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Scientific production on Gerodontology as a dental specialty – Bibliometric literature review

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Abstract

Introduction: Gerodontology or 'geriatric dentistry' exists as a field since the 1970s. However, its presence in the undergraduate dental curriculum is limited and distorted even today. **Aim:** Therefore, this study aimed to characterize the scientific production on gerodontology. **Methodology:** Studies focusing on gerodontology were searched in PubMed NCBI in November 2022 and constituted a database that was analyzed in Bibliometrix 4.0 for R. Descriptive and network analysis were applied to data. The conceptual structure analysis involved keywords co-occurrence network and thematic map. **Results:** The scientific production in the field of Gerodontology has a 7.2% annual growth rate. Japan is the most productive country in the field, followed by Switzerland. Most of the ten more productive journals are related to conventional dental specialties, such as clinical dentistry, prosthetics and dental implant. The analysis of the conceptual structure presented the current tendency of observational studies addressing the oral health and the quality of life of old people and related factors. Testing of materials meant for oral rehabilitation was found with lower relevance and densely studied during the assessed time spam. **Conclusion:** The profile of publication and the themes addressed in gerodontology focus on the association of oral conditions and risk factors. Testing of materials and teaching of gerodontology are also explored. Still, important issues such as prejudice related to ageing, working market of gerodontology and the formation of qualified personnel in the field still require further study.

Keywords: Geriatric Dentistry. Aged. Dental Care for Aged. Review. Bibliometrics.

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Introduction

Gerodontology or geriatric dentistry is the dental specialty dedicated to the dental care of older adults. It involves the diagnosis, prevention and treatment of the problems accumulated during the lifetime[1]. In general, both 'gerodontology' and 'geriatric dentistry' represent the same specialty, though for some countries, they are slightly distinguished, the former involving the attention to people from retirement to death, and the latter representing a special attention to people with higher need for oral health care[2].

Populational ageing is a reality worldwide since the 20th century. It results mainly from an unprecedented socioeconomic improvement over the last 50 years[3], and reflects changes in health care, social control of diseases and improvements of medical technologies. According to the World Health Organization (WHO), it derives more of an improvement of survival at younger ages than at older ages[3]. The Brazilian Institute of Geography and Statistics (IBGE) has shown important changes in the age pyramid in the last decades, highlighting the increase of the population older than 60 years[4]. Also, the WHO estimates that the proportion of the Brazilian population older than 60 years, which was 10-19% in 2015, will increase to 25-29% in 2050[3].

This trend has walked aside important conceptual shifts of understanding of the main diseases in dentistry, namely caries and periodontal disease, in such way that more older people have retained their teeth[5] and have required a differentiated approach as to oral and dental care[6]. Based on this scenario, gerodontology has become key in maintaining the health of older people, since nutrition and frailty are impacted by the adequacy of oral health[7].

Knowledge and skills specific to the gerodontology field include the major geriatric medical problems, the diagnosis and management of oral manifestations of systemic diseases, geronto-psychiatry, psychosocial issues, barriers to access of older people to proper oral health care and communication skills[8]. In spite of the recognized need for geriatric dentistry, training of dental professionals to provide adequate oral health care has been questioned[9]. Also, claims that geriatric dentistry has been deemed of secondary importance in dental curriculum[8] or has been fragmented in technical components of dentistry, such as periodontics, prosthodontics or stomatology[10] have been found.

Teaching of gerodontology has been reported by countries as Austria, Germany and Switzerland[11], USA[12], Australia[8], European countries[13], Chile[14], India[15] and Brazil[10]. The variable institutional profiles have been shown to have some influence on how geriatric dentistry is taught[2,12]. The compulsory nature, the time dedicated, the didactical/practical profile of teaching, the content taught and the depth of the approach vary widely[2,8,12] and have been claimed insufficient to deliver adequate care to the older population[8].

Teaching of gerodontology has been discussed since the 1970s[8]. Still, the insufficient delivery of health care and the variable teaching profile in geriatric dentistry raise queries as to how this issue has been addressed in dental literature and to which extent. Based on that, this study aimed to characterize the scientific production in the field of gerodontology, focusing on the themes explored.

Methodology

Studies addressing the gerodontology theme were searched in PubMed NCBI on November 16th 2022, using the following search strategy: "Geriatric Dentistry"[MeSH] OR "Dentistry, Geriatric" OR "Gerodontology". Early publications were excluded and the file containing the references was downloaded.

The science mapping package Bibliometrix 4.0 for R[16] was used with the online user-friendly extension biblioshiny for bibliometric analysis. Characterization of the scenario considered the number of documents and sources, time span, annual production growth rate, mean document age, number of keywords, number of authors, number of authors of single-authored documents, number of single authored documents, mean number of co-authors per document. Most productive authors, countries and institutions were expressed by means of a three-field plot.

The conceptual structure was analyzed by the author´s keywords co-occurrence network and by thematic map. The parameters adopted in the co-occurrence network were automatic layout, Louvain clustering algorithm, normalization by association, node color by year, repulsion force of 0.1, number of nodes of 50, and minimum number of edges of two.

For theme analysis, a number of 250 words was adopted, with a minimal cluster frequency (per thousand documents) of five and the Louvain clustering algorithm. Theme maps were plotted based on Callon centrality, which expresses the importance of the topic, and Callon density, which represents a measure of the topic development. These parameters divide the map into four quadrants: the upper-right quadrant characterizes the motor themes, which present high centrality (important) and high density (developed) in the field; the lower-right quadrant represents basic and transversal themes, which present high centrality and low density; the lower-left quadrant represents emerging or declining themes, that translate into weakly developed or marginal themes (low centrality and low density); the upper-left quadrant characterizes highly developed and isolated themes, with limited importance to the field[17].

Results

A total of 3,840 documents from 528 sources were found considering a 1946:2022 timespan. The annual production growth rate was 7.2% and the mean document age was 15.9 years. The number of keywords identified was 7,053 and the total number of authors was 8,560. Authors of single-authored

documents totalized 587, and 864 documents were single-authored. The mean number of co-authors per document was 4.9. The annual scientific production is represented by Figure 1.

Figure 1. Annual scientific production on the theme

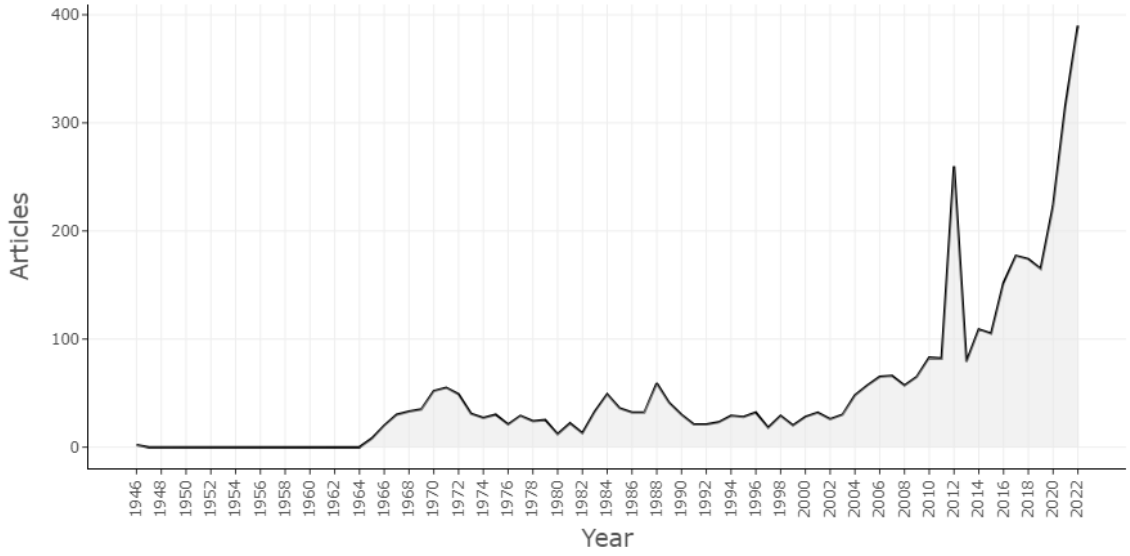


Figure 2 reveals Japan as the most productive country, associated with the twelve most productive authors. Also, eight out of the most productive affiliations were japanese. The second most productive country was Switzerland.

Figure 2. Three-field plot with the 12 most productive authors in the field: AU_CO - author´s country; AU - author; AU_UN - author's affiliation

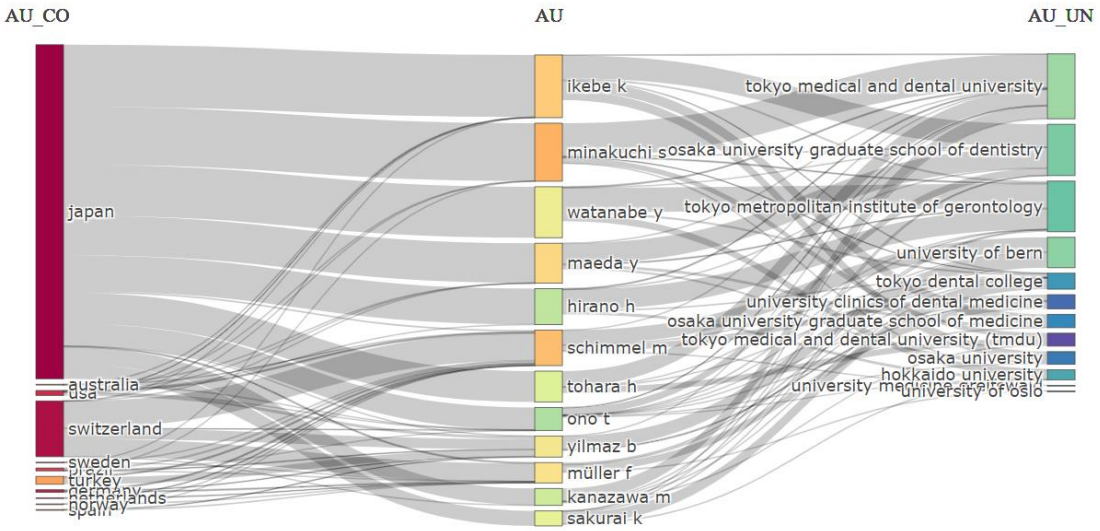


Figure 3 presents the fifteen most relevant journals. Gerodontology is, by far, the most relevant journal in the field, with more than 1,400 articles published. It is followed by journals focused on prosthetic dentistry, dental education, implantodontology and general geriatric health.

Figure 3. Fifteen most relevant journals

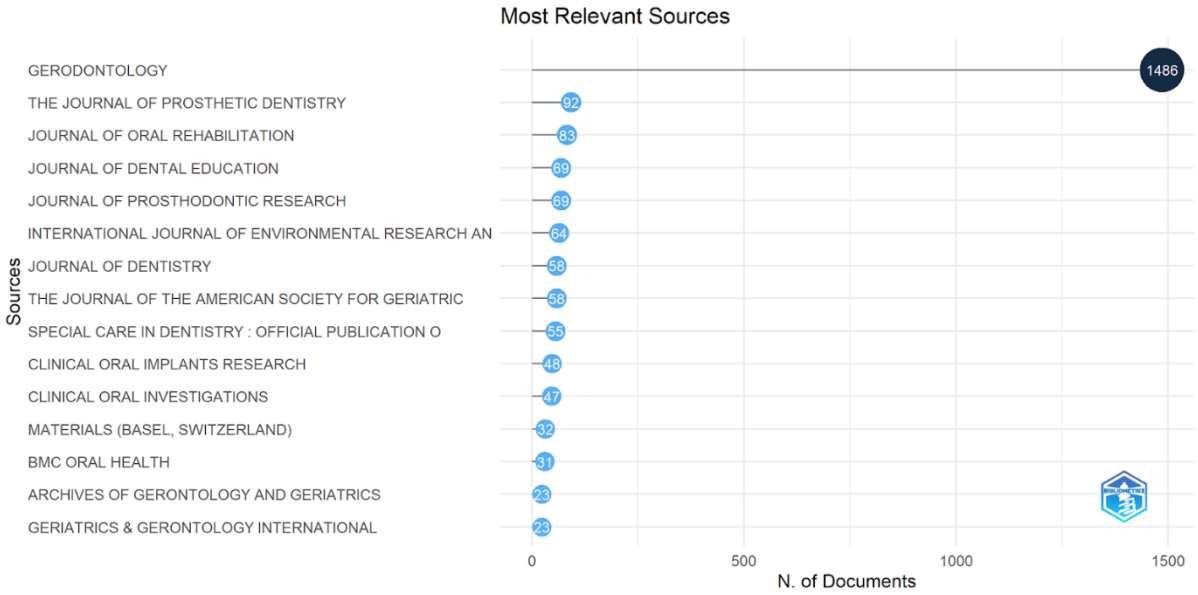


Figure 4 expresses the co-occurrence of the author´s keywords. Emphasis is placed on the co-occurrence of *aged*, *humans*, *male* and *female*, keywords that link two different clusters. Another cluster expressed the material testing focusing on prosthetic rehabilitation of older people.

Figure 4. Author´s keywords co-occurrence network. Lighter colors represent older keywords and darker colors, more recent keywords

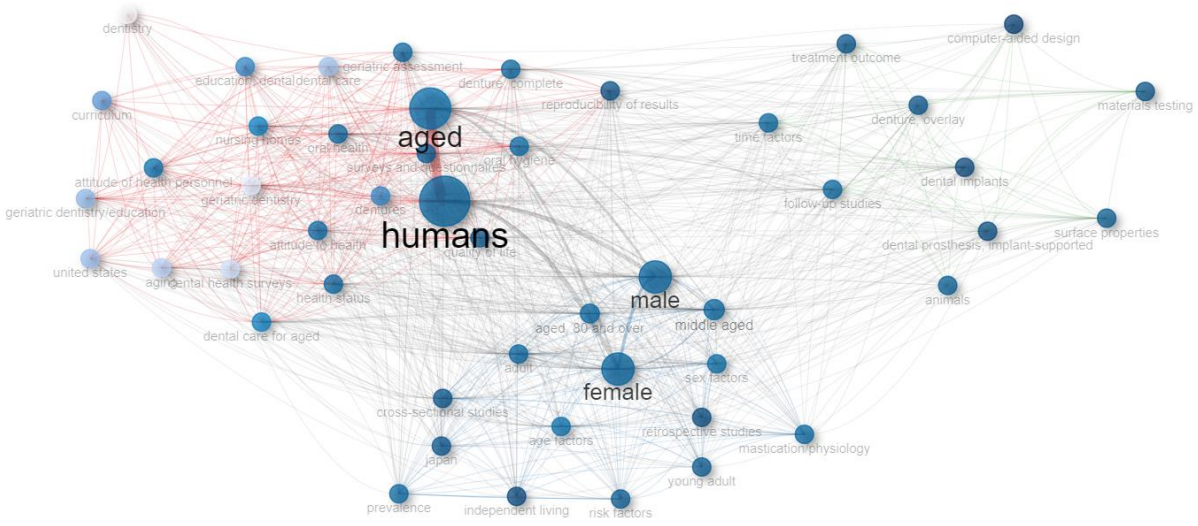
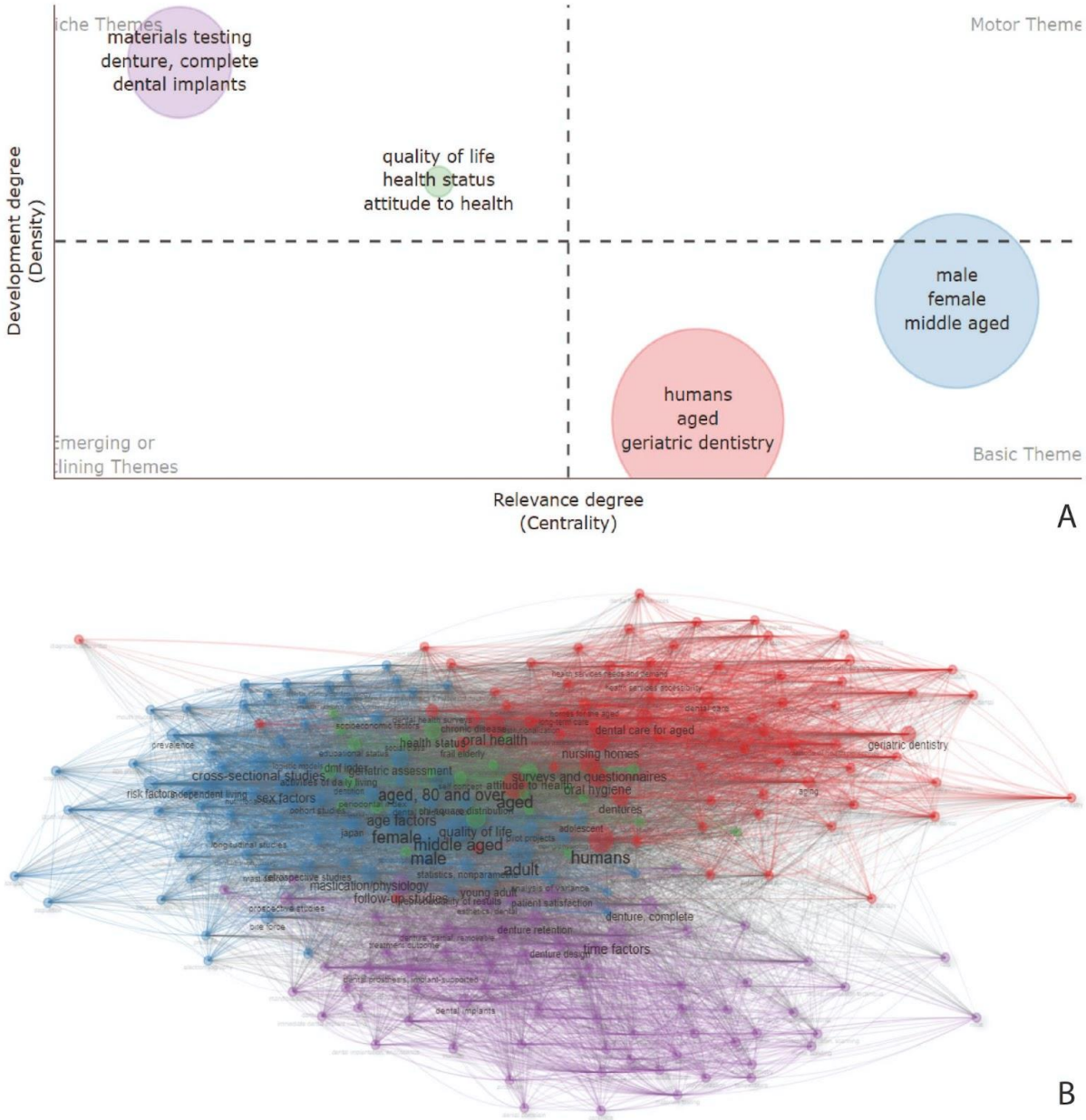


Figure 5 presents the thematic map (A) and the author´s keywords network (B). Four distinct clusters were depicted. The two main clusters were placed in the 'basic themes' quadrant, while the other two smaller clusters were located in the 'niche themes' quadrant. The cluster with the highest centrality (centrality: 1.89; density: 5.31) was composed mainly by the keywords *humans, aged, geriatric dentistry, oral health, surveys and questionnaires, geriatric dentistry/education, dental care for aged, nursing homes, oral hygiene* and *aging*. The second most central cluster (centrality: 1.21; density: 4.66) involved mainly the keywords *male, female, middle aged, aged, 80 and over, adult, cross-sectional studies, age factors, sex factors, risk factors* and *Japan*. Both represented the majority of the scientific production in the field. The most densely studied theme (centrality: 0.75; density: 6.56) was mainly composed by *materials testing, complete denture, dental implants, surface properties, follow-up studies, time factors, implant-supported dental prosthesis, treatment outcome, overlay denture* and *computer-aided design*. Also, the other cluster with high density (centrality: 0.80; density: 5.43) focused on *quality of life, health status, mastication/physiology, attitude to health, geriatric assessment, educational status, activities of daily living, chronic disease, nutritional status* and *dentition*. The network (Figure 5.B) shows a strong interaction of clusters 'human', 'male' and 'quality of life', while 'materials testing' relates mainly with the cluster 'male'.

Figure 5. Theme analysis. A - Thematic map with four distinct clusters; B - Network of the author´s keywords representative of the clusters revealed in A



Discussion

The study characterized the profile of the scientific production on gerodontology based on a PubMed database, revealing a growing trend of publication on the theme, with an important increase from 2013 (Figure 1) and a 7.2% annual growth rate. Japan was the most productive country (Figure 2) and Gerodontology was the journal that published the highest number of studies related to the field (Figure 3). The analysis of the conceptual structure revealed a trend of observational studies involving

the oral health of *aged humans*, *males* and *females*, and also the *materials testing* for the rehabilitation of the older population (Figure 4). This last theme was identified as the most densely studied issue, and its low centrality characterized it as a declining theme of study (Figure 5).

Health literature has been indexed in the PubMed database since 1946. The first records published in the gerodontology field are from the mid-1960s. According to Slack-Smith[8], the importance of gerodontology was emphasized in the 1970s. A growing trend of scientific production of 7.2% was found and coincides with an important growth in the last five years (Figure 1) and with a global increase of the old population[3]. Still, the awareness of the relevance of specialized oral health care for the old people is not the same in different countries. The most productive country in the field of gerodontology was Japan (Figure 2), with a long trajectory of population aging[18]. Tokyo and Osaka universities were the most productive, followed by the University of Bern, in Switzerland, a nordic country with a high life expectation as well.

Gerodontology was the most productive journal in the field (Figure 3). This is one of the few journals specifically dedicated to the oral health of older people. The other journals were from clinical dentistry, prosthetics, implant and special care. Such profile reinforces the understanding of gerodontology as limited to the conventional dental specialties that deal with the patient who lost most or all their teeth, inherited from a period when dentistry did not focus on the disease, but on its consequence[19]. Noteworthy, one journal dedicated to dental education was amongst the five most productive in the field (Figure 3).

The insertion of gerodontology in the undergraduate dental curriculum, the modes of teaching it and the time dedicated to the field have been studied since the 1970s[8,20]. Still, most studies sign the need for more time dedicated to gerodontology in undergraduate and postgraduate levels, aiding at forming qualified workforce[20,21]. Themes related to dental education and geriatric dentistry appeared in the oldest cluster of author´s keywords (Figure 4). This first cluster is mainly loaded by the keywords *aged* and *humans*, which represent the population under study along with *male* and *female* from the other main cluster. Other keywords highlighted in this cluster as recently adopted keywords are *cross-sectional studies*, *Japan*, *independent living*, *risk factors* and *retrospective studies*. Japan has long been recognized as a country involved with health care of the older population. When it comes to oral health, they proposed in 1989 the '8020 Movement', which aided at the Japanese population to keep a minimum of 20 teeth at the age of 80[22]. The other keywords reveal a current tendency of focusing on observational studies of association between disease outcomes and risk factors. As to the third cluster, it brings studies that test dental materials applied in oral rehabilitations of the older population, emphasizing as recently used keywords *computer-aided design* and *dental implants* (Figure 4).

Thematic maps and networks, such as Figure 5, may be based on author´s keywords, indexed keywords or terms extracted from titles and abstracts. They express research themes or topics, based on a keyword co-occurrence matrix[17,23]. Valuable information is translated by the position, color, size and link sizes in the network. Similarly, the thematic map identifies subgroups of strongly linked terms that represent the research interests of a specific moment[17]. The thematic map revealed two main clusters as the most relevant (Figure 5). Both, blue and red clusters appear in the 'basic themes' quadrant, revealing the most studied themes of the moment (Figure 5.A). The keywords that compose these clusters confirm the scenario of observational studies focused on the association between diseases and risk factors, mainly the blue cluster (Figure 5.B). The other two clusters show up in the 'niche themes' quadrant. The green one, lower in size, is mainly loaded by the keywords *quality of life*, *health status* and *attitude to health*, and mingles with the main clusters, probably meaning that interest in these themes arises associated with those identified in the two main clusters. The fourth cluster (purple) is not so closely associated to the others in the network (Figure 5.B) and represents the studies involving dental materials used for prosthetic rehabilitation of the older people, loaded mainly by the keywords *materials testing*, *denture*, *complete* and *dental implants*. Its position on the thematic map (Figure 5.A) ultimately reflects the study focus of geriatric dentistry so far, having been the most densely studied and developed theme related to the field. It is also the less relevant theme revealed in the thematic map, considering the time interval studied.

Some topics considered important in gerodontology were missing or were inexpressive. Prejudice, working market and public politics towards the formation of new professionals in the field were not detected in the analysis of the literature. Prejudice must be considered in a context in which aging is negative, in which the stimulus is for people to remain young and in which being a patient of a dental specialty focused on the elderly is an undesirable condition. As to the Brazilian working market, the Brazilian Federal Dental Council reveals the existence of 347 specialists in dental geriatrics[24] for more than 30 million aged people, according to the Brazilian Institute of Geography and Statistics[25]. Also, 66.5% of these specialists are located in the South and Southeast regions of the country, characterizing an irregular distribution of the specialty[21]. Noteworthy, not only the population ageing is globally recognized as expectations are that the future elders will be dentate elders, with lower prosthetic demand and more recurrent problems associated to the presence of teeth. Evidence has been produced on teaching of dental geriatrics in undergraduate and post-graduate levels globally[8,12,13]. Yet, a recent scoping review found inconsistent, limited reports of educational outcomes in geriatric dentistry to inform and propose content in dental schools[26]. The authors propose the construction of national and international guidelines to include sufficient training on geriatric dentistry in the undergraduate

curriculum. Demands also arise for qualified people to teach the issue[21], which could be solved with a public politics focusing on qualified dentists in the *lato* and *stricto sensu*.

As usual in bibliometric studies, limits in the scenario analyzed were imposed by some author´s choices. The study presents the scenario of scientific production in geriatric dentistry based on PubMed database. PubMed was chosen due to indexing most of the qualified biomedical and life science journals, including most journals indexed in other databases. Also, author´s keywords were elected among other possibilities to analyze the topics addressed by the included studies[23]. Finally, a specific research question was not applied as it would be in a systematized review, since the objective of the review was to track the literature produced on the subject, without restrictions.

Conclusion

Although the scientific production in the field of gerodontology is growing, important issues have not been sufficiently addressed. The major production derives from Japanese institutions. Gerodontology is the journal with the highest number of publications in the subject, followed by journals on prosthesis, implants, clinical dentistry and dental education.

The conceptual structure shows that cross-sectional and longitudinal observational studies focusing on the association of oral conditions and risk factors, involving or not quality of life have been the main focus. Parallel to that, studies addressing the test of materials for oral rehabilitation and the scenario of teaching of geriatric dentistry have been found. Issues related to the prejudice related to the ageing process, the working market of geriatric dentistry, the proposal of minimum undergraduate and post-graduate training and public policies towards the formation of a qualified working force in the field are still topics that demand attention.

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