oral Biology, 9% in journals of Medicine, and 5% in Anthropological area. Of the 60 articles published in dental journals, 40% were published in orthodontic journals (American Journal of Orthodontics and Dentofacial Orthopedics; The Angle Orthodontist; European Journal of Orthodontics). This was expected since dental anomalies are frequently observed in orthodontic patients and must be considered because they could complicate the dental and orthodontic

treatments. Moreover, the early detection of a single dental anomaly may allow timely orthodontic intervention.<sup>25,26</sup> In addition, of the 26 articles published in journals specialized in oral biology, 77% addressed the genetic aspects of dental anomalies, especially tooth agenesis (35%).

The keywords provided in the articles included were also evaluated using a co-occurrence network mapping. This type of map is a tool that allows the research domain in a certain field to be summarized, visualized and examined. In the present analysis, a total of 389 keywords were identified. "Hypodontics" was the most prevalent word (14), followed by "dental anomalies" (10), "expression" and "oligodontics", both appeared 9 times. This result was expected since tooth agenesis was the most studied dental anomaly and corresponded to 27% of all articles in the ranking.

The 100 most cited articles were produced predominantly by the United States (40%), in agreement with several bibliometric studies in the area of health.<sup>27-29</sup> This result probably reflected the large number of researchers who belong to this country, which was also the leading country in the number of medical research publications.<sup>18</sup> Furthermore, the United States has a large scientific community and generous science funding policies.<sup>30</sup>

In total, 324 authors were involved in the articles that were ranked, with each publication having an average of 4.05 authors. The top 17 most prolific authors contributed 39 articles and accounted for almost half of the total number of citations (45%). These authors worked mainly on three themes: anomalies of eruption trajectory, structure, and number, demonstrating their outstanding contributions in the area. The 3 authors with the highest number of citations were Ericson, S (1086), Kuroi, J (1086) and Wright, JT (1024). It is interesting to emphasize that Ericson, S and Kuroi, J contributed five articles to the ranking, in which they were the only authors of the articles, with Ericson, S always being the first author of the articles. This partnership focused exclusively on studies on the trajectory of permanent canine eruption. Vastardis, H was the author responsible for the publication with the highest number of citations and addressed the etiology of tooth agenesis. Still on the same theme, the author produced another study (20th) with a high number of citations (237). It is noteworthy that studies involving the etiological factors of dental anomalies (46%) and, in particular, the genetic aspects involved in tooth agenesis (37%) aroused great interest among the academic community (3,497 citations).

One of the limitations of the present study was the lack of time restrictions, favoring older publications. Naturally, studies published in previous years had more time to be cited, irrespective of their scientific value. In addition, two databases were consulted to identify the articles, but only the Web of Science was used to rank the studies. However, WOS is the oldest, most widely used, and trusted research database, publications, and citations that

covers nearly 34,000 journals today.<sup>31</sup> More research is needed to address and overcome present limitations.

## Conclusions

The majority of the articles were laboratory studies, and it was possible to observe a lack of studies of the systematic review type.

Number anomalies and structural changes were the most studied thematic fields. Orthodontics journals accounted for 24% of all surveys and United States was the most prolific country.

This study provides a source of quality information for researchers, academics and students and allows for analysis and prediction of the trend of future research.

**Table 1:** Search strategy

<b>TS =</b>	(Tooth Abnormalit* OR Anodontia OR Hypodontia OR Oligodontia OR Hyperdontia OR Shape anomal* OR Tooth Ankylosis OR Dens evaginatus OR Dens in Dente OR Enamel hypoplasia OR Amelogenesis Imperfecta OR Dentin Dysplasia OR Dentinogenesis Imperfecta OR Fused Teeth OR Generation OR Dilaceration OR Concrescence OR Odontodysplasia OR Tooth, Supernumerary OR Tooth Eruption, Ectopic OR Taurodontism OR Distoangulation OR Hypercementosis OR Macrodonia OR Microdonia OR Impaction OR Ectopic tooth eruption OR Ectopic eruption OR Tooth Transposition OR Talon cusp OR Enamel pearls OR Giroversion OR Dental anomal* OR Dental agenesis OR Tooth agenesis OR Palatally displaced canine OR Dental Fusion OR Supranumerary OR Odontoma OR Congenitally missing tooth OR Congenitally missing teeth OR Peg-shaped)
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**Table 2:** The top-100 most-cited papers in dental anomalies

	Article	Number of citations
1	VASTARDIS, Heleni et al. A human MSX1 homeodomain missense mutation causes selective tooth agenesis. <b>Nature genetics</b> , v. 13, n. 4, p. 417-421, 1996.	482
2	POLDER, Bart J. et al. A meta-analysis of the prevalence of dental agenesis of permanent teeth. <b>Community dentistry and oral epidemiology</b> , v. 32, n. 3, p. 217-226, 2004.	473
3	GOODMAN, Alan H.; ROSE, Jerome C. Assessment of systemic physiological perturbations from dental enamel hypoplasias and associated histological structures. <b>American Journal of Physical Anthropology</b> , v. 33, n. S11, p. 59-110, 1990.	427
4	LAMMI, Laura et al. Mutations in AXIN2 cause familial tooth agenesis and predispose to colorectal cancer. <b>The American Journal of Human Genetics</b> , v. 74, n. 5, p. 1043-1050, 2004.	403
5	VAN DEN BOOGAARD, Marie-José H. et al. MSX1 mutation is associated with orofacial clefting and tooth agenesis in humans. <b>Nature genetics</b> , v. 24, n. 4, p. 342-343, 2000.	403
6	STOCKTON, David W. et al. Mutation of PAX9 is associated with oligodontia. <b>Nature genetics</b> , v. 24, n. 1, p. 18-19, 2000.	355
7	GIBSON, Carolyn W. et al. Amelogenin-deficient mice display an amelogenesis imperfecta phenotype. <b>Journal of Biological Chemistry</b> , v. 276, n. 34, p. 31871-31875, 2001.	337
8	WEERHEIJM, K. L.; JALEVIK, B.; ALALUUSUA, Satu. Molar-incisor hypomineralisation. <b>Caries research</b> , v. 35, n. 5, p. 390, 2001.	289
9	ERICSON, Sune; KUROL, Jüri. Early treatment of palatally erupting maxillary canines by extraction of the primary canines. <b>European Journal of Orthodontics</b> , v. 10, n. 4, p. 283-295, 1988.	288
10	SREENATH, Taduru et al. Dentin sialophosphoprotein knockout mouse teeth display widened predentin zone and develop defective dentin mineralization similar to human dentinogenesis imperfecta type III. <b>Journal of Biological Chemistry</b> , v. 278, n. 27, p. 24874-24880, 2003.	286
11	PECK, Sheldon; PECK, Leena; KATAJA, Matti. The palatally displaced canine as a dental anomaly of genetic origin. <b>The Angle Orthodontist</b> , v. 64, n. 4, p. 250-256, 1994.	286
12	WITKOP JR, C. J. Amelogenesis imperfecta, dentinogenesis imperfecta and dentin dysplasia revisited: problems in classification. <b>Journal of Oral Pathology &amp; Medicine</b> , v. 17, n. 9-10, p. 547-553, 1988.	286
13	BROOK, A. H. A unifying aetiological explanation for anomalies of human tooth number and size. <b>Archives of oral biology</b> , v. 29, n. 5, p. 373-378, 1984.	265
14	GROVER, Pushpinder S.; LORTON, Lewis. The incidence of unerupted permanent teeth and related clinical cases. <b>Oral Surgery, Oral Medicine, Oral Pathology</b> , v. 59, n. 4, p. 420-425, 1985.	259
15	SHIELDS, E. D.; BIXLER, D.; EL-KAFRAWY, A. M. A proposed classification for heritable human dentine defects with a description of a new entity. <b>Archives of oral biology</b> , v. 18, n. 4, p. 543-547, 1973.	253
16	ERICSON, Sune; KUROL, Jüri. Radiographic examination of ectopically erupting maxillary canines. <b>American Journal of orthodontics and Dentofacial orthopedics</b> , v. 91, n. 6, p. 483-492, 1987.	250
17	XIAO, Shangxi et al. Dentinogenesis imperfecta 1 with or without progressive hearing loss is associated with distinct mutations in DSPP. <b>Nature genetics</b> , v. 27, n. 2, p. 201-204, 2001.	240
18	BACCETTI, T. A controlled study of associated dental anomalies. <b>The Angle Orthodontist</b> , v. 68, n. 3, p. 267-274, 1998.	239
19	RANTA, Reijo. A review of tooth formation in children with cleft lip/palate. <b>American Journal of Orthodontics and Dentofacial Orthopedics</b> , v. 90, n. 1, p. 11-18, 1986.	239
20	VASTARDIS, Heleni. The genetics of human tooth agenesis: new discoveries for understanding dental anomalies. <b>American Journal of Orthodontics and Dentofacial Orthopedics</b> , v. 117, n. 6, p. 650-656, 2000.	237
21	ERICSON, Sune; KUROL, Jüri. Resorption of incisors after ectopic eruption of maxillary canines: a CT study. <b>The Angle Orthodontist</b> , v. 70, n. 6, p. 415-423, 2000.	218
22	HILLSON, S.; BOND, S. Relationship of enamel hypoplasia to the pattern of tooth crown growth: A discussion. <b>American Journal of Physical Anthropology</b> , v. 104, n. 1, p. 89-103, set. 1997.	217
23	GOODMAN, Alan H.; ARMELAGOS, George J.; ROSE, Jerome C. Enamel hypoplasias as indicators of stress in three prehistoric populations from Illinois. <b>Human biology</b> , p. 515-528, 1980.	212
24	THESLEFF, Irma. The genetic basis of tooth development and dental defects. <b>American Journal of Medical Genetics Part A</b> , v. 140, n. 23, p. 2530-2535, 2006.	211

25	LAGERSTRÖM, Maria et al. A deletion in the amelogenin gene (AMG) causes X-linked amelogenesis imperfecta (AIH1). <b>Genomics</b> , v. 10, n. 4, p. 971-975, 1991.	210
26	JACOBY, Harry. The etiology of maxillary canine impactions. <b>American journal of orthodontics</b> , v. 84, n. 2, p. 125-132, 1983.	201
27	ZHANG, Xiaohai et al. DSPP mutation in dentinogenesis imperfecta Shields type II. <b>Nature genetics</b> , v. 27, n. 2, p. 151-152, 2001.	200
28	HART, P. S. et al. Mutation in kallikrein 4 causes autosomal recessive hypomaturation amelogenesis imperfecta. <b>Journal of medical genetics</b> , v. 41, n. 7, p. 545-549, 2004.	187
29	CATERINA, John J. et al. Enamelysin (matrix metalloproteinase 20)-deficient mice display an amelogenesis imperfecta phenotype. <b>Journal of Biological Chemistry</b> , v. 277, n. 51, p. 49598-49604, 2002.	186
30	ERICSON, Sune; KURROL, Jüri. Radiographic assessment of maxillary canine eruption in children with clinical signs of eruption disturbance. <b>The European Journal of Orthodontics</b> , v. 8, n. 3, p. 133-140, 1986.	179
31	LEPPANIEMI, A.; LUKINMAA, Pirjo-Liisa; ALALUUSUA, Satu. Nonfluoride hypomineralizations in the permanent first molars and their impact on the treatment need. <b>Caries research</b> , v. 35, n. 1, p. 36-40, 2001.	173
32	PHILIPSEN, H. P. et al. Mixed odontogenic tumours and odontomas. Considerations on interrelationship. Review of the literature and presentation of 134 new cases of odontomas. <b>Oral oncology</b> , v. 33, n. 2, p. 86-99, 1997.	168
33	PECK, Leena; PECK, Sheldon; ATTIA, Yves. Maxillary canine-first premolar transposition, associated dental anomalies and genetic basis. <b>The Angle Orthodontist</b> , v. 63, n. 2, p. 99-109, 1993.	168
34	CRAWFORD, Peter JM; ALDRED, Michael; BLOCH-ZUPAN, Agnes. Amelogenesis imperfecta. <b>Orphanet journal of rare diseases</b> , v. 2, n. 1, p. 1-11, 2007.	166
35	KIM, J. W. et al. MMP-20 mutation in autosomal recessive pigmented hypomaturation amelogenesis imperfecta. <b>Journal of medical genetics</b> , v. 42, n. 3, p. 271-275, 2005.	164
36	DAVIS, P. Jane. Hypodontia and hyperdontia of permanent teeth in Hong Kong schoolchildren. <b>Community Dentistry and Oral Epidemiology</b> , v. 15, n. 4, p. 218-220, 1987.	164
37	BECKER, Adrian; SMITH, PATRICIA; BEHAR, RUTH. The incidence of anomalous maxillary lateral incisors in relation to palatally-displaced cuspids. <b>The Angle Orthodontist</b> , v. 51, n. 1, p. 24-29, 1981.	164
38	THILANDER, Birgit; JAKOBSSON, S. O. Local factors in impaction of maxillary canines. <b>Acta Odontologica Scandinavica</b> , v. 26, n. 1-2, p. 145-168, 1968.	164
39	RAJPAR, M. Helen et al. Mutation of the gene encoding the enamel-specific protein, enamelin, causes autosomal-dominant amelogenesis imperfecta. <b>Human molecular genetics</b> , v. 10, n. 16, p. 1673-1677, 2001.	160
40	PINDBORG, Jens J. Aetiology of developmental enamel defects not related to fluorosis. <b>International dental journal</b> , v. 32, n. 2, p. 123-134, 1982.	157
41	ERICSON, Sune; KURROL, Jüri. Resorption of maxillary lateral incisors caused by ectopic eruption of the canines: a clinical and radiographic analysis of predisposing factors. <b>American Journal of Orthodontics and Dentofacial Orthopedics</b> , v. 94, n. 6, p. 503-513, 1988.	151
42	GOODMAN, Alan H.; ARMELAGOS, George J. Factors affecting the distribution of enamel hypoplasias within the human permanent dentition. <b>American journal of physical anthropology</b> , v. 68, n. 4, p. 479-493, 1985.	150
43	DE COSTER, P. J. et al. Dental agenesis: genetic and clinical perspectives. <b>Journal of Oral Pathology &amp; Medicine</b> , v. 38, n. 1, p. 1-17, 2009.	147
44	KIM, J.-W.; SIMMER, J. P. Hereditary dentin defects. <b>Journal of dental research</b> , v. 86, n. 5, p. 392-399, 2007.	147
45	ROBERTSSON, Stefan; MOHLIN, Bengt. The congenitally missing upper lateral incisor. A retrospective study of orthodontic space closure versus restorative treatment. <b>The European Journal of Orthodontics</b> , v. 22, n. 6, p. 697-710, 2000.	145
46	NIEMINEN, Pekka. Genetic basis of tooth agenesis. <b>Journal of Experimental Zoology Part B: Molecular and Developmental Evolution</b> , v. 312, n. 4, p. 320-342, 2009.	143
47	HU, Jan C.-C. et al. Enamel formation and amelogenesis imperfecta. <b>Cells Tissues Organs</b> , v. 186, n. 1, p. 78-85, 2007.	142
48	STEWART, Jeffrey A. et al. Factors that relate to treatment duration for patients with palatally impacted maxillary canines. <b>American Journal of Orthodontics and Dentofacial Orthopedics</b> , v. 119, n. 3, p. 216-225, 2001.	141
49	VAN DEN BOOGAARD, Marie-José et al. Mutations in WNT10A are present in more than half of isolated hypodontia cases. <b>Journal of medical genetics</b> , v. 49, n. 5, p. 327-331, 2012.	139
50	GOODMAN, Alan H.; ROSE, Jerome C. Dental enamel hypoplasias as indicators of nutritional status. <b>Advances in dental anthropology</b> , v. 5, p. 225-240, 1991.	139
51	M. HÜLSMANN. Dens invaginatus: aetiology, classification, prevalence, diagnosis, and treatment considerations. <b>International Endodontic Journal</b> , v. 30, n. 2, p. 79-90, mar. 1997.	137
52	ALDRED, M.; SAVARIRAYAN, R.; CRAWFORD, P. Amelogenesis imperfecta: a classification and catalogue for the 21st century. <b>Oral Diseases</b> , v. 9, n. 1, p. 19-23, jan. 2003.	136
53	WANG, X.-P. et al. Apc inhibition of Wnt signaling regulates supernumerary tooth formation during embryogenesis and throughout adulthood. <b>Development</b> , v. 136, n. 11, p. 1939-1949, 1 jun. 2009.	135
54	SURI, L.; GAGARI, E.; VASTARDIS, H. Delayed tooth eruption: Pathogenesis, diagnosis, and treatment. A literature review. <b>American Journal of Orthodontics and Dentofacial Orthopedics</b> , v. 126, n. 4, p. 432-445, out. 2004.	131
55	MULLER, T. P. et al. A Survey of Congenitally Missing Permanent Teeth. <b>The Journal of the American Dental Association</b> , v. 81, n. 1, p. 101-107, jul. 1970.	131
56	LIDRAL, A. C.; REISING, B. C. The Role of MSX1 in Human Tooth Agenesis. <b>Journal of Dental Research</b> , v. 81, n. 4, p. 274-278, abr. 2002.	129
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**Table 3:** Categorization of articles in terms of study design

Study design	N° of articles
Laboratory studies	23
Literature reviews	16
Epidemiological studies	11
Controlled clinical trial	7
Prevalence and Incidence Study	5
Randomized clinical trial	5
Clinical Practice Guide	5
Control case	5
Diagnostic study	3
Tracking Study	3
Experimental research	3
Observational study	3

**Table 4:** Authors with three or more papers in the 100 most-cited papers in dental anomalies

Name	First author	Co-author	N° of citations	Total
ERICSON S	5	0	1086	5
KUROL J	0	5	1086	5
WRIGHT JT	0	5	1024	5
GOODMAN AH	4	0	929	4
SIMMER JP	2	5	879	7
VASTARDIS H	3	0	850	3
PECK L	1	4	782	5
PECK S	4	1	782	5
ROSE JC	0	3	779	3
THESLEFF I	1	2	734	3
NIEMINEN P	2	1	666	3
HU JCC	2	3	650	5
ALALUUSUA S	1	2	585	3
D'SOUZA RN	0	3	569	3
KATAJA M	0	3	500	3
KIM JW	3	0	435	3
DIXON MJ	1	2	365	3

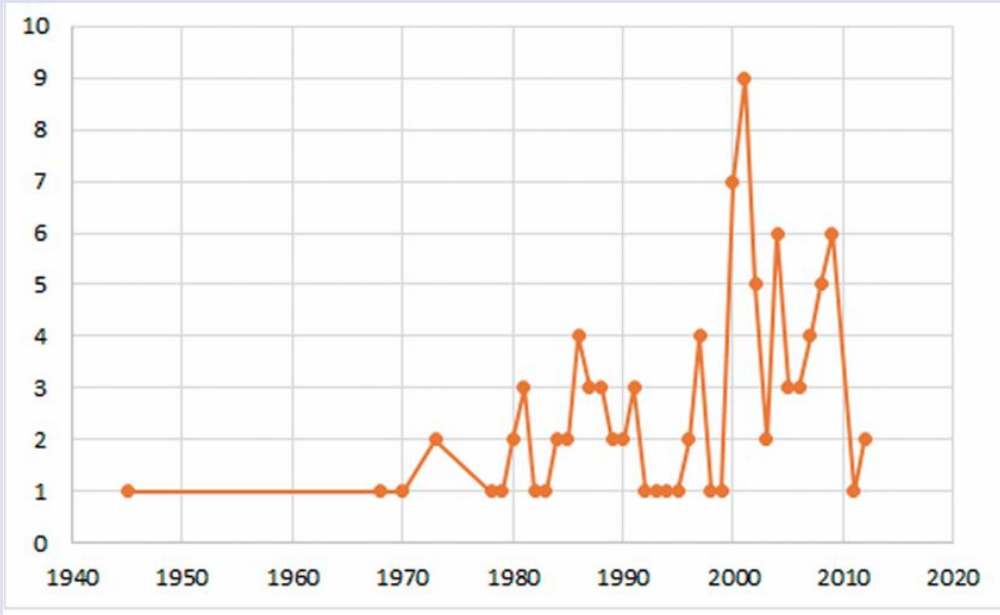


Figure 1. Number of articles per year

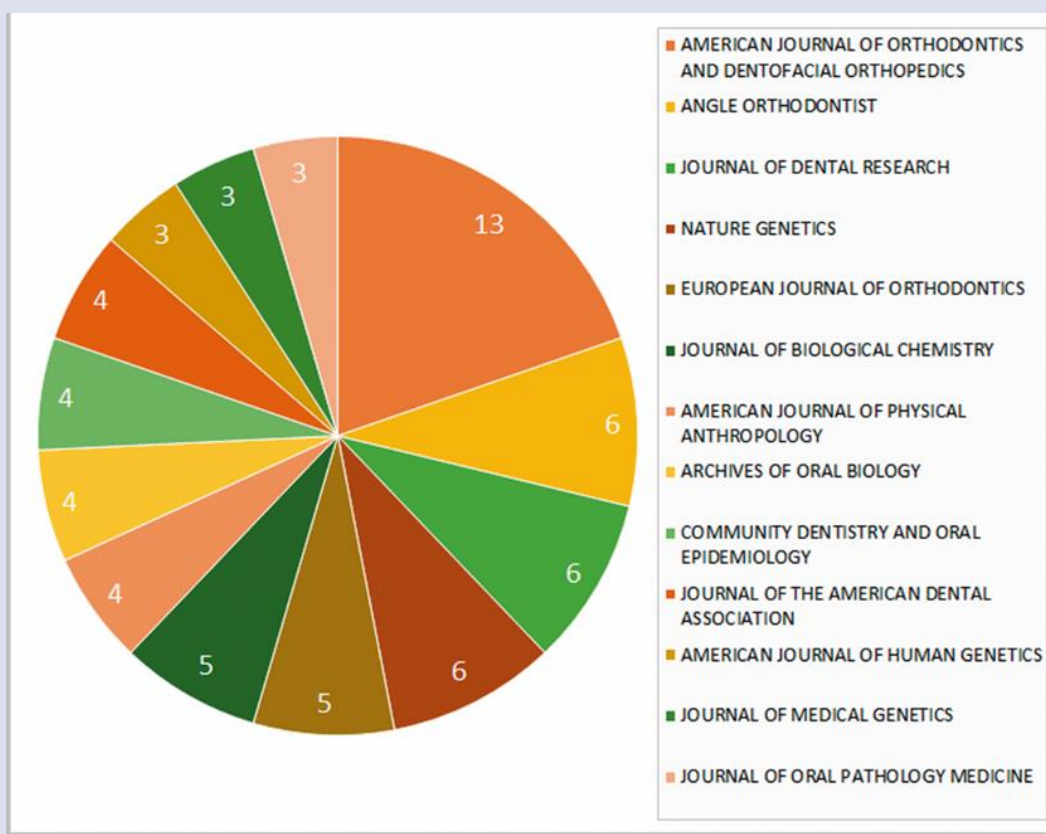
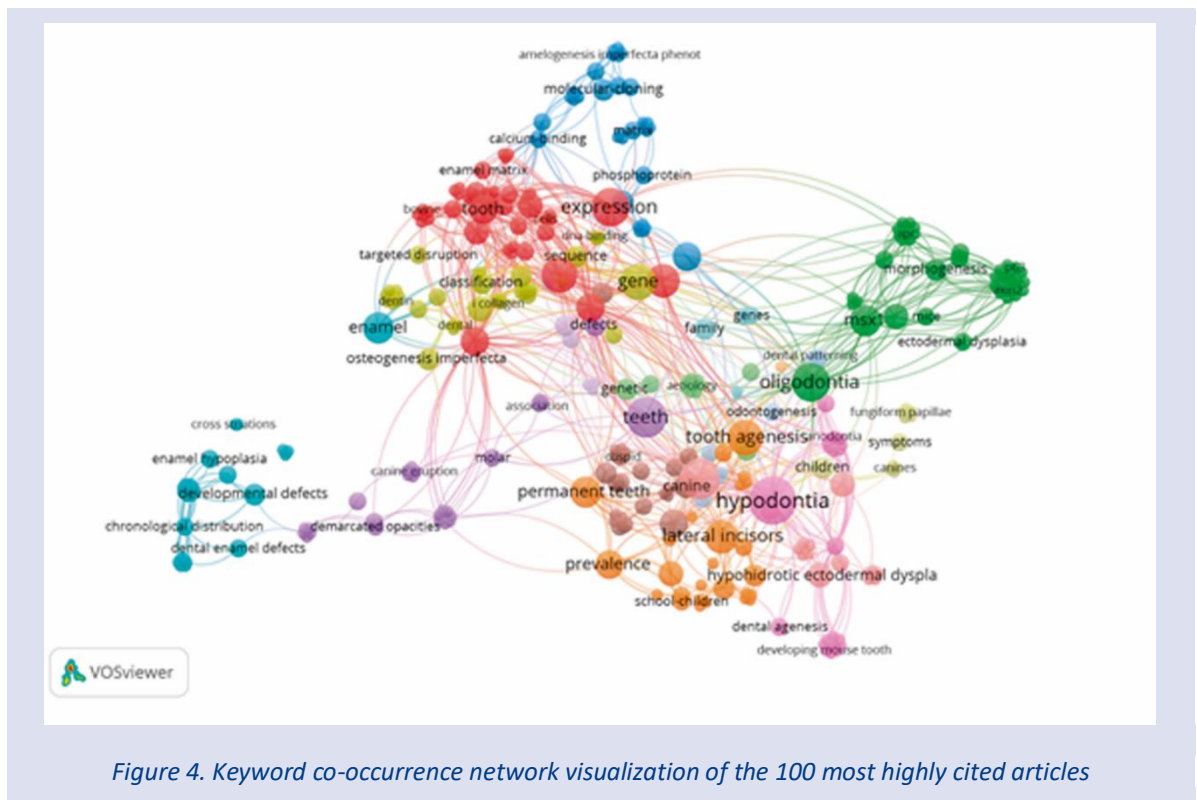
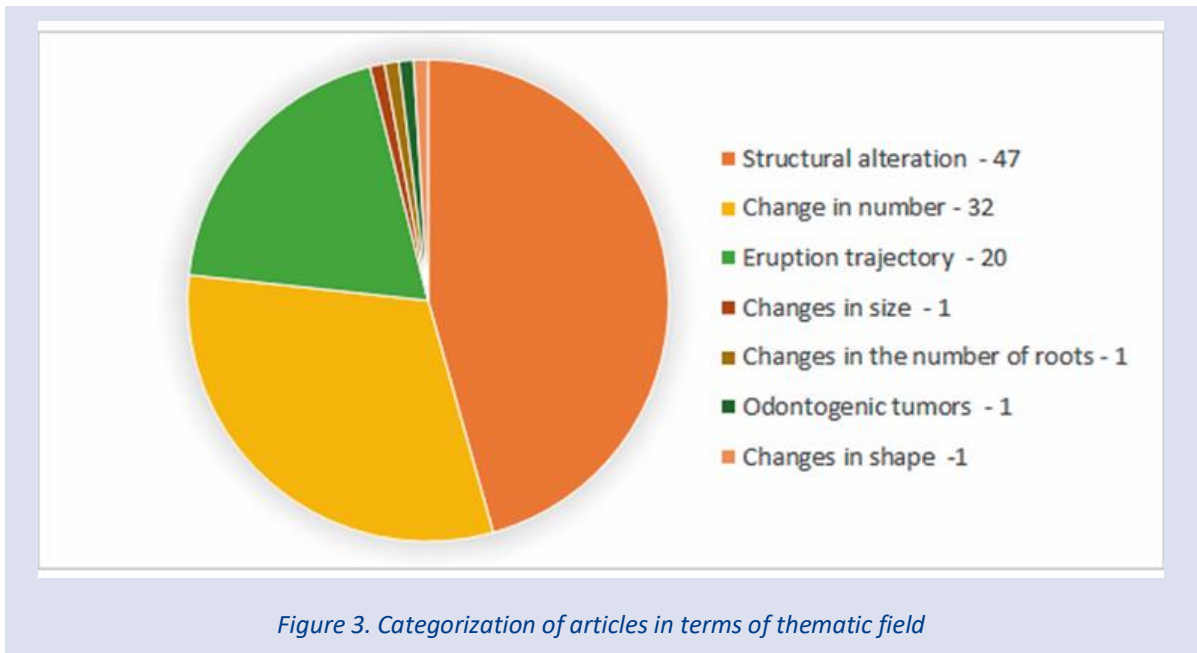
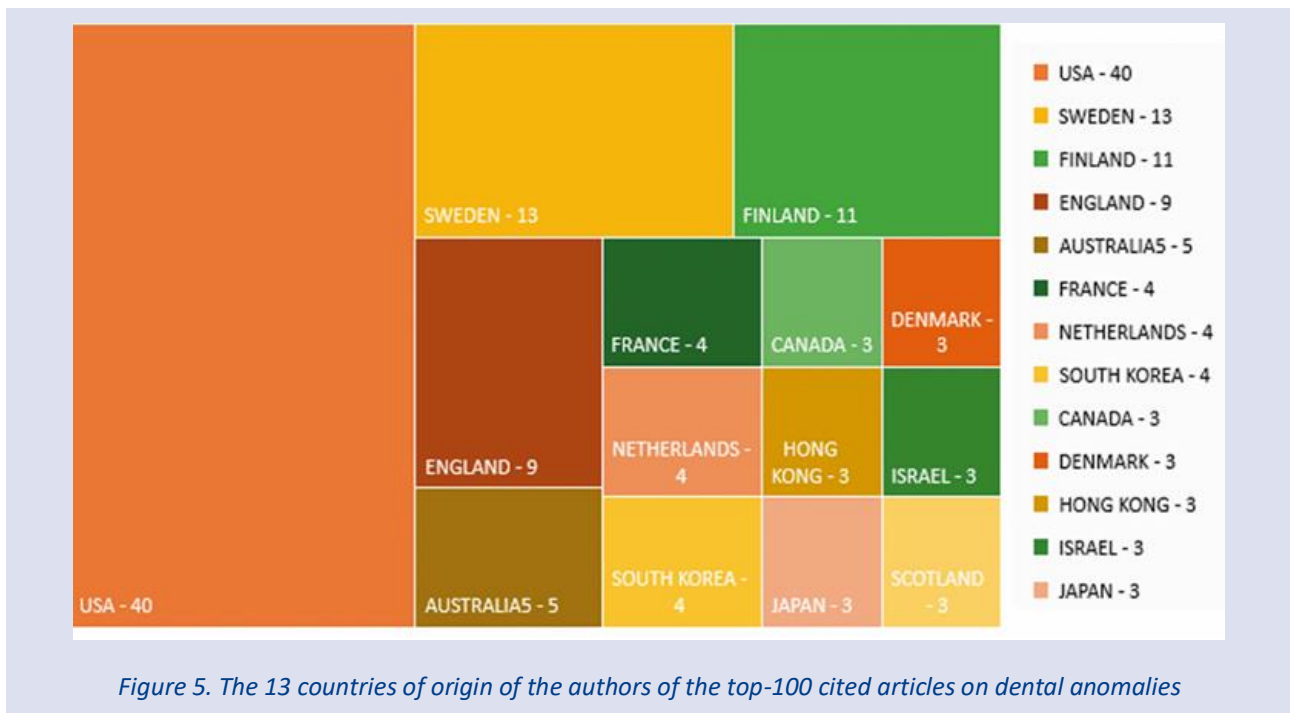


Figure 2. The 13 journals in which the top-100 cited articles were published







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