

## **The Brazilian scientific production on Pediatric Dentistry in an international context**

### **A produção científica brasileira em Odontopediatria em um contexto internacional**

### **La producción científica en Odontopediatría de Brasil en un contexto internacional**

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### **Abstract**

**Objective:** To analyze Brazilian scientific production in pediatric dentistry. **Methods:** Four journals were selected from the *Journal Citation Reports* 2011 database. All papers published between 2000 and 2011 were reviewed. The variables were the number of scientific articles published in each journal, institution of origin, authorship of articles and the involvement of both national and international partnerships. **Results:** From 2.428 articles retrieved, 315 were by Brazilian authors, with an average of 26.25 articles per year. **Conclusions:** The participation of Brazilian researchers increased from 2000 to 2011. The majority of the production occurred in public higher education institutions from the southeast of the country, and only a few studies were performed in partnership with researchers from different institutions, whether domestic or international. The development of collaborative networks between researchers from different institutions should be encouraged as a way to increase high impact scientific production in pediatric dentistry

**Keywords:** Bibliometrics. Pediatric Dentistry. Impact Factor. Health Sciences.

### **Resumo**

**Objetivo:** Analisar a produção científica brasileira em Odontopediatria. **Métodos:** Quatro periódicos de Odontopediatria foram selecionados a partir do banco de dados *Journal Citation Reports* 2011. Todos os artigos publicados entre 2000 e 2011 foram revisados.

As variáveis foram o número de artigos científicos publicados em cada revista, instituição de origem, autoria dos artigos e o envolvimento de parcerias nacionais e internacionais. Resultados: Dos 2.428 artigos analisados, 315 eram de autores brasileiros, com uma média de 26,25 artigos por ano. Conclusões: A participação de pesquisadores brasileiros aumentou de 2000 para 2011. A maioria dessa produção ocorre em instituições públicas de ensino superior do Sudeste do país, sendo poucos os estudos realizados em parceria com pesquisadores de diferentes instituições, nacionais ou internacionais. O desenvolvimento de redes de colaboração entre pesquisadores de diferentes instituições deve ser encorajado como forma de aumentar a produção científica de alto impacto em Odontopediatria.

**Palavras-chave:** Bibliometria. Odontopediatria. Fator de Impacto. Ciências da Saúde.

## Resumen

Objetivo: analizar la producción científica brasileña en Odontopediatria. Métodos: Cuatro revistas de odontología pediátrica fueron seleccionadas desde la base de datos *Journal Citations Reports* 2011. Todos los artículos publicados entre 2000 y 2011 fueron revisados. Las variables fueron el número de artículos científicos publicados en cada revista, institución de origen, la autoría de los artículos y la participación de las colaboraciones nacionales e internacionales. Resultados: De 2.428 artículos analizados, 315 eran de autores brasileños, con un promedio de 26,25 artículos por año. Conclusiones: La participación de investigadores brasileños aumentó desde 2000 hasta 2011. La mayor parte de esta producción tiene lugar en las instituciones públicas de educación superior en el sureste del país, con pocos estudios realizados en colaboración con investigadores de diferentes instituciones, nacionales o internacionales. Se debe fomentar el desarrollo de redes de colaboración entre investigadores de diferentes instituciones como una manera de aumentar la producción científica de alto impacto en Odontopediatria.

**Palabras clave:** Bibliometría. Odontopediatria. Factor de Impacto. Ciencias de la Salud.

## Introduction

Scientific production is a growing impulse factor in science, technology, innovation and competition. The formulating and implementing of a support network in the areas of Science, Technology and Innovation (STI) has led to a new phase of development in Brazil (LETA; GLANZEL; THUS, 2006; DE MEIS; ARRUDA; GUIMARÃES, 2007).

In July 2011, the Brazilian government launched the Science without Frontiers (CsF, using Portuguese initials) program, whose objective was to promote the consolidation, expansion and internationalization of the Brazilian science and technology community, and increase innovation and competitiveness through an international exchange and mobility scheme. More than 20,000 university and post-doctorate students were selected to receive scholarships to study in 30 different countries in Europe, Asia, Australia, Africa, Central America and North America in 2012 (BRASIL, 2014). As a result, the involvement of Brazilian universities in international collaborations is increasing through unprecedented international exposure, something that is already reflected in the international ranking of the universities (GARCIA; PARODI; OLIVA, 2012).

The increasing globalization of research, driven by an expansion of collaboration networks throughout the world, strengthens the research capacity of emerging countries and alters the global scientific balance. China, India, Singapore, Brazil and South Korea were recently included among nations currently performing high-level scientific research (SCIMAGO, 2007; ADAMS, 2012). During the last twenty years, Brazil has undergone a major transformation in terms of its global scientific importance (HELENE; RIBEIRO, 2011). The production of scientific articles in the country has increased at double the average global rate, and the proportion of Brazilian articles listed on the *Web of Science* index, which represented approximately 0.5% of global production twenty years ago, reached 2.7% in 2009 (REZENDE, 2011).

In the area of bibliographic production, Dentistry is currently the second fastest growing post-graduate program in Brazil, behind only Medicine. As a result of the growth of Brazilian scientific production,

and its international reputation, a significant percentage of Dentistry articles have been published in journals from outside Brazil, with a high international profile (SHINKAI, 2011).

In this context, the aim of the present study was to evaluate the Brazilian contribution to the main international pediatric dentistry journals.

## Material and Methods

A cross-sectional, descriptive study was performed. First, a survey of Pediatric Dentistry journals listed in *Journal Citation Reports* (JCR) (JCR, 2011) was undertaken. From this, four journals were identified, together with their respective impact factors: *Pediatric Dentistry* (1.022), *International Journal of Pediatric Dentistry* (1.088), *The Journal of Clinical Pediatric Dentistry* (0.444) and *European Journal of Pediatric Dentistry* (0.435). Once journals titles were identified, a search was performed using the Portal de Periódicos, of the Brazilian Federal Agency for Evaluation and Support of Higher Education (CAPES) to access the journals, and all the articles published in the period between 2000 and 2011 were reviewed (CAPES, 2014).

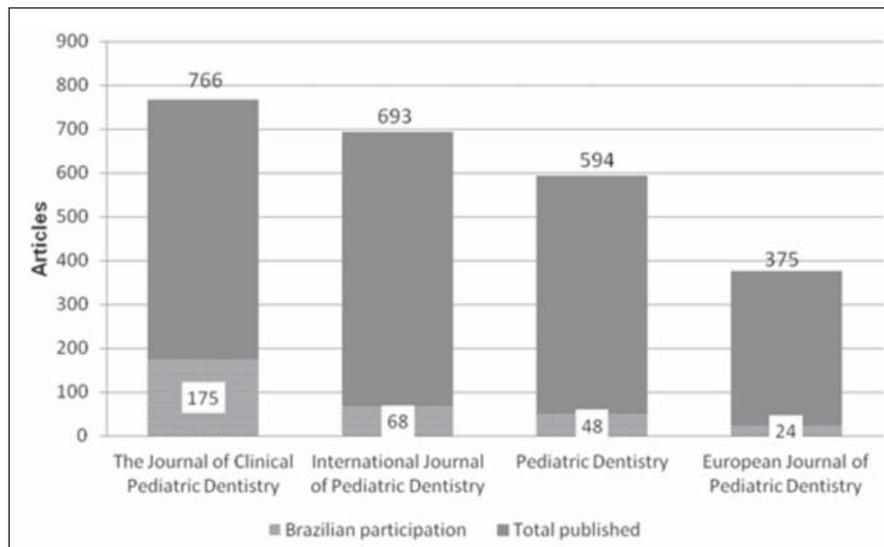
The main variables were: number of scientific articles published in each period, institutional and authorial origin of these articles, together with the involvement of national or international partnerships in the preparation of the articles.

A database was created and statistical analysis was performed using SPSS® 18.0 (*Statistical Package for Social Science for Windows, Inc., USA*) software. A descriptive analysis of the variables was performed, using frequencies, percentages, averages and standard deviation.

## Results

A total of 2,428 Pediatric Dentistry articles were published from 2000 to 2011 and listed in the JCR (JCR, 2011). The majority of these

articles appeared in *The Journal of Clinical Pediatric Dentistry* and *International Journal of Pediatric Dentistry*, which published 32% (766), and 29% (693) of the total articles, respectively (Figure1).

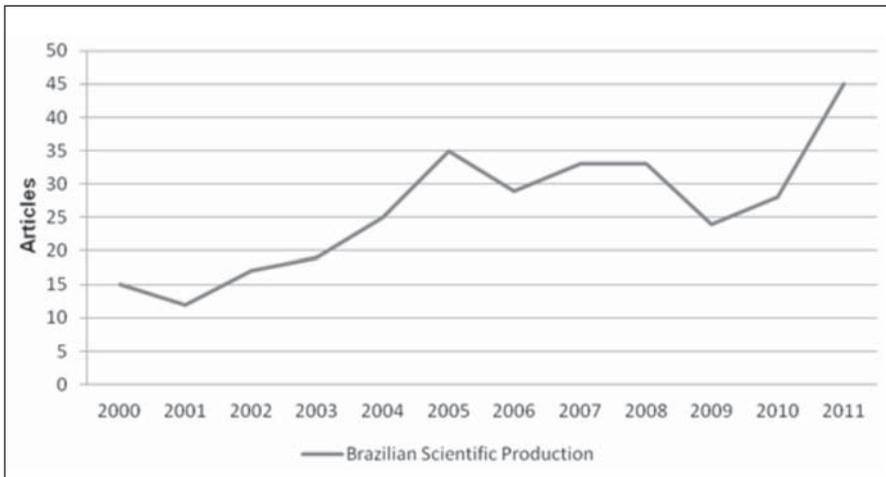


Source: Prepared by the authors.

**Figure 1. Total distribution of articles published and Brazilian participation in the field of pediatric dentistry during period from 2000 to 2011**

Of the total of scientific articles published (n=2,428), 315 (13%) featured Brazilian researchers, which were distributed heterogeneously in the journals *The Journal of Clinical Pediatric Dentistry*, *International Journal of Pediatric Dentistry*, *Pediatric Dentistry* e *European Journal of Pediatric Dentistry*, representing, respectively, 22.8% (175 articles), 9.8% (68 articles), 8.0% (48 articles) and 6.4% (24 articles) of total published articles (Figure 1).

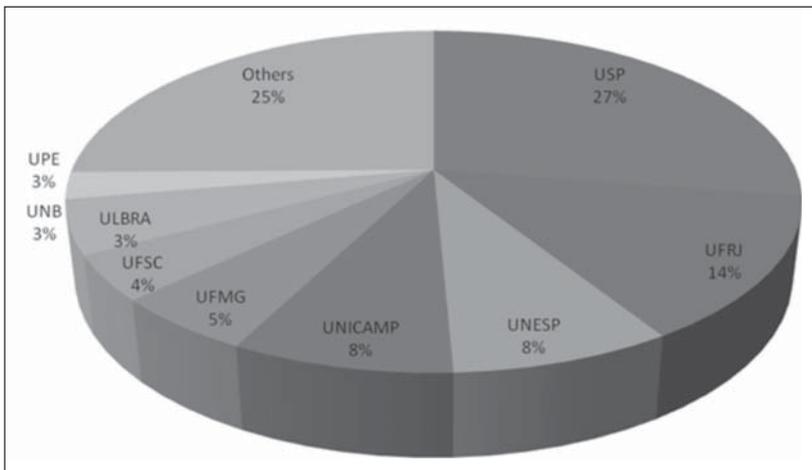
The average Brazilian scientific contribution to the international Pediatric Dentistry journals evaluated was 26.25 articles per year (SD=9.56). The absolute value of Brazilian articles increased from 15 in 2000 to 46 in 2011, an approximate growth of 300% during the period 2000-2011 (Figure 2).



Source: Prepared by the authors.

**Figure 2. Number of articles by Brazilian researchers published per year in international pediatric dentistry journals analyzed**

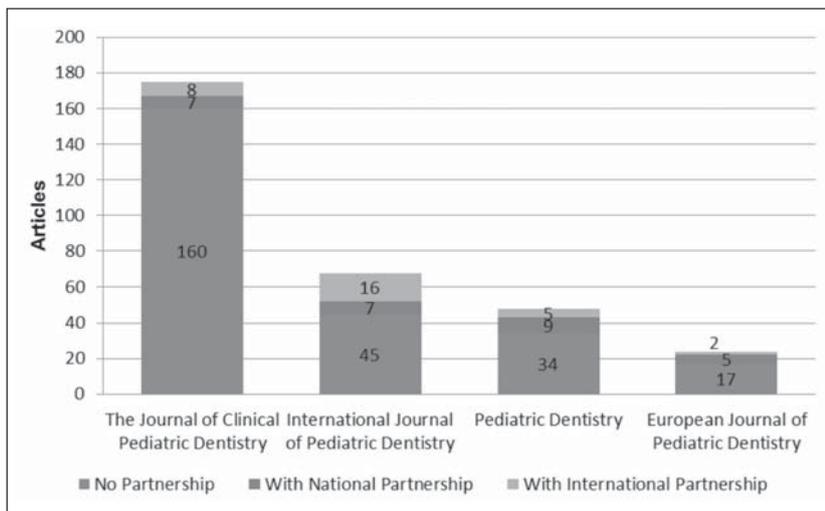
Five of the higher education institutions (HEI) involved in the 315 scientific articles by Brazilian researchers in the international journals evaluated were responsible for the publication of approximately 62% of the articles: University of São Paulo – USP (27%), Federal University of Rio de Janeiro – UFRJ (14%), State University of São Paulo – UNESP (8%), University of Campinas - UNICAMP (8%) and Federal University of Minas Gerais – UFMG (5%) (Figure 3). Universities in the southeast of Brazil participated in 236 (74.9%) of the 315 articles by Brazilian researchers.



Source: Prepared by the authors.

**Figure 3. Distribution of educational institution of origin of Brazilian scientific production published in international pediatric dentistry journals from 2000 to 2011**

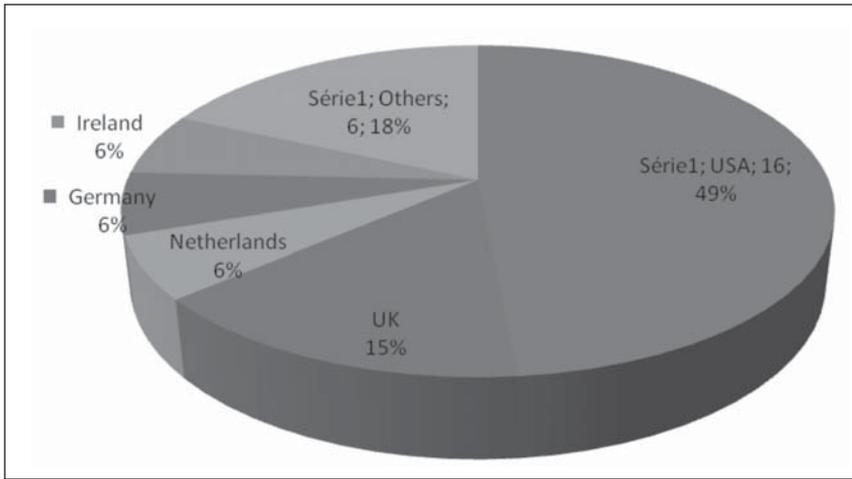
A total of 59 of the published articles by Brazilian researchers were developed in partnership with other institutions, of which 28 were located within Brazil and 31 were from other countries (Figure 4).



Source: Prepared by the authors.

**Figure 4. Distribution of articles published by Brazilian researchers in each journal, with details of involvement of domestic and international partnerships from 2000 to 2011**

Institutions in the south east of Brazil participated in 68% of the Brazilian-only partnerships and 96% of the international partnerships. In terms of articles by Brazilian researchers prepared in cooperation with researchers from institutions outside Brazil, twelve Brazilian HEI's participated in such an international partnership. Among these, USP participated in the preparation of nine such articles, and UFRJ and UFMG, in four articles each. Finally, it is worth noting that during the period 2000-2011, Brazilian researchers collaborated mostly with researchers from the USA and United Kingdom (UK), which represented 49% and 15% of total international collaborations, respectively (Figure 5).



Source: Prepared by the authors.

**Figure 5. Distribution of main countries participating in partnerships with Brazilian researchers during the period from 2000 to 2011**

## Discussion

In the current climate, scientific and technological knowledge can be seen as an essential ingredient of national health policy (GLOBAL FORUM FOR HEALTH RESEARCH, 2003). It is, therefore, necessary to consider the impact that research and technological development may have on health care policies (DA SILVA et al., 2007).

Scientific developments in Brazilian dentistry, as well as new technology and equipment, raise the global profile of Brazil (SÍGOLO; CASARIN, 2011). The growing global participation of Brazilian scientific publications in the area of dentistry is clearly visible (CORMACK; SILVA FILHO, 2000).

The present study confirmed this increase in the number of studies by Brazilian researchers appearing in the major international Pediatric Dentistry journals analyzed, with the percentage rising from 10.4% in 2000 to 18.8% in 2011. This fact is of considerable importance, as scientific production establishes scientific support for clinical practices, resulting in quality national pediatric dental care. It is,

therefore, essential that these studies be published, as they provide a scientific base for professional seeking to improve the quality of life of the general population (FORREST; MILLER, 2001).

An evaluation of the Brazilian contribution to the main international pediatric dentistry journals found that 90% of Brazilian scientific production during the period analyzed originated from public HEI. It was noted that scientific production remains entirely dependent on universities and post-graduate programs. Previous studies also observed these scientific production tendencies in Brazil (SCARIOT et al., 2011; LETA, 2012).

It was also found that five public HEI located in the southeast of Brazil accounted for approximately 2/3 of the scientific output of Brazilian researchers in the international journals evaluated, the majority of which were located in São Paulo based institutions. This geographic distribution is consistent with the predominance of São Paulo HEI, particularly the three state universities, USP, UNESP and UNICAMP, which offer seven highly rated graduate courses and post-graduate programs in Dentistry (CORMACK; SILVA FILHO, 2000) and which are major production centers of pediatric dentistry knowledge. This concentration of scientific dentistry production has also been identified by other authors (SCARIOT et al., 2011; POPOFF et al., 2012; POLETTI; FARACO JUNIOR, 2010).

The lack of studies developed in partnership with researchers from other institutions remains a challenge for Brazilian Pediatric Dentistry. Partnerships between institutions are important as they increase the visibility of the work, mutually benefiting the institutions involved (GLÄNZEL; SCHUBERT, 2005). The Brazilian Federal Agency For Evaluation and Support of Higher Education, which promotes the expansion and growth of post-graduate programs throughout Brazil, has been investing resources on courses in public and private Brazilian educational institutions to promote the growth of scientific cooperation and integration (SCARIOT et al., 2011).

Scientific research is becoming more and more interconnected, with increasing international collaboration. Currently, more than 35% of the articles published in international journals are developed through international cooperation, compared with 25% 15 years ago (ROYAL SOCIETY, 2011). In the present study it was found that only 9.8% of Brazilian scientific production published during the period analyzed was developed through international partnerships, suggesting that researchers in the field of Pediatric Dentistry should collaborate and publish more in tandem with researchers from overseas institutions, as these international partnerships are fundamental for increasing research standards in Brazil (CRUZ, 2012). A number of studies have reported that articles by authors from more than one country are cited twice as much as articles where the authors work in a single institution, or within the same country (GLÄNZEL; SCHUBERT, 2005; LUO et al., 2011).

Corroborating these findings, a recent article published in *Science* reiterated that Latin America should continue to strengthen the internationalization of its scientific community by exploiting its local excellence through intercontinental collaborations, positioning the continent to become a global leader in science, technology and innovation, where each nation can benefit from continued growth of qualified research (GARCIA; PARODI; OLIVA, 2012).

### **Final considerations**

The scientific production in Latin America is growing and Brazil accounts for more than half of the papers from the continent. However, monitoring the scientific results is essential for the creation, revision and improvement of research policies.

Pediatric dentistry in Brazil is endeavoring to globally project its production through publication in high profile journals, and gradually increased its participation during the period under analysis. Challenges exist, such as how to develop collaborative networks for the production of scientific studies between researchers from different institutions,

whether in Brazil or outside the country, increasing production in high profile international journals.

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