

Evaluation of the scientific production of a *stricto sensu* postgraduate program in Dentistry as a management tool

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ABSTRACT

At a university, the production, dissemination and socialization of knowledge are consolidated through research and the publication of results. The aim of the present cross-sectional study was to identify the characteristics of dissertations, theses of the *Stricto Sensu* postgraduate program in dentistry of the Lutheran University of Brazil and subsequent publication in journals. For such, a descriptive, quantitative, bibliometric analysis was performed of the period from 1997 to 2016. The data were collected using a specific form addressing year of defense, specialty and study design. Searches were performed in the *Lattes* Platform and PubMed database to verify publications in journals of the articles stemming from the work defended. The publications were classified using the Qualis criteria and the data were analyzed using descriptive statistics. A total of 284 master's dissertations and 50 theses were defended in the period analyzed. The specialties with the largest number of defenses were endodontics, restorative dentistry and dental prosthetics. Among the total number of dissertations and theses analyzed, 62% generated scientific publications and 41% were published in journals with Qualis A1 and A2 ratings, especially those in the fields of endodontics, periodontics and pediatric dentistry. Regarding the methods, the largest portion used an *in vitro* experimental design (43.7%), followed by the cross-sectional design (23.4%) and studies involving animal models (11.1%). The self-evaluation of postgraduate programs with a focus on a critical stance with regards to what is being produced enables the reorientation of lines of research as well as the dynamics of knowledge generation and innovation.

1 INTRODUCTION

Stricto sensu graduate programs are responsible for research as well as the generation of knowledge and technologies. In Brazil, the

largest number of such programs are found in the health sciences field. Data from the evaluation of the *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior* (CAPES [Coordination for the

Advancement of Higher Education Personnel) of the period from 2013 to 2016 reveal an increase in the field of dentistry in all regions of Brazil, with a total of 77 academic programs and 24 professional programs. However, there remains a polarization of these programs, which are located more in the southern and southeastern regions of the country¹.

Scientific production in the field of dentistry in Brazil accounts for 85.2% of what is produced in Latin America and occupies the second position in the world ranking of intellectual production among articles indexed in the Scopus database¹. In the period from 2013 to 2016, 15,921 complete articles were published, 5,897 (37%) of which were published in journals with Qualis A1 or A2 ratings. This was an increase in comparison to the previous period, clearly demonstrating scientific maturity and consolidation in the field of dentistry in both the national and international scenarios¹.

The characteristics of the scientific production of a graduate program in a specific period can be identified using bibliometrics. In the scientific-academic context, this method emerges as a statistical aid that enables mapping and generating different indicators regarding the treatment and management of the knowledge of information². Moreover, it enables identifying the topics addressed most and innovations over time as well as potential paths for future development³.

The aim of the present study was to perform a bibliometric analysis to identify the characteristics of dissertations and theses of the *Stricto Sensu* Postgraduate Program in Dentistry of the Lutheran University of Brazil in the period from 1997 to 2016 and respective publications in journals up to 2018.

2 METHODS

The present cross-sectional study involved

a bibliometric survey with a quantitative approach preceded by a descriptive statistical analysis. The material consisted of dissertations and theses defended at the Postgraduate Program in Dentistry between 1997 and 2016 and respective publications in journals up to 2018.

The data were collected using a specific form addressing the year of the defense of the dissertation or thesis, student's name, advisor's name, title, specialty and study design. The data were obtained from the records of the Postgraduate Program in Dentistry. An experienced researcher performed the reading of the abstracts and data extraction. If insufficient information was found in the abstract, the full text was analyzed. A search was performed of the curriculum vitae of the students and advisors in the *Lattes* Platform (*Conselho Nacional de Desenvolvimento Científico e Tecnológico* [CNPq – National Council of Scientific and Technological Development]) as well as the PubMed database (authors' name and keywords) to determine whether the dissertations and theses resulted in publications in journals. The study designs were categorized as literature review (systematic or narrative), randomized clinical trial, cohort, case-control, cross-sectional, case series, *quasi*-experimental, experimental (animal model, *in situ* and *in vitro*), non-controlled intervention, documental analysis, bibliometric, qualitative approach and validation study^{4,5}. The categories of the specialties were endodontics, restorative dentistry, dental prosthetics, periodontics, oral-maxillofacial surgery and traumatology, pediatric dentistry, orthodontics, dental radiology and imaging, implantology and stomatology⁶. Publications in journals were classified based on the CAPES Qualis criteria: A1, A2, B1, B2, B3, B4, B5, C and without classification.⁷ The data were tabulated with the aid of STATA®, Version 12.0 (Stata Corp., College Station, TX, USA) and analyzed using

descriptive statistics.

3 RESULTS

In the period studied, 284 master's dissertations and 50 doctoral theses (total: 334) were defended at the Postgraduate Program in Dentistry of the Lutheran University of Brazil. Figure 1 illustrates the number of defenses per year. The largest number of dissertation defenses (50/18%) occurred in 2003. Thesis defenses began in 2008 and the largest number occurred in 2015 (12/24%). In the last four-year period (2013-2016), 44 dissertations and 32 theses (total: 76) were defended.

Figure 2 displays the number of publications in journals per year. The dissertations and theses resulted in 207 published articles, corresponding to 62% of the work defended (58% of the dissertations and 82% of the theses). The largest number of publications occurred in 2015 (18/9%). In the last four-year period (2013-2016), 52 articles were published in journals.

Figure 3 displays the distribution of the dissertations, theses and respective publications according to specialty. Endodontics was the field with the largest number of defenses (56/17% of the total), followed by restorative dentistry (51/15%) and dental prosthetics (48/14%).

Pediatric dentistry and dental radiology were the fields with the largest number of these defended (42% of the total). Endodontics was the field with the largest number of publications (55/26% of the total), followed by periodontics (42/20%) and pediatric dentistry (32/16%); 98%, 93% and 89% of the dissertations and theses in these fields, respectively, were published.

Figure 4 displays the most common methodological designs used. Among the 334 dissertations and theses defended, 146 (43.7%) had an *in vitro* experimental design, 78 (23.4%) had a cross-sectional design, 37 (11.1%) had an experimental design involving an animal model, 19 (5.7%) were randomized clinical trials and 14 (4.2%) had a *quasi*-experimental design. These types accounted for 88% of the designs of the dissertations and theses defended at the Postgraduate Program in Dentistry. Randomized clinical trials and systematic reviews accounted for less than 10% of the designs employed.

Figure 5 displays the distribution of the publications by specialty and Qualis/CAPES classification. Periodicals with Qualis A1 and A2 ratings accounted for 41% (n = 86) of the publications in the period analyzed. Endodontics, periodontics and pediatric dentistry accounted for 64% of all articles published in journals with Qualis A1 and A2 ratings.

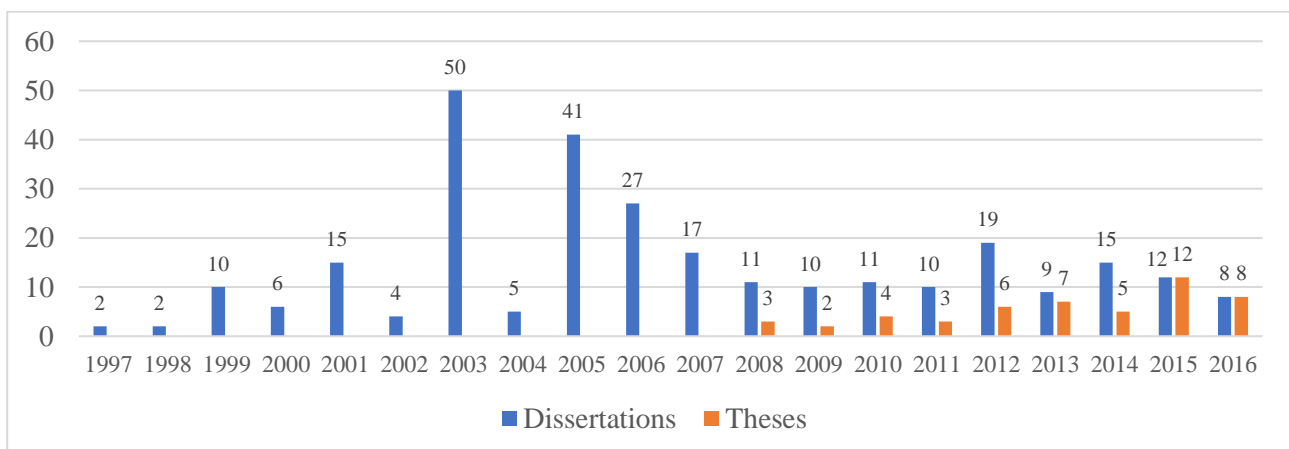


Figure 1. Distribution of dissertations and theses of Postgraduate Program in Dentistry, Lutheran University of Brazil (n = 334), according to year of defense

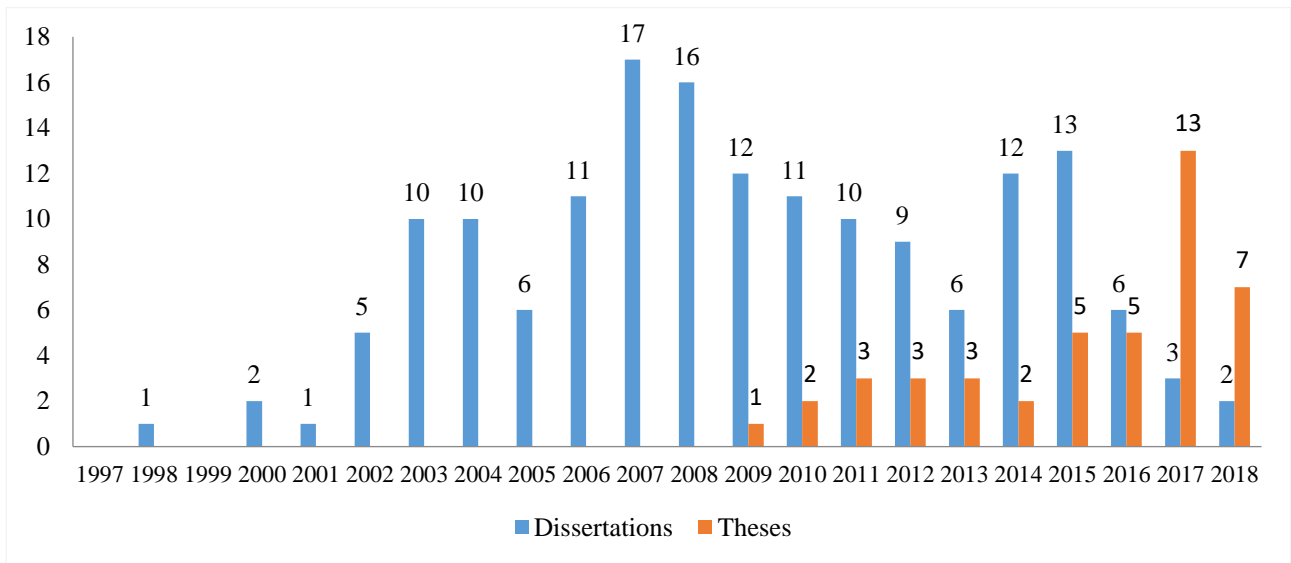


Figure 2. Distribution of publication in journals of articles resulting from dissertations and theses of Postgraduate Program in Dentistry, Lutheran University of Brazil (n = 207), according to year of publication.

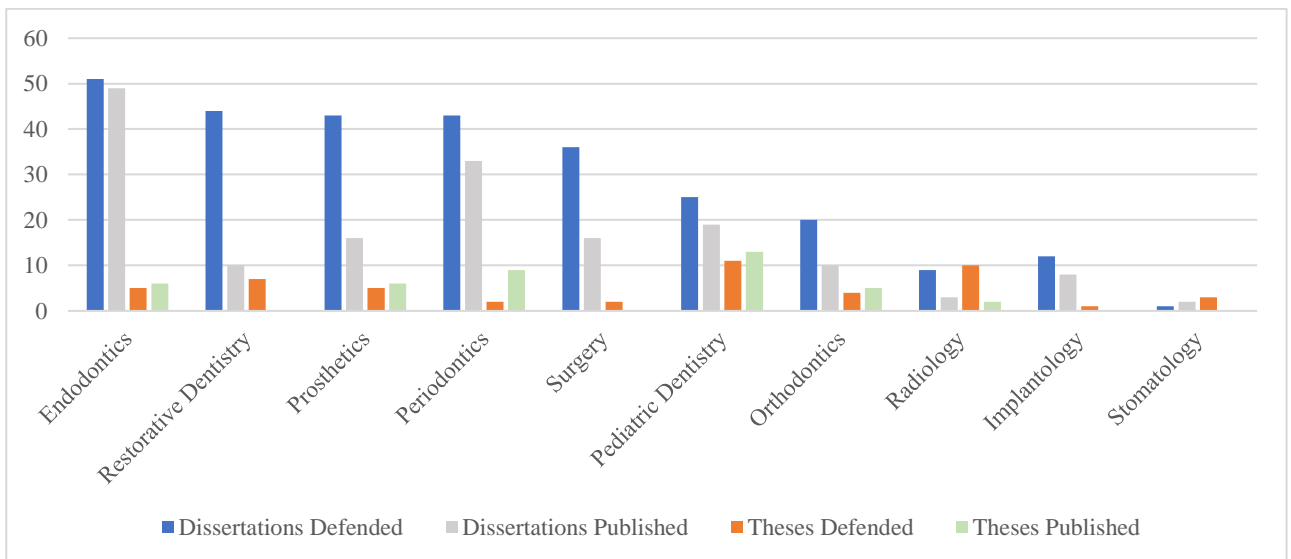


Figure 3. Distribution of dissertations (n = 284), theses (n = 50) of Postgraduate Program in Dentistry, Lutheran University of Brazil, and respective publications in journals (n = 207) according to specialty.

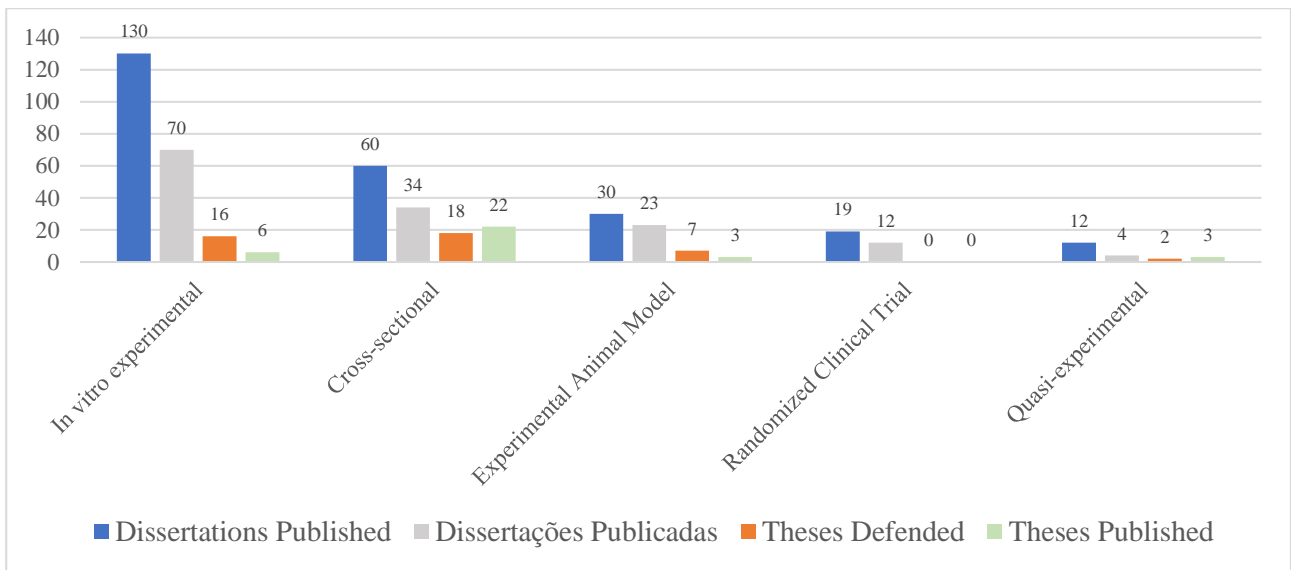


Figure 4. Distribution of dissertations (n = 284), theses (n = 50) of Postgraduate Program in Dentistry, Lutheran University of Brazil, and respective publications in journals (n = 207) according to most used designs.

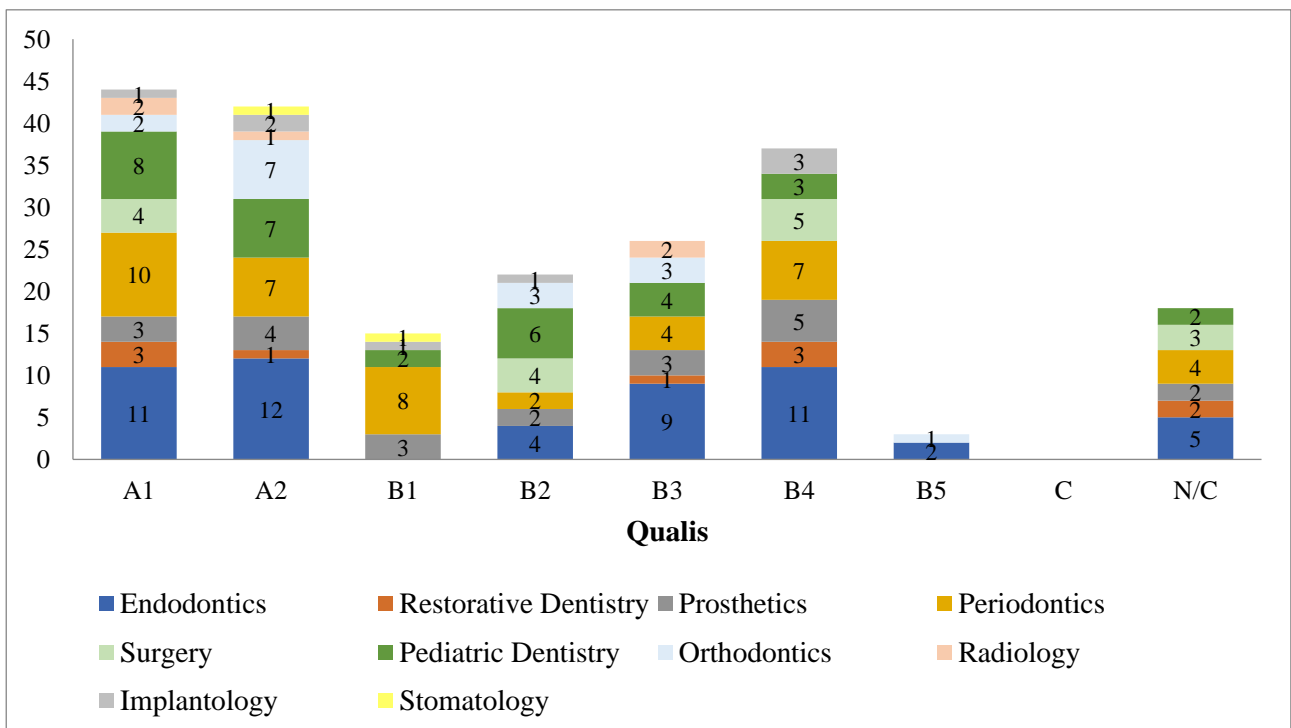


Figure 5. Distribution of publications of articles resulting from dissertations and theses of Postgraduate Program in Dentistry, Lutheran University of Brazil (n = 207), according to Qualis/CAPES classification and specialty.

4 DISCUSSION

Scientific and technological policy addresses a broad variety of issues, such as research programs, funding instruments, aspects of legislation and the dynamics of knowledge generation and innovation. The scientific conjuncture in Brazil reveals the maturation of critical thinking with regards to what is being produced, especially when one perceives the expansion of meta-scientific studies or the evaluation of modes of making and understanding science^{8,9}.

Evidence-based dentistry is defined as the conscious, explicit and prudent use of the best available evidence in care practices. Studies conducted at postgraduate programs achieve visibility through publication in scientific journals of merit and bibliometric analysis constitutes an important instrument for assessing and monitoring the dissemination of scientific knowledge².

In the present study, endodontics, restorative dentistry and dental prosthetics were the specialties that accounted for the largest number of dissertations and theses defended. These fields stand out for emphasizing professionalizing domains of dental knowledge¹⁰. Moreover, the market exerts an influence on the determination of the subject of studies, reproducing interest directed toward the medical-pharmaceutical-technological complex, demonstrated mainly by studies related to modernization and the use of dental materials¹¹.

The dissemination of new knowledge occurs primarily through journals specialized in publishing information resulting from different types of studies in the form of scientific articles.¹² The dissertations and theses analyzed in the present investigation made a significant contribution to scientific production. Indeed, 58% of the dissertations and 82% of the theses resulted in scientific publications. According to Martelli-Júnior *et al.* (2007)¹³, there has been an increase in Brazilian scientific production in the field of

dentistry, as demonstrated by the progressive acculturation of higher education teaching staff regarding the need to produce and publish scientific knowledge.

Dissertations and theses in the fields of endodontics, periodontics and pediatric dentistry accounted for 62% of all publications. Investments from fostering agencies (CAPES and CNPq) are directed to the formation and absorption of human resources and research projects that contribute to the increase in knowledge production and innovation for the country¹⁴. The non-publication of these studies interrupts the cycle that the fostering agency is financing, resulting in the waste of public resources. There is a possibility that understanding the characteristics of publications can direct choices for research topics, methodological designs and scientific-technological projections of postgraduate programs at the institution.

Policies adopted and strengthened by research agencies stimulate evaluation systems and provide parameters for evidencing scientific meritocracies⁸. Levels of evidence based on the design and characteristics of a study favor the analysis of the quality of the studies published¹⁵. In the work defended in the period analyzed, there was a predominance of designs with a low potential for generating evidence, such as *in vitro* experimental studies and experimental studies involving animal models. These findings are in agreement with the scientific profile of work presented to the Brazilian Society of Dental Research, in which laboratory studies predominate¹⁶. Randomized clinical trials and systematic reviews of the literature were less frequent in comparison to other designs. However, it is important to stress that improvements in health care depend on the results of studies conducted and focused on the investigation and synthetization of relevant evidence of quality^{17,18}. Besides having the potential to make contributions to the definition of

clinical conduct and evaluate the cure of diseases, patient survival and the reduction in sequelae, such studies increase the chances of publication in journals with a greater impact factor^{19,20}.

The QUALIS classification is a reference position that a journal possess in relation to its indexing in national and international databanks as well as the impact of this production before the scientific community²¹. In the present study, publications in journals with Qualis A1 and A2 ratings accounted for 41% of all publications in the period analyzed, with particular emphasis on the fields of endodontics, periodontics and pediatric dentistry.

The present bibliometric analysis of the scientific production of the Postgraduate Program in Dentistry of the Lutheran University of Brazil enables us to determine the state of the art of the program and future strategies for the different specialties. The most productive fields accounted for approximately two-thirds of all publications in journals and also accounted for approximately 70% of publications in journals with Qualis A1 and A2 ratings. These are important parameters that can contribute to the management of the program by assisting in the redefinition of research groups and lines of research and discussing study designs.

The indissociability between teaching and research at the undergraduate/postgraduate interface has guided the structure and organization of higher education institutions since the last century, although there has always been tension between historically disseminated discourse and academic reality. However, the university has advanced in this process, as evidenced by the tendency to value early scientific exposure through scientific initiation groups, the formation of research groups involving teaching staff, undergraduate students and postgraduate students, and the redefinition of lines of research responding to the needs of the pedagogical projects of the courses. This interaction among different levels has

enabled the exchange of knowledge, academic mobility and scientific development, contributing to the consolidation of a higher education of quality founded on the autonomy of the individual/citizen and connected to the demands of contemporary society.

Higher education institutions aware of their commitment and social responsibility should stand out distinctly in an integrating, collective manner, strengthening their potential for recognition and, above all, the achievement of indicators of excellence through national and international visibility. The prospects of the internationalization process of *stricto sensu* postgraduate programs are real and cast light on the importance and urgency in the context of collaborations in scientific production in the international scenario, thereby contributing to an increase in citations. Moreover, student and professor exchanges through collaborative projects favor joint publications and active participation in international scientific events²².

5 CONCLUSIONS

Based on the findings of the present bibliometric analysis, 334 dissertations and theses were defended at the Postgraduate Program in Dentistry of the Lutheran University of Brazil between 1997 and 2016 and 207 articles resulting from this production were published in journals, corresponding to a 62% publication rate. Endodontics, restorative dentistry and dental prosthetics were the fields that concentrated the largest number of defenses, whereas endodontics, periodontics and pediatric dentistry were the fields with the largest number of publications. *In vitro* experimental studies, experimental studies with animal models, randomized clinical trials and *quasi*-experimental studies accounted for 88% of the designs used in the work defended. Publication in journals with Qualis A1 and A2 ratings accounted for 41% of the articles produced in the

program and approximately 70% of the published articles were from the fields of endodontics, periodontics and pediatric dentistry.

RESUMO

Avaliação da produção científica de um programa de pós-graduação *stricto sensu* em Odontologia como ferramenta de gestão

Na universidade, o ambiente de produção, disseminação e socialização do conhecimento se consolida pela realização da pesquisa e publicação de seus resultados. O presente estudo transversal objetivou identificar o perfil das dissertações, teses e publicações em periódicos do Programa de Pós-graduação *Stricto Sensu* em Odontologia da Universidade Luterana do Brasil (PPGOdonto/ULBRA). Realizou-se uma análise bibliométrica quantitativa e descritiva no período de 1997-2016. Os dados, coletados por meio de formulário específico, consistiram em ano de defesa, especialidade e delineamento do estudo. Realizou-se uma busca na Plataforma *Lattes* e base de dados *PubMed* a fim de verificar as publicações em periódicos decorrentes dos trabalhos defendidos; e as publicações foram classificadas de acordo com os critérios Qualis. Os dados foram analisados por meio de estatística descritiva. Foram identificadas 284 dissertações de mestrado e 50 teses de doutorado defendidas no referido período. As áreas de Endodontia, Dentística e Prótese Dentária foram as especialidades com o maior número de defesas. Do total de dissertações e teses analisadas, 62% geraram publicações científicas, sendo 41% em periódicos de estratos Qualis A1 e A2, especialmente nas áreas de Endodontia, Periodontia e Odontopediatria. Em relação à metodologia utilizada nos estudos, 43,7% utilizaram delineamento experimental *in vitro*, seguido de estudos transversais (23,4%) e de estudos em modelo animal (11,1%). A autoavaliação dos programas de pós-graduação com foco na postura crítica em relação ao que está produzindo tem permitido a reorientação de linhas de pesquisa e da dinâmica de geração

de conhecimento e inovações.

Descritores: Pesquisa em Odontologia. Bibliometria. Publicação Periódica.

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