

Profile and scientific production of Brazilian researchers in oral pathology

Perfil e produção científica dos pesquisadores brasileiros em patologia oral

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Resumo

Objetivo: Este estudo objetivou avaliar o perfil e a produção científica de pesquisadores da Odontologia na área da patologia oral que receberam bolsas do Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) no Brasil. **Material e método:** O *curriculum vitae* padronizado (*Curriculum Lattes*) de 34 pesquisadores da área de patologia oral que receberam bolsas no triênio 2008-2010 foram analisados. As variáveis analisadas foram: sexo, filiação institucional, tempo de conclusão do doutorado, produção científica, e orientação de estudantes de iniciação científica e em programas de mestrado e doutorado. **Resultado:** Os Estados de São Paulo (18; 52,94%) e Minas Gerais (9; 26,47%) foram responsáveis por 79,41% dos pesquisadores. Quanto à filiação, três instituições foram responsáveis por aproximadamente 44,11% dos pesquisadores: UNICAMP (6 = 17,64%); USP (5 = 14,71%) e UFMG (4 = 11,76%). Os pesquisadores publicaram um total de 906 artigos com texto completo, com mediana de 26,64 artigos por pesquisador no triênio e 8,88 artigos por ano. Verificou-se que de 906 artigos publicados, 366 (40,39%) foram publicados em qualis A (Qualis-CAPES). Os pesquisadores da patologia oral orientaram 437 alunos de graduação e pós graduação. Destes, 138 (31,57%) eram alunos de iniciação científica, 169 (38,67%) eram alunos de mestrado e 130 (29,74%) eram alunos de doutorado. **Conclusão:** Uma importante produção científica dos pesquisadores da patologia oral no triênio 2008-2010 foi observada. Ao conhecer o perfil dos pesquisadores da Odontologia na área de patologia oral, estratégias mais eficazes para estimular a produção científica e a demanda de recursos para financiar projetos de pesquisa podem ser definidas.

Descritores: Indicadores de produção científica; pesquisadores; pesquisa em odontologia; relação pesquisador-produção científica; Brasil.

Abstract

Objective: This study evaluated the profile and scientific production of researchers in oral pathology who received grants in the area of Dentistry from the Brazilian National Research and Development Council. **Material and method:** The standardized online *curriculum vitae* (*Curriculum Lattes*) of 34 researchers in oral pathology who received grants in the years 2008-2010 were analyzed. The variables were: gender, affiliation, time from completion of the PhD program, scientific production, and supervision of undergraduate students and Master's and PhD programs. **Result:** The States of São Paulo (52.94%) and Minas Gerais (26.47%) were responsible for 79.41% of the researchers. Regarding affiliation, three institutions accounted for approximately 44.11% of the researchers: UNICAMP (17.64%); USP (14.70%); and UFMG (11.76%). The researchers published a total of 906 full-text articles, with a median of 26.64 articles per researcher in the triennium and 8.88 articles per year. It was found that of 906 articles published, 366 (40.39%) were published in strata A (qualis-CAPES). Oral pathology researchers supervised 437 scientific initiation and post-graduate students. Of these, 138 (31.57%) were scientific initiation, 169 (38.67%) were Master and 130 (29.74%) were PhD students. **Conclusion:** An important scientific production of oral pathology researchers in the 2008-2010 triennium was observed. By knowing the profile of researchers in oral pathology, more effective strategies for encouraging scientific production and demanding resources to finance research projects can be defined.

Descriptors: Scientific publication indicators; research personnel; dental research; relationship between researcher and scientific production; Brazil.

INTRODUCTION

In the last decade, scientific production in Brazil has consistently grown based on an increase in total funding for science and technology that soared from 21.4 billion reais (US\$ 11.4 billion) to 43.1 billion reais (or from 1.26% to 1.43% of Brazil's growing gross domestic product; GDP)¹. Between 1997 and 2007, the number of Brazilian papers in indexed, peer-reviewed journals more than doubled, reaching 19,000 papers per year. According to Thomson Reuters, Brazil now ranks 13th in publications, having surpassed the Netherlands, Israel, and Switzerland².

In Brazil, there are two main scientific funding agencies: CAPES (Coordination for the Improvement of Higher Education Personnel, a section of the Ministry of Education) and CNPq (National Council for the Development of Science and Technology, a part of the Ministry of Science and Technology), where CNPq is the funding agency that evaluates and funds researchers, and CAPES evaluates and supports postgraduate courses. The National Council for the Development of Science and Technology (CNPq) funds research based on a peer evaluation of the merits of the proponents and of their proposals, and it also provides a particular form of funding for researchers, called scientific productivity fellowships. These researchers are currently classified into two main categories for this fellowship: researcher category 1 and researcher category 2, by decreasing order of value and prestige. Category 1 is subdivided into four levels: 1A, 1B, 1C and 1D, where the first level is only attributed to researchers with notorious scientific productivity³.

Research in the field of dentistry has also increased both quantitatively and qualitatively⁴. Recently, Scariot et al.⁵ (2011) showed that a change in the profile of scientific research production may be occurring in Brazilian dentistry. With the exception of restorative dentistry/dental materials, research in fields focusing on technical and traditional professional dentistry disciplines has decreased, while increasing interest has been observed in basic fields and new specialties. Although inter-regional and inter-state discrepancies exist in Brazilian research production, this difference has tended to decrease over time. Moreover, public institutions are still responsible for the majority of dental research projects performed in Brazil.

A number of studies have examined the profile and the scientific production of researchers supported by CNPq in several areas of knowledge⁶⁻⁹. Recently, we compared CNPq researchers in Medicine according to their areas of specialty¹⁰. Due to the important role of oral pathology among the scientific productivity fellowships of CNPq¹¹, the present cross-sectional study aimed to describe the demographic characteristics and academic production of Brazilian researchers in oral pathology.

MATERIAL AND METHOD

1. Participants

At first, 201 researchers registered as having received a CNPq grant for scientific productivity were included in the database, according to the list provided by the CNPq in April 2011¹¹.

2. Research Area

Each researcher's specific area detailed in the Lattes platform was considered for this variable. When such information was lacking, the researcher's scientific production in the last three years was assessed, and the dominant area in the publications and/or supervised themes was attributed to the researcher. Following this methodology, 34 researchers in the area of oral pathology were identified.

3. Data Collection Protocol

This scientific investigation focused on 34 CNPq researchers who received scientific productivity grants in the area of oral pathology and who were active in the 2008-2010 triennium. As an inclusion criterion, the researcher had to have received a CNPq scientific productivity grant, which should still have been active. After identifying the researchers, their *curricula* Lattes were consulted and the researchers were classified according to the following CNPq categories: 1A, 1B, 1C, 1D, and 2. Based on the *curricula* Lattes publicly available in the Lattes platform (CNPq), a database was built including the following information: gender; distribution of the researchers according to the CNPq categories (1A, 1B, 1C, 1D, 2, and senior); geographical and institutional distribution; time from completion of the PhD program; PhD institution; scientific production (publication of scientific articles); and human resource formation (supervision in scientific initiation, Master's and PhD programs). The publications and supervisions during the 2008-2010 triennium were analyzed.

Regarding the variables of interest, the values referring to the last triennium described in the *curricula* Lattes were assessed. The CAPES website (<http://novo.periodicos.capes.gov.br/>)¹² was used to access the databases from which the scientific articles published by the researchers included in the CNPq list were retrieved. The researcher's scientific name, used in the investigation, was the one provided on the *curriculum* Lattes. In addition, possible variations in the names of the researchers were sought.

RESULT

Of a total of 202 researchers in Dentistry, 34 (16.83%) were identified in the area of oral pathology. The distribution of the 34 researchers according to gender and grant category is shown in Table 1. A predominance of male gender (70.58%) and category 2 grants (50.0%) was observed. All categories showed a prevalence of male gender, except category 1C. The distribution of the oral pathology researchers according to time from completion of the PhD program is shown in Table 2. Most of the researchers concluded their PhDs between 11-20 years ago. In category 1A, three researchers (75%) had obtained their PhDs more than 21 years ago, whereas researchers in category 2 concluded their PhDs less than 10 years ago.

Table 3 shows the distribution of the researchers according to the Brazilian regions, since 73.53% of the researchers are in southeastern region of Brazil. Table 4 shows the distribution of the 34 researchers according to the State of Federation and Institutions.

Table 1. Distribution of research grants in oral pathology according to gender and CNPq grant category (n = 34)

CNPq grant category	Male	Female	Total (%)
1A	3	1	4 (11.76)
1B	3	0	3 (8.82)
1C	2	2	4 (11.76)
1D	6	0	6 (17.64)
2	10	7	17 (50)
Total	24	10	34 (100)

Table 2. Distribution of the oral pathology researchers according to time from completion of the PhD program (n = 34)

Time (years)	1A	1B	1C	1D	2	Total (%)
<10	0	0	0	2	10	12 (35.29)
11-20	1	3	3	3	6	16 (47.05)
>21	3	0	1	1	1	6 (17.64)

Table 3. Distribution of the researchers with grants of the Stomatology area considering Brazilian regions

Regions of Brazil	Number of researchers	%
Midwest	2	5.88
Northeast	5	14.71
Southeast	25	73.53
South	2	5.88
Total	34	100

The following two Brazilian States accounted for approximately 79.41% of the researchers: São Paulo (18; 52.94%) and Minas Gerais (9; 26.47%). Regarding affiliation, the oral pathology researchers were distributed throughout 14 different institutions in the country. However, the following three institutions accounted for approximately 44.11% of the researchers: UNICAMP (6. 17.64%); USP (5. 14.70%); and UFMG (4. 11.76%).

Regarding the institution of the PhD program, 33 researchers obtained their PhD degree in Brazil and 1 in a foreign institution (United Kingdom). The following Brazilian institutions contained the greatest number of PhD researchers: USP, 21 researchers; and UNICAMP, 9. The other institutions at which PhD degrees were obtained were as follows: UFMG (2) and PUC-RS (1). Most researchers (52.94%) had a post-doctorate degree, 15 were obtained at foreign institutions and three in Brazil.

1. Publications/journals

Considering the 2008-2010 triennium analyzed, oral pathology researchers published 906 articles in journals, with a median of 26.64 articles per researcher during the triennium and 8.88 articles per year. Table 5 illustrates the distribution of articles among the oral pathology scientific productivity fellowships of CNPq, according to the qualis-CAPES¹². It was found that of

906 articles published in three years, 366 (40.39%) were published in strata A (qualis-CAPES). Only 4 articles were published in strata C and 15 were not published in qualis-CAPES¹².

2. Supervisions

Considering the 2008-2010 triennium analyzed, oral pathology researchers supervised 437 scientific initiation and post-graduate (Master's and PhD) students. Of these, 138 (31.57%) were scientific initiation, 169 (38.67%) were Master's and 130 (29.74%) were PhD students. Regarding the values adjusted for time, the researchers supervised, on average, 1.35 scientific initiation, 1.65 Master's, and 1.27 PhD grants per year.

DISCUSSION

According to the Advisory Committee for Dentistry of CNPq, the criteria for the selection and classification of scholarships include scientific production, the training of human resources, contributions to innovation, coordination and participation in research projects, participation in editorial activities, and scientific management³. Moreover, this Committee stated that, considering the limited supply of scholarships, the following criteria, among others, should be used as classification parameters for all categories/levels: (1) the number of publications and the impact factor of the journals; (2) the number of national and foreign patents; (3) the number of PhD theses, both tutored and approved; (4) the number of Master's theses, both tutored and approved; and (5) the leadership of research groups³.

The group of oral pathology researchers was formed by 24 men (70.58%) and 10 women (29.41%), revealing the predominance of the male gender. Furthermore, there were more men in all categories, except category 1C. Among the categories analyzed, there was a clear dominance of category 2 grants (50.0%). These results are consistent with a previous analysis of ours⁷. In 2006, among 132 researchers in Dentistry, 64.39% were men.

Table 4. Distribution of research grants in Oral Pathology according to the State of Federation and Institutions in the country (n = 34)

State	Institution	1A	1B	1C	1D	2	Total
São Paulo	UNICAMP	1	3	1	1	0	6
	USP	0	0	2	1	2	5
	S. L. MANDIC	2	0	0	0	1	3
	UNESP	0	0	0	1	1	2
	UNAERP	0	0	0	1	0	1
	Hospital AC CAMARGO	0	0	0	0	1	1
Minas Gerais	UFMG	1	0	0	1	2	4
	UNIMONTES	0	0	0	0	3	3
	UFU	0	0	0	1	1	2
Goias	UFG	0	0	0	0	2	2
Rio Grande do Norte	UFRN	0	0	1	0	1	2
Rio Grande do Sul	UFRGS	0	0	0	0	1	1
Pernambuco	UFPE	0	0	0	0	1	1
Bahia	UFBA	0	0	0	0	1	1
Total	14	4	3	4	6	17	34

Table 5. Distribution of articles among the oral pathology scientific productivity fellowships of CNPq according to the qualis-CAPES¹² (n = 34)

QUALIS	n	(%)
A1	104	11.47
A2	262	28.91
B1	127	14.01
B2	101	11.14
B3	152	16.77
B4	79	8.71
B5	62	6.84
C	4	0.44
None	15	1.65
Total	906	100

Furthermore, there were more men in all of the categories, and 42.4% of the researchers were in category 2⁷. These results are in agreement with those of Scarpelli et al.⁴ (2008), who analyzed the profile and distribution of researchers in Dentistry who received CNPq scientific productivity grants in 2008. Research in the field of Dentistry has seen an increase in the number of references to Brazilian dental studies indexed in international databases (ISI, Web of Science)¹³. Brazilian dental research is currently one of the most respected areas of dental research in the international scientific community¹⁴.

For decades, disparities have been seen in the development of macro-regions in Brazil, and these discrepancies have also manifested in the distribution of scientific, technological and

human resources, as well as in scientific production¹⁴. The technical-scientific base in Brazil is much more pronounced in the southeastern and southern regions, to which most government investments in science and technology are directed, besides the existence of Higher Education Institutions well established in this region and the presence of institutions that promote strong and historically aware of the importance of investment in research. Indicators have revealed that the southeast region houses a large portion of university centers with a level of excellence in many fields of knowledge, as well as the most well-equipped research institutes in the country¹⁵. In the present study, 82.35% of the oral pathology researchers were from the southeastern and southern regions. In another study, we showed that most (90%) nephrology researchers were concentrated in only three Brazilian states, two of which were located in the southeastern region¹⁶.

Another important characteristic of scientific activity relates to the formation of qualified human resources, with an emphasis on the supervision of undergraduate and post-graduate (Master's and PhD programs) levels. This study illustrated the important participation of researchers in the formation of new researchers. The medians of supervision, adjusted for the researchers' time from completion of post-graduate (Master's and PhD), were 1.65 for the Master's degree and 1.27 for the PhD degree per year. These values are very similar to those of the 411 researchers in Medicine, considering all specialties (0.50 and 0.30 for the Master's degree and PhD degree, respectively)¹⁰. They are also comparable to those of the most productive researchers in the area of public health, as compiled by Barata, Goldbaum⁶ (2003) in an analysis of CNPq researchers. The analysis of the scientific production of researchers in oral pathology showed a robust

level of production, with a large number of published scientific articles. From a quality perspective, it is also noteworthy that most of the articles by these researchers were published in journals indexed in prominent databases, such as ISI and Scopus. Considering the 2008-2010 triennium analyzed, the researchers published 906 articles in journals, with a median of 26.64 articles per researcher during the triennium and 8.88 articles per year. It was found that of the 906 articles published in the three years, 366 (40.39%) were published in strata A¹². This increase in scientific production was also observed in other areas such as public health, chemistry, and physical therapy⁶⁻⁹.

This finding possibly reflects several factors that have contributed to the positive incremental cycle of Brazilian scientific production, as recently pointed out by Petherick¹ (2010). We believe that this quantitative increase in the productivity of researchers in Dentistry is also correlated with the general increase in Brazilian scientific production and possibly reflects the various incentive mechanisms that have been implemented by Brazilian research agencies. Among these mechanisms is the improvement in the system for evaluating postgraduate programs. The Brazilian institution responsible for this evaluation is CAPES, which gives priority to the number and quality of articles when published ranking Brazilian postgraduate programs. Another mechanism is the diverse modality of scholarships, including the productivity in research scholarship that promotes competition among peers, encouraging both the training of new researchers and the publication of articles in journals of renown.

A challenging question in science is how to judiciously distribute resources among a large number of competing

researchers¹⁶. Thus, an important issue for our analysis was to compare the various scholarship categories regarding scientific productivity. Scholarship in research productivity was conceived by CNPq as a way to motivate researchers with a PhD degree and outstanding scientific output. After several changes in the levels, the scholarships are currently divided into two categories: category 1 (subdivided into levels 1A, 1B, 1C, and 1D) and category 2. Researchers are assigned to these categories/levels according to several criteria available on the CNPq website¹¹, and this assignment has practical implications regarding several aspects of an academic career.

CONCLUSION

The present scientific investigation addressed the profile and distribution of oral pathology researchers who received CNPq productivity grants and emphasized the important scientific production during the 2008-2010 triennium, with significant participation in the supervision of scientific initiation and post-graduate (Master's and PhD) students. It also showed that most researchers are concentrated in a few Brazilian States. By knowing the profile of researchers in oral pathology, more effective strategies for encouraging scientific production and demanding resources to finance research projects can be defined.

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REFERENCES

1. Petherick A. High hopes for Brazilian science. *Nature*. 2010;465(7299):674-5. PMID:20535173. <http://dx.doi.org/10.1038/465674a>
2. Regalado A. Science in Brazil. *Brazilian science: riding a gusher*. *Science*. 2010;330(6009):1306-12. PMID:21127226. <http://dx.doi.org/10.1126/science.330.6009.1306>
3. Arruda D, Bezerra F, Neris VA, Toro PR, Wainer J. Brazilian computer science research: gender and regional distributions. *Scientometrics*. 2009;79:651-65. <http://dx.doi.org/10.1007/s11192-007-1944-0>
4. Scarpelli AC, Sardenberg F, Goursand D, Paiva SM, Pordeus IA. Academic trajectories of dental researchers receiving CNPQ's productivity grants. *Braz Dent J*. 2008;19:252-6. PMID:18949300. <http://dx.doi.org/10.1590/S0103-64402008000300014>
5. Scariot R, Stadler AF, Assunção CM, Pintarelli TP, Ferreira FM. A map of Brazilian dental research in the last decade. *Braz Oral Res*. 2011;25:197-204. PMID:21670851. <http://dx.doi.org/10.1590/S1806-83242011000300002>
6. Barata RB, Goldbaum M. A profile of researchers in public health with productivity grants from the Brazilian National Research Council (CNPq). *Cad Saúde Pública*. 2003;19:1863-76. PMID:14999353. <http://dx.doi.org/10.1590/S0102-311X2003000600031>
7. Cavalcante RA, Barbosa DR, Bonan PR, Pires MBO, Martelli Júnior H. Perfil dos pesquisadores da área de odontologia no Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq). *Rev Bras Epidemiol*. 2008;11:106-13. <http://dx.doi.org/10.1590/S1415-790X2008000100010>
8. Mendes PHC, Martelli DRB, Souza WP, Filho SQ, Martelli Júnior H. Perfil dos pesquisadores bolsistas de produtividade científica na medicina no CNPq, Brasil. *Rev Bras Educ Med*. 2010;34:535-41. <http://dx.doi.org/10.1590/S0100-55022010000400008>
9. Santos SMC, Lima LS, Martelli DRB, Martelli Júnior H. Perfil dos pesquisadores da Saúde Coletiva no Conselho Nacional de Desenvolvimento Científico e Tecnológico. *Physis*. 2009;19:761-75. <http://dx.doi.org/10.1590/S0103-73312009000300012>
10. Martelli Júnior H, Martelli DRB, Quirino IG, Oliveira MC, Lima LS, Oliveira EA. CNPq researchers in medicine: a comparative study of research areas. *Rev Assoc Med Bras*. 2010;56:478-83. PMID:20835648.
11. CNPq. Ministério de Ciência e Tecnologia. (2010). Critérios de Julgamento – CA-OD [citado em 2011 Maio 4]. Disponível em: <http://www.cnpq.br/bolsas/index.htm>

12. Capes. Ministério da Educação. Qualis (2011). Disponível em: <http://www.capes.gov.br/avaliacao/qualis>.
13. Cormack E, Silva Filho CF. A pesquisa científica odontológica no Brasil. Rev Assoc Paul Cir Dent. 2000;54:242-7.
14. Dias AA, Narvai PC, Rêgo DM. Scientific output trends in oral health in Brazil. Rev Panam Salud Publica. 2008;24(1):54-60. PMID:18764995. <http://dx.doi.org/10.1590/S1020-49892008000700007>
15. Barros FAF. The regional unbalances of the technical-scientific production. São Paulo Perspec. 2000;14(2):12-9.
16. Oliveira EA, Pécoits-Filho R, Quirino I, Oliveira MC, Martelli DRB, Lima LS, et al. Profile and scientific production of CNPq researchers in Nephrology and Urology. J Bras Nefrol. 2011;33(1):17-22.

CONFLICTS OF INTERESTS

The authors declare no conflicts of interest.

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