Profile and scientific production of CNPq researchers in Nephrology and Urology

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ABSTRACT

Objective: This study aimed at evaluating the profile and scientific production of researchers in Nephrology and Urology, receiving grants in the area of Clinical Medicine from the Brazilian National Research Council. **Methods:** The standardized online curriculum vitae (*Curriculum Lattes*) of 39 researchers in Medicine receiving grants in the 2006-2008 triennium were included in the analysis. The variables analyzed were: gender, affiliation, time from completion of the PhD program, scientific production, and supervision of undergraduate students, and master's and PhD programs. **Results:** Males (74.4%) and category 2 grants (56.4%) predominated. The following three Brazilian states are responsible for 90% of the researchers: São Paulo (28; 71.8%); Rio Grande do Sul (4; 10.3%); and Minas Gerais (3; 7.7%). Four institutions are responsible for 70% of the researchers: UNIFESP (14; 36%); USP (8; 20.5%); UFMG (3, 7.7%); and UNICAMP (3; 7.7%). Considering the academic career, the assessed researchers published 3,195 articles in medical journals, with a median of 75 articles per researcher (QI = 52-100). The researchers received a total of 25,923 citations at the database *Web of Science®*, with a median of 452 citations per researcher (QI = 161-927). The average number of citations per article was 13.8 citations (SD = 11.6). **Conclusions:** The Southeastern region of Brazil concentrates researchers in Nephrology and Urology. Our study has shown an increase in the scientific production of most researchers in the last five years. By knowing the profile of researchers in Nephrology and Urology, more effective strategies to encourage the scientific production and the demand for resources to finance research projects can be defined.

Keywords: scientific production indicators, Nephrology, Health Sciences.

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INTRODUCTION

The activity of producing quantitative indicators in science, technology, and innovation has grown strong in Brazil in the past decade with the recognition, by the federal and state governments and the national scientific community, of the need for providing instruments for the definition of guidelines, investment and resource allocation, formulation of programs, and assessment of activities related to scientific and technological development in Brazil.[1] In a recent article published in the journal Nature, the director of the National Science Foundation, Julia Lane, made a plea for the development of metric systems to permanently assess researchers and universities.[2] That author made a complimentary remark about the Lattes Platform (http://lattes.cnpq.br/), emphasizing that the Brazilian experience with that instrument is a powerful example of good practice, providing high quality information about approximately 1.6 million researchers and 4,000 institutions inside and outside Brazil.[2]

In recent years, several studies have assessed the profile and scientific production of researchers of the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq - National Council for Scientific and Technological Development) in several areas of knowledge.[3-7] Recently, we have assessed the profile of researchers receiving a scientific productivity grant in the area of Medicine, and compared the several research areas.[5,8] However, in the areas of Nephrology and Urology, information is scarce, not up-to-date, and limited to Latin America as a whole.[9] The present cross-sectional study aimed at describing the demographic characteristics

and academic production of researchers in Medicine receiving CNPq grants, whose major research area is either Nephrology or Urology.

Methods

Design of the study. Cross-sectional study

Participants. At first, 411 researchers registered as receiving a CNPq grant of scientific productivity were included in the database, according to the list provided by the CNPq in February 2009. Researchers, whose grants were suspended, such as those attending post-doctorate courses in foreign countries, were excluded from the present study. One deceased and three senior researchers were also excluded at the beginning of data collection.

Research area. The researcher's specific area informed in the Lattes platform was considered for this variable. When such information lacked, the researcher's scientific production in the last five years was assessed, and the area predominating in the publications and/or supervised themes was attributed to the researcher. In specific cases of well-defined subareas, such as Pediatric Nephrology, the researcher was included in the area of Nephrology and the research subarea was considered separately. Following that methodology, 39 researchers in the areas of Nephrology and Urology were identified.

Protocol of data collection. This scientific investigation used the CNPq relation of researchers receiving scientific productivity grants in the area of Medicine, which were active in the 2006-2008 triennium. As an inclusion criterion, the researcher should have received a CNPq scientific productivity grant, which should be 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 with the following information: 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; scientific production (scientific article publication); and human resource formation (supervision in scientific initiation, master's and PhD programs). For analyzing the scientific production, all publications and supervisions during the researcher's career were considered. The publications and supervisions of the 2004-2008 quinquennium were also analyzed.

Variables of interest. The following variables were assessed: gender; researcher's institution; time from completion of the PhD program; PhD institution; grant category; supervision of scientific initiation programs, master's thesis and PhD dissertation; and journal publications. In regard to supervisions and publications, the absolute values of all scientific career and the values referring to the last quinquennium described in the curriculum Lattes were assessed. In addition, the supervisions and publications adjusted for the time from completion of the researcher's PhD program were computed. The databases Web of Science® Thomson - ISI (Institute for Scientific Information - http://apps.isiknowledge.com/) and Scopus® (http://www.scopus.com/home.url) were also assessed. The CAPES website (http://novo.periodicos.capes.gov.br/) was used to access those databases, from where the scientific articles published by the researchers included in the CNPq list were retrieved. The researcher's scientific name used for the investigation was the one provided in the curriculum Lattes. In addition, possible variations of the names of the researchers were sought for.

Statistical analysis. After database construction by use of the statistical program SPSS, version 18.0 for Windows, descriptive and univariate statistical analysis of the data obtained was performed. Continuous data were reported as median and interquartile intervals (QI) between the 25th and 75th percentiles. Mann-Whitney non-parametric test was used for comparing those variables. The Chi-square test was used for comparing dichotomous or nominal variables.

Result

Of a total of 411 researchers in Medicine, 39 (9.5%) were identified in the area of Nephrology-Urology, of whom only three (0.73%) were identified as researchers in Urology. Of the 30 research areas identified, Nephrology-Urology accounted for the greatest percentage, followed by Neurosciences and Endocrinology (Figure 1). The distribution of the 39 researchers according to gender and grant category is shown in Table 1. Predominance of the male gender (74.4%) and of category 2 grants (56.4%) was observed. No significant difference in the distribution of the categories between genders (p = 0.52) was observed. The following three Brazilian states accounted for approximately 90% of the researchers: São Paulo (28; 71.8%); Rio Grande do Sul (4; 10.3%); and Minas Gerais (3; 7.7%). The following

Figure 1. Distribution in areas per researchers.

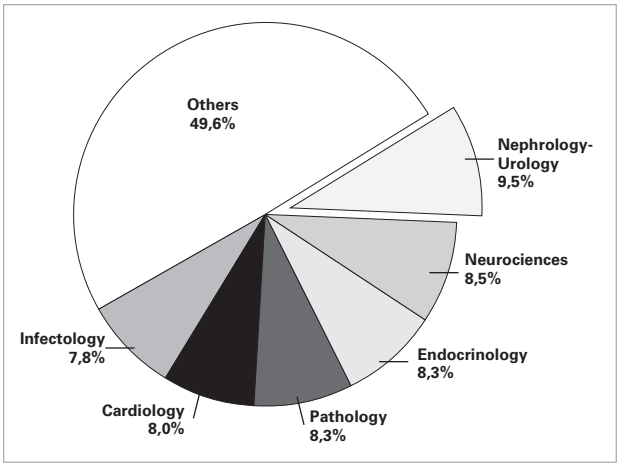


Table 1 Distribution of research grants in Nephrology-Urology according to gender and CNPq grant category (N = 39)

CNPq grant category	Male	Female	Total
1A	2 (6.9)*	2 (20.0)	4 (10.3)
1B	2 (6.9)	1 (10.0)	3 (7.70)
1C	4 (13.8)	1 (10.0)	5 (5.80)
1D	5 (17.2)	0 (00.0)	5 (5.80)
2	16 (55.2)	6 (60.0)	22 (56.4)
Total	29 (100)	10 (100)	39 (100)

* # researchers(%).

Brazilian states received one research grant: Paraná; Distrito Federal; Bahia; and Ceará. Regarding affiliation, the Nephrology-Urology researchers were distributed in 13 different institutions in the country. However, the following four institutions accounted for approximately 70% of the researchers: UNIFESP (14, 36%); USP (8, 20.5%); UFMG (3, 7.7%); and UNICAMP (3, 7.7%). The other institutions were as follows: UFRGS; UNESP; FAMERP; PUC-PR; PUC-RS; UCS; UFBA; and UFC. The median of the time from completion of the PhD program of the 39 researchers was 15 years (QI = 10-20 years). Regarding the institution of the PhD program, 34 researchers obtained their PhD degree in Brazil and five at foreign institutions (two in the United Kingdom, and the others in the United States, Netherlands, and Germany). The following Brazilian institutions concentrated the greatest number of PhD researchers: UNIFESP, 17 researchers; and USP, 11. The other institutions at which PhD degrees were obtained were as follows: UFMG (3); UNICAMP (1); UNESP (1); and UFRGS (1). Most researchers (77%) have post-doctorate degree, 26 obtained at foreign institutions and four in Brazil. Among the foreign institutions, those in the United States (21) predominated, followed by France (2), Sweden, Germany, and United Kingdom.

Supervisions

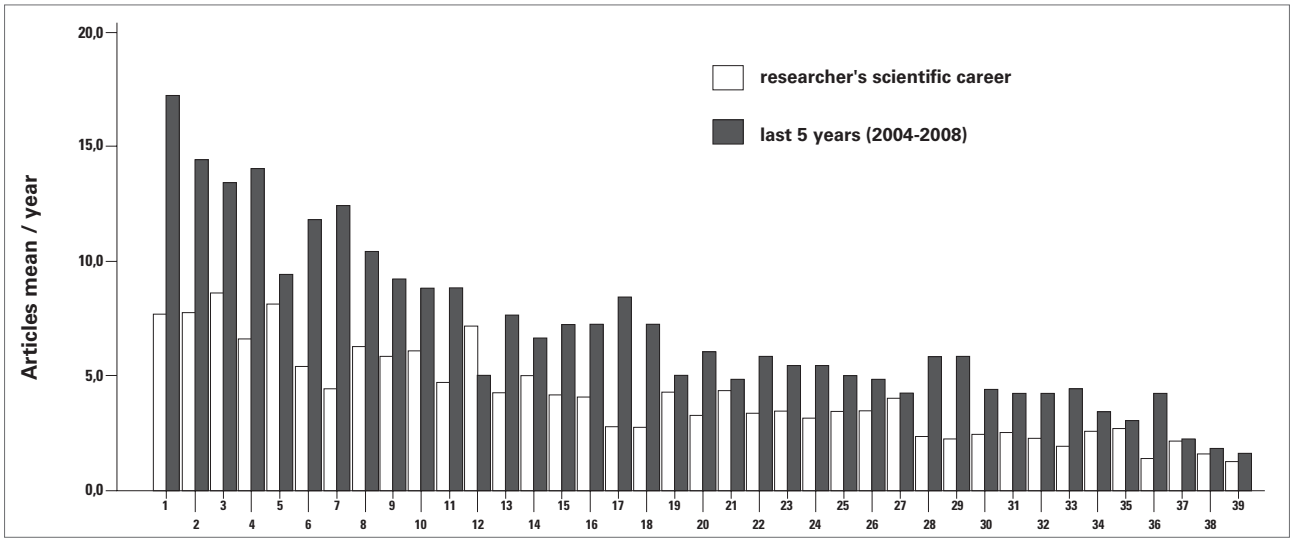
Considering all their academic careers together, Nephrology-Urology researchers supervised 394 scientific initiation grants (median for researcher, 7; QI = 2-14), 353 master's thesis (median, 7; QI = 4-11), and 212 PhD dissertations (median, 3; QI = 2-8). Regarding the values adjusted for the time from completion of the PhD program, the researchers supervised, on average, 0.72 scientific initiation grants, 0.56 master's thesis, and 0.32 PhD dissertations per year.

Publications/Journals

Considering all their academic careers together, Nephrology-Urology researchers published 3,195 articles in journals, with a median of 75 articles per researcher (QI = 52-100). The total of 1,763 articles were indexed in the database Web of Science®, accounting for approximately 55% of the total number of articles published (median per researcher, 43; QI = 26-59). In the database Scopus®, 2,219 articles were indexed (median, 54; QI = 31-71), corresponding to 69% of the academic production. Considering the number of articles adjusted for career duration, the mean number of publications was four articles/year (SD = 1.98). The adjusted mean number of publications in the database Web of Science® was 2.4/year (SD = 1.7), and in the database Scopus®, 2.90/year (SD = 1.8). Considering the mean number of publications per year, most researchers (38, 97.5%) increased their scientific production over the past five years. This increment ranged from 2.8% to 206%, with a mean 78% increase in the scientific production (SD = 55). Figure 2 illustrates the mean annual production of scientific articles, comparing the researcher's scientific career with the scientific production in the 2004/2008 quinquennium.

Considering all their academic careers together, the Nephrology-Urology researchers published in 602 different journals. Of that total, the Impact Factor (IF) of 350 journals was identified in the Journal Citation Reports. The median IF was 2.45 (QI = 1.67-3.77), ranging from 0.168 to 50.01. Regarding scientific journals, tables 2 and 3 show, respectively, the ten indexed and non-indexed scientific journals most used by researchers for their publications.

Figure 2. Mean annual production of scientific articles.



Impact

Considering all their academic careers together, the Nephrology-Urology researchers received a total of 25,923 citations in the database Web of Science®, with a median per researcher of 452 citations (QI = 161-927, ranging from 68 to 3632 citations). The mean number of citations per article was 13.8 (SD = 11.6). In the database Scopus®, 26,626 citations of Nephrology-Urology researchers were identified, with a median of 496 citations per researcher (QI = 172-1,017, ranging from 58 to 2,974 citations). The mean of citations per article in the database Scopus® was 12.8 (SD = 10.7).

The median of the H index in the database Web of Science® was 10 (QI = 7-16), ranging from 4 to 23. The corresponding value for the H index in the database Scopus® was a median of 11 (QI = 7-17), ranging from 3 to 25. A significant difference was observed in comparing the median of the H indices of both databases, Web of Science® ($P < 0.013$) and Scopus® ($P < 0.005$). Figure 3 shows the distribution of the H indices in both databases, according to the category of the researcher's grant. That difference, however, was not significant for the M index, which is the H index corrected for the duration of the researcher's academic career: Web of Science® ($P < 0.29$) and Scopus® ($P < 0.22$). Figure 4 shows the distribution of the M indices in both databases according to the category of the researcher's grant.

Tabela 2 Distribuição dos dez periódicos indexados no JCR mais utilizados para publicação pelos pesquisadores do CNPq

Indexed journals	Impact factor 2008	Articles	%
Transplantation Proceedings	1.05	142	4.40
Braz J Med Biol Res	1.21	124	3.88
Kidney International	6.42	112	3.50
Nephrol Dial Transpl	3.57	85	2.66
Renal Failure	0.65	61	1.90
Hypertension	7.34	60	1.87
J Am Soc Nephrol	7.50	54	1.69
Nephron	1.71	50	1.56
Perit Dial Int	1.90	44	1.37
Pediatr Nephrol	2.30	43	1.34

Table 3 Distribution of the ten non-JCR-indexed journals most used for publication by CNPq researchers

Não Indexed journals	Impact factor 2008	Articles	%
J Bras Nefrol	-	291	9.10
Rev Assoc Med Bras	-	137	4.28
Arq Bras Cardiol	-	63	1.97
Arq Bras Endoc Metabol	-	42	1.31
Rev Bras Medicina	-	34	1.06
J Bras Transplantes	-	33	1.03
Rev Bras Hipertensão	-	32	1.00
Rev AMRIGS	-	22	0.68
Rev Bras Clin Terapêutica	-	16	0.50
Rev Med Minas Gerais	-	10	0.31

Figure 3. Distribution of the H indices in Web of Science® and Scopus®.

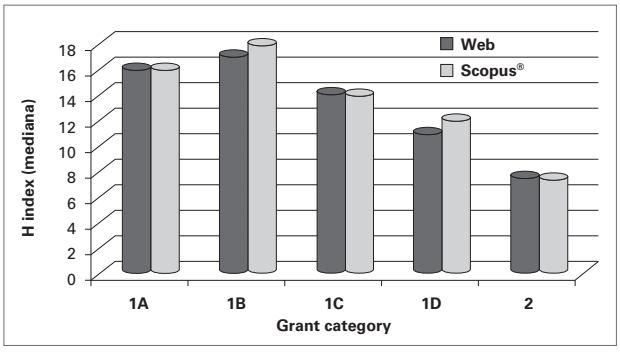
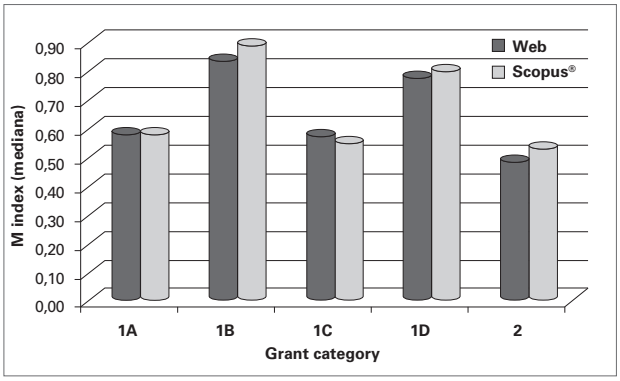


Figure 4. Distribution of the M indices in Web of Science® and Scopus®.



Discussion

The present cross-sectional study, focusing on the CNPq researchers in Nephrology and Urology, shows a great concentration of research in those two areas of knowledge. Most (90%) researchers are concentrated in only three Brazilian states, two of which located in the Southeastern region of Brazil. The findings of this study show that two institutions in the state of São Paulo (UNIFESP and USP) are important centers forming and producing scientific knowledge in Nephrology in our country. Not less than 28 (72%) researchers in that area obtained their PhD degrees in those two institutions.

The medical research concentration observed in this study has also been reported by other authors assessing other areas of knowledge.[6] Our previous study including all 441 researchers in Medicine has also shown a marked concentration as follows: 79% of the researchers were in the Southeastern region of Brazil and 60% originated from the state of São Paulo.[8]

Another important characteristic of the scientific activity relates to the formation of qualified human resources, with an emphasis on the supervision at undergraduate and post-graduate (master's and PhD programs) levels. This study evidenced the important participation of researchers in the formation of new researchers. The medians of supervision adjusted for the researcher's time from completion of the PhD program were 0.56 for the master's degree and 0.32 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 master's degree and PhD degree, respectively).[8] They are also comparable to those of the most productive researchers in the Public Health area, compiled by Barata and Goldbaum, in an analysis of CNPq researchers.[3]

The analysis of the scientific production of researchers in Nephrology-Urology has shown a robust production with an expressive publication of scientific articles in medium-to-high IF journals. During the academic career, the median of published articles per researcher was 75, while that median for the 411 researchers in Medicine was 87 articles per researcher.[8] However, considering the number of articles adjusted for career duration, our analysis showed that the mean of publications was four articles/year, and 2.4/year in the database Web of Science® and 2.90/year in the database Scopus®. The respective values for the 411 researchers in Medicine were 4.13 articles/year, being 2.23/year in the database Web of Science® and 2.90/year in the database Scopus®.[8] These data suggest that researchers in Nephrology and Urology are younger when compared with researchers in Medicine as a whole.

Another important point observed in our analysis is the significant increase in the scientific production, a fact that has also been observed in other areas, such as Odontology, Public Health, and Physical Therapy.[3,4,6,7] This quantitative increment in the scientific production in Medicine correlates with the overall increase in the Brazilian scientific production and may reflect the several inductive mechanisms established by the different Brazilian agencies that stimulate research. One of such mechanisms is the improvement in the post-graduation assessment system, which, through the Coordination for the Improvement of College Educational Level Personnel (CAPES), prioritizes the number and quality of the articles published when assessing the national programs.[10] Another inductive mechanism to consider is the scientific productivity grant itself that promotes a competition among peers, boosting both the formation of new researchers and the publication of articles in leading journals.

It is worth noting not only the quantitative increment in scientific production, but also its qualitative

improvement with greater international insertion. However, in this regard, other areas, such as Neurosciences and Psychiatry, have performed better than Nephrology and Urology, with a significant effort in the search for quality, having approximately 70% of the published articles indexed in the selective database Web of Science®. It is worth emphasizing that 9% of the articles of the major researchers in Nephrology have been published in the Jornal Brasileiro de Nefrologia, the official publication of the Brazilian Society of Nephrology, whose indexation in qualified databases, such as SciELO, has been recently sought.[11] In addition, further indexations in other databases, such as PubMed, JCR, and Scopus®, should be encouraged, as well as in leading journals of other specialties, such as Cardiology, Pediatrics, and Endocrinology.

Another important point is to prize Brazilian journals, an essential factor for the national scientific growth and development, as emphasized in a recent editorial by the most eminent editors of the major national journals.[12] Although our study has not been designed to answer that question, our findings regarding the IF of journals in which the most productive researchers in Nephrology publish strengthen the criticism about the new QUALIS of CAPES.[13] In our study, the median IF was 2.45 and the 75th percentile was 3.77. According to the CAPES documents referring to Medicine I, in which Nephrology is included, the cutoff point for an A1 journal should be 3.8 and for an A2 journal, 2.5. Thus, we do not consider a classification that underestimates more than half of the production of the major researchers in Nephrology, just to include it with other specialties with very different IFs, reasonable. In the database Web of Science®, the recently released JCR 2009 (June 2010) showed that, of the 63 journals in Nephrology and Urology, only nine (14%) have an IF greater than 3.8 and only 22 (35%) have an IF greater than 2.5.

Conclusion

The present scientific investigation showed a great concentration of researchers in Nephrology in few Brazilian institutions. By knowing the profile of researchers in medical Nephrology, more effective strategies to encourage the scientific production and the demand for resources to finance research projects can be defined.

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