Avaliação da Produção Científica em Áreas da Medicina: um Estudo Comparativo

Evaluation on the Scientific Production in Fields of Medicine: a Comparative Study

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PALAVRAS-CHAVE

- Indicadores de Produção Científica.
- Medicina.
- Ciências da Saúde.
- Pesquisadores.

RESUMO

Objetivo: *Produção de conhecimento, geração de tecnologia e formação de recursos humanos para pesquisa são temas que têm se destacado nos ambientes acadêmico e governamental. O objetivo deste estudo foi comparar a produtividade científica, formação de recursos humanos e o perfil de pesquisadores contemplados com bolsas de produtividade em pesquisa pelo Conselho Nacional de Desenvolvimento Técnico e Científico (CNPq), provenientes de cinco áreas de conhecimento médicas.* ***Métodos:*** *Este é um estudo descritivo e comparativo entre pesquisadores, com bolsas das áreas de Cardiologia, Hematologia/Oncologia, Nefrologia/ Urologia, Neurociência Clínica e Pediatria, obtido por meio de estudos prévios. As variáveis analisadas foram: gênero, instituição de origem do pesquisador, tempo de doutoramento, instituição de doutoramento, orientações de iniciação científica, mestrado e doutorado, e publicações em periódicos. Os pesquisadores contemplados com bolsas de produtividade científica (PQ) foram também divididos nas categorias do CNPq em: 2, 1A, 1B, 1C e 1D.* ***Resultados:*** *Do total de 411 pesquisadores em Medicina, 192 (46,7%) foram identificados como pertencentes a áreas dos cinco estudos envolvidos, com predominância do sexo masculino (71,3%), concentrando-se nas categorias 2 e 1A. As regiões Sudeste e Sul, juntas, concentram a maioria dos pesquisadores (mais de 90,0%), sendo São Paulo responsável por 63% dos pesquisadores, sediando também as duas principais instituições – Universidade Federal de São Paulo (Unifesp) e Universidade de São Paulo (USP) –, que continham 49,5% dos bolsistas. Houve prevalência na formação de mestres (1.846 orientações), seguida de 1.674 alunos de iniciação científica e de 1.115 alunos de doutorado. Foram publicados 18.456 artigos em periódicos, sendo 56,0% deles indexados na base ISI e 78,0% na base Scopus.* ***Conclusões:*** *Em todas as áreas médicas analisadas há uma crescente produtividade científica, com destaque para a Neurociência Clínica, e expressiva formação de recursos humanos, com uma preocupação constante em melhorar o desempenho qualitativo. Entretanto, há uma disparidade regional quanto à concentração de pesquisadores, bem como não se verifica produção de patentes.*

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KEYWORDS

– Scientific Production Indicators.

– Medicine.

– Health Sciences.

– Researchers.

ABSTRACT

Objective: *Knowledge production, technology generation and human resource training for research are themes which have been under the limelight in the academic and governmental environment. The aim of this study was to compare the scientific productivity, human resource training and the profile of researchers awarded scientific productivity grants by the CNPq (Brazilian Council for Scientific and Technological Development), from medical knowledge areas.* ***Methods:*** *This is a descriptive and comparative study among researchers with scholarships in the fields of Cardiology, Hematology/Oncology, Nephrology/Urology, Pediatrics and Clinical Neuroscience, obtained through previous studies. The variables analyzed were: gender, researcher home institution, PhD time, doctoral institution, undergraduate research guidelines, master's and doctorate degrees, and publications in journals. The researchers granted with the PQ (scientific productivity) grants were also divided into the present CNPq categories of: 2, 1A, 1B, 1C and 1D.* ***Results:*** *from a total of 411 researchers in Medicine, 192 (46.7%) were identified as belonging to areas of the five studies involved, predominantly male (71.3%), concentrated in categories 2 and 1A. The southeastern and southern Brazilian regions together comprise the majority of the researchers (over 90.0%) and São Paulo accounted for 63.0% of the researchers, also hosting the two main institutions – Universidade Federal de São Paulo (Unifesp) and Universidade de São Paulo (USP) – containing 49.5% of the stock. There was a prevalence students undergoing of teacher training (1,846 master's degree supervisions), followed by 1,674 undergraduate and 1,115 doctoral students. Of the 18,456 articles that were published in journals, 56.0% of them indexed in the ISI database and 78% in Scopus.* ***Conclusions:*** *In this study, it was noted that all the analysed fields showed growing scientific productivity, above all Clinical Neuroscience, and expressive human resource training, with a constant for improving quality performance. However, regional disparity was found as regards the concentration of researchers, as well as a lack of patent production.*

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INTRODUCTION

Knowledge production, technology generation and human resources training for research are themes which have been under the lime light in the academic and governmental environment[1]. The systemic evaluation of researchers, journals, universities, research institutions, regions and countries is an activity, although controversial, that has been relevant for scientists and managers[2]. Promotion agencies need systemic evaluation to optimize resource allocation and decide strategies for the research councils, enabling the restructuring of research in specific domains, or the growth of the scientific and technological production in the courtry[3].

Through the publications attached on the Institute for Scientific Information (ISI) and Scopus database, we can see that the Brazilian scientific production has been increasing expressively in recent years, highlighting areas such as: Medicine, Physics, Chemistry, Human Science, Social Science and Engineering[4,5]. In the medical field we can see the growth in number and quality of the scientific production, the increase of the post-graduation programs, the organization of research groups and expressive number of qualified researchers, been fully able of continuing the process of development of new researchers. However they are still under the necessary index numbers in order to face the important social and economic challenges that the country has in this area and as well as in other areas[6,7].

One of the consequences of more participation of the medical field and the national scientific production is the increasing demand for project funding resources for researches and grants of research productivity (PQ) of CNPq[8]. This grant is given as an incentive to those researchers who have a PhD degree and important scientific production in their research fields, to value their work compared to their peers[9]. Therefore, the PQ grant holder profile has an important interest to the scientific comunity[10].

In the last years various studies have analyzed the profile and the scientific production of the PQ grant holders of CNPq in many fields of knowledge[1,7,9,10,11]. In Medicine, some studies evaluated the profile of the scientific production of researchers in this area[8,12-16]. However, the data are still scarce

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and they need better understating. Therefore, the aim of the present scientific investigation is to describe the technical and scientific profile in a comparative way of the PQ researchers in five distinct medical areas.

METHODS

A cross-sectional study was done, based on previous studies which evaluated the profile and the scientific productivity of the researchers who had a PQ grant in the following medical fields: Cardiology[12], Hematology/Oncology[13], Nephrology/Urology[14], Clinical Neuroscience[15] and Pediatrics[16]. These studies have been done by the same group of researchers, with similar methodology, based on the 411 researchers, who had PQ grants from CNPq in Medicine during the period of three year of 2006-2008.

These five studies took into consideration the knowledge areas through the analyses of the resume Lattes of the researcher, available on the CNPq Lattes platform. In the case of not having this information clearly specified, we analyzed the scientific production of the last five years, been allocated to a knowledge area with greater predominance in the published and/or advised topics[12-16].

The researchers granted with the PQ grants were divided into the present categories of CNPq in: 2, 1A, 1B, 1C and 1D. The category 2 researcher is the one that has at least two years of his/her doctors degree course in the occasion of analyses of the proposal by the Assistance Committee. The researcher 1 has at least five years of his/her doctors degree; for category 2, there is only one framework in for levels (A, B, C and D) accordingly to his/her scientific production, human resources training and contribution to the area, which was established by the comparison to his/her peers[17]. PQ grants that were suspended and senior researchers were excluded.

Starting from the five years of studies mentioned[12-16], a data bank was built to enable the comparison between the medical fields, holding the following information: gender (male or female), grant category (2, 1A, 1B, 1C and 1D), researchers' home institution (geopolitical region, federation unit and by academic institution), time of the doctors degree conclusion, institution of the doctors degree, human resources training and scientific production (scientific articles).

In relation to human resources training, the studies counted all the guidance to the scientific introduction students (BIC), masters and doctor degree students during the researcher's whole academic career. For the scientific production analyses, the studies not only took into consideration all the publishing during the researcher's career, but also the publishing in the last 5 years, from the period of 2004-2008. The guidance and publishing shown in the studies were also adjusted to the period of time of the grant holder doctoring.

The scientific articles published by the PQ grant holders were analyzed through ISI/Web of Science database (http://www.webofknowledge.com/) and Scopus database (http://www.scopus.com/home.url). This enabled to elicit other indicators from PQ, such as the number of indexing and quotes, the H-index and M-index. From eliciting all the variables mentioned, the data was expressed in a descriptive and comparative way among the participant medical fields in the present study (Cardiology, Hematology/Oncology, Nephrology/Urology, Clinical Neuroscience and Pediatrics).

RESULTS

From the total of 411 medicine researchers with PQ grants those who worked in the five areas involved in the present study were pointed out: 33 researchers in the Cardiology field, 28 in Hematology/Oncology, 39 in Nephrology/Urology, 58 in Clinical Neuroscience and 34 in the Pediatrics field. Therefore the following results were based on this framework of 192 PQ (46.7% of the total) from the five medical fields in CNPq.

Table 1 presents the distribution of PQ according to the gender (male and female) and the category of productivity grant holders. The predominance of the male gender was observed (n = 137 researchers, 71.3%) in the 2:1 ratio men/women, with the exception of the researchers in the Hematology/Oncology field where the ratio between the genders was practically 1:1. As regards to research productivity category grant, the predominance of category 2 grant was observed. When putting together the various levels 1 a slight predominance of this category over group 2 from the Hematology/Oncology and Clinical Neuroscience field was observed.

The Southeastern and Southern regions, together, concentrate the majority of the researchers in the studied areas. Among the other regions, the North was the only one that did not have any PQ. The state of São Paulo has 63.0% of the researchers and the states of Rio Grande do Sul, Minas Gerais and Rio de Janeiro complete the group which concentrates more than 90.0% of PQ researchers in the five studies. Concerning the home institution of PQ, two institutions – Unifesp and USP – are responsible for 95 researchers (49.5% of the total). Other institutions have significant representation of PQ, mentioned in the five studies are: State University of São Paulo (Unesp), State University of Campinas (Unicamp), Federal University of Rio Grande do Sul (UFRGS), Federal University of Rio de Janeiro (UFRJ) and Federal University of Minas Gerais (UFMG).

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Table 1
Distribution of medical researchers in Medicine PQ by CNPq according to gender and scholarship category. Brazil, 2006-2008. N = 192

Knowledge area	Number of PQ n (%)	Gender		Grant category				
		Male n (%)	Female n (%)	2 n (%)	1A n (%)	1B n (%)	1C n (%)	1D n (%)
Cardiology	33 (17.2)	24 (17.5)	9 (16.4)	19 (18.8)	6 (22.2)	1 (4.0)	1 (7.1)	6 (24.0)
Hematology/ Oncology	28 (14.6)	15 (10.9)	13 (23.6)	13 (12.9)	3 (11.1)	4 (16.0)	3 (21.4)	5 (20.0)
Nephrology/ Urology	39 (20.3)	29 (21.2)	10 (18.2)	22 (21.8)	5 (18.5)	5 (20.0)	3 (21.4)	4 (16.0)
Clinical Neuroscience	58 (30.2)	43 (31.5)	15 (27.3)	26 (25.7)	7 (25.9)	10 (40.0)	6 (42.8)	9 (36.0)
Pediatrics	34 (17.7)	26 (18.9)	8 (14.5)	21 (20.8)	6 (22.2)	5 (20.0)	1 (7.1)	1 (4.0)
Total	192 (100.0)	137 (100.0)	55 (100.0)	101 (100.0)	27 (100.0)	25 (100.0)	14 (100.0)	25 (100.0)

CNPq – Brazilian Council for Scientific and Technological Development.
PQ – Grant of scientific productivity.

The general average time after doctoring among the five areas was 15 years, varying from 13.0 years (IQ, 10.0-22.5) in Cardiology, 13.5 years (IQ, 9.0-21.0) in Pediatrics, 15.0 years in Nephrology/Urology (IQ, 10.0-20.0) and Clinical Neuroscience (IQ, 10.0-21.2) and 16.0 years in Hematology/Oncology (IQ, 13.0-24.4). Regarding the doctoring institution, 173 researchers (90.1%) were given the title in Brazil, the same situation of the majority in the five analyzed fields (Table 2).

Concerning the training of human resource (guidance), in Table 2 is observed that in the whole academic career, there was the prevalence in the masters training (1,846 guidances, with the average of 8 per researcher), followed by 1,674 BIC (average 4) and 1,115 doctors students (average of 4 for PQ) in the five studied fields. The average of guidance by researchers by adjusted values by the doctoring time was of 0.53 to masters, while to BIC it was of 0.33 and 0.32 to guidance

Table 2
Distribution of medical researchers with PQ by CNPq according to the knowledge area, number of grant holders, time and place of doctoring conclusion and human resources. Brazil, 2006-2008. N = 192

Knowledge area	Number of PQ	Average time after doctoring in years (IQ)	Place of doctoring		Number of guidance throughout the researchers' academic career (*) [**]		
			Brazil	Abroad	BIC	Master	Doctors
Cardiology	33	13 (10.0-22.5)	29	4	324 (4) [0.68]	242 (6) [0.43]	199 (9) [0.31]
Hematology/ Oncology	28	16 (13.0-24.4)	25	3	213 (2) [0.18]	293(10) [0.47]	188 (5) [0.32]
Nephrology/ Urology	39	15 (10.0-20.0)	34	4	394 (7) [0.72]	353 (7) [0.56]	212 (3) [0.32]
Clinical Neuroscience	58	15 (10.0-21.2)	51	7	453 (4) [0.33]	568 (8) [0.53]	347 (4) [0.32]
Pediatrics	34	13,5 (9.0-21.0)	33	1	290 (6) [0.26]	390 (9) [0,70]	169 (4) [0.66]
Total	192	15	173	19	1,674 (4) [0.33]	1,846 (8) [0.53]	1,115 (4) [0.32]

*Notes: BIC – Scientific introduction students; CNPq – Brazilian Council for Scientific and Technological Development; IQ – Interquartile range; PQ – Grant of scientific productivity; * Average per researcher; ** Average per researcher in adjusted values times by after doctoring time.*

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Table 3
Medical researchers' profile with PQ by CNPq according to the scientific productivity. Brazil, 2006-2008. N = 192

Knowledge area	Number of PQ	Total number of published articles by PQ group*	Annual average of articles per PQ throughout their career	Average increase of scientific production in the area**	Total of index on databases***		Average of H-index of the PQ in databases		Average of M-index of PQ in databases	
					ISI	Scopus	ISI	Scopus	ISI	Scopus
Cardiology	33	2,958 (89)	4.4	103.0%	1,617 (49)	2,222 (67)	10.0	11.0	0.68	0.67
Hematology/ Oncology	28	2,655 (87)	4.4	85.0%	1,719 (50)	2,075 (69)	11.0	12.0	0.55	0.56
Nephrology/ Urology	39	3,195 (75)	4.0	78.0%	1,763 (43)	2,219 (54)	10.0	11.0	0.58	0.58
Clinical Neuroscience	58	6,526 (90)	7.4	77.4%	3,992 (69)	5,061 (67)	10.5	12.0	0.77	0.82
Pediatrics	34	3,122 (89)	5.4	84.0%	1,258 (33)	1,827 (45)	8.0	9.0	0.56	0.56
Total	192	18,456 (86)	5.1		10,349	13,404	10.5	11.0	0.58	0.58

*CNPq – Brazilian Council for Scientific and Technological Development. PQ – Grant of scientific productivity. * Average per researcher. ** In the period of five years (2004-2008). *** Average by PQ.*

for doctorate. Also, according with table 2, we can observe a better performance among the PQ in Pediatric in the guidance of masters and doctors (average of 0.70 and of 0.66 for researchers, respectively). On the other hand the PQ of Cardiology and Nephrology/Urology were highlighted in the BIC guidance (average of 0.68 and 0.72 respectively).

Table 3 shows the scientific productivity of PQ in five areas of study. We can observe that PQ have published throughout their academic career, 18,456 scientific articles, with the average of 89 articles per researcher in Cardiology (IQ, 25.0-219.0), 87 in Hematology/ Oncology (IQ, 52.0-122.0), 75 in articles in Nephrology/Urology (IQ, 52-100), 90 in Clinical Neuroscience (IQ, 65.7-128.5) and 89 articles in Pediatrics (IQ, 51.0-119.0). Adjusting to the doctoring time, each researcher has published an average of 4.4 articles/year in the areas of Cardiology, and Hematology/Oncology, 4 articles/year in Nephrology/Urology, 7.4 articles/year in Clinical Neuroscience and 5.4 articles in the Pediatrics yearly. Among the five areas analyzed, we can observe an average of 5.1 articles published per PQ, throughout their careers, highlighting the PQ in Clinical Neuroscience, which presents an average higher than the other areas with (7.4 articles/year).

Regarding the average number of published articles yearly, most of the PQ in the five areas of study presented an important increase in the scientific production in the five years mentioned, highlighting Cardiology (103% of increase). The total number of published articles in the five studies (18,456 scientific articles), 10,346 were indexed on the databases of Web of Science (nearly 56% of the total) and 13,404 indexed articles on the database of Scopus, equivalent of 78% of the academic production.

In the academic career, the researchers involved in the five areas of study have got the total of 121,777 quotes on the ISI database, with the highlight of the PQ in Clinical Neuroscience, which has got the biggest number of publishing (total of 50,669 quotes) and the grants of Nephrology/Urology, that have reached the best average of quotes per researcher (the average of 452 quotes per PQ).

Other indicators used in the scientific metric refer to the h and m index. Looking at Table 3 we can observe regarding H-index, a similar performance among the researchers of the five medical fields studied, varying from 8.0 to 11.0 on ISI database (average of 10.5) and between 9.0 to 12.0 (average of 11.0) on Scopus database, highlighting the area of Hematology/Oncology where the researchers reached numbers higher than the average in both databases (11.0 and 12.0 respectively). Concerning m index, we can see considerate difference between the medical specialties, with the average of 0.58 for both ISI and Scopus. We can highlight Clinical Neuroscience that has reached the index of 0.77 on ISI database and 0.82 on Scopus database.

DISCUSSION

The present study, aiming PQ researchers of CNPq working in five medical fields – Cardiology, Hematology/Oncology, Nephrology/Urology, Clinical Neuroscience and Pediatrics

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–, has shown some similar technical and scientific indicator among the medical fields studied.

Analyzing the researchers' profile, we noticed the predominance of male gender involving other areas, such as Chemistry9and Dentistry[18]. However, this fact has been changing in the last years, in areas such as Nursing[1] and Physiotherapy[20], in which we observe the predominance of the female gender among the grant holders of PQ/CNPq, alongside with the history of feminization of jobs. It is important to mention the same tendency observed in two studies involving PQ in the field of Public Health: in the first study 155 resumes Lattes of researchers were analyzed in the three years of 2004-2006, we could observe the similarity between the male and female gender (1.03:1)[11]. However in the second study that analyzed the historical series of 2000-2012 we came to the conclusion that at the end of this period, there was already a predominance of the female gender (52%)[1].

In general terms, the smaller number of females with productive grants in researches of CNPq can be explained by the late insertion of women in the science and technology system (C&T)[7]. Studies indicate that part of women who go through the first stages of training and education for the scientific activities deviate themselves a long this path or simply do not get the recognition from their peers through awarding their grants, including, some kind of prejudice in the grants awarding system, especially those with a higher hierarquic[22]. To this factor adds the difficulty of women to conciliate their scientific career with their family lives, including gestation and maternity[23].

Another variable of the study refers to the predominance of PQ level 2, same fact observed in the study involving PQ of all the areas of Medicine[7,21]and in studies on the field of Nursing[1], Dentistry[18] and Public Helath[11]. The insertion of researchers in science productivity is relatively new, but there is a greater effort (or pressure) to reach a higher level of excellence in the scientific production and training of human resources, demanded in category 1A[17].

Regarding the geographic distribution of PQ, the present study pointed out a greater concentration of grants in the Southeastern and Southern region, facts that corroborates in studies involving other areas of knowledge[1,9,10,11,18,21]. In a previous study involving the 411 medicine researchers, it was also possible to see and expressive concentration of these professional in the Southeast (79%) and seven institutions responsible for 80% of the researchers in the country, highlighting USP (51%) and Unifesp (17%)[7]. This supremacy can be justified by the greater number of undergrad and graduate courses in medicine in the southeastern and southern regions that, together, represent 62.5% of the total number of medicine schools in the country[24]. In general terms, we can observe the researchers' regional and institutional concentration, respectively in the Southeast and in the state of São Paulo, fact reproduced in many studies involving other areas [1,7,9,10,11,21].

Another recent study, involving in Pediatrics, shows the evidence of the density of the researchers group in the states of São Paulo, Minas Gerais and Rio Grande do Sul, situated in the regions with more social and economic development in the country[13]. We highlight that the geographic concentration of the scientific production is not only a Brazilian peculiarity, on the contrary, it has been shown as an increasingly tendency in the contemporary world[1]. The investments in science, technology and innovation are among the expenses which are more concentrated in the world; this can be observed nationally, as well as in a regional scale[1].

The high qualification of the grant holders of PQ/CNPq in the medical fields was also found in studies done in the areas of Nursing1 and Dentistry[18] in which, respectively, 98.8 and 98.6% of the grant holders are doctors graduated in Brazil. The average time after doctorate of PQ in Dentistry[18] was estimated in 14 years, similar time found in the five medical areas.

The scientific activity of the grant holder also involves the training of human resources, in other words, the guidance and development of student in the BIC, master and doctorate. Here we can see an important participation of the PQ in the education of new researchers. The PQ/CNPq grant is designated to promote the scientific and technological research and also to train the human resources for research in the country[17]. In this context, there are many studies that highlight the worry with the premise of PQ grant[1,7,9,18,19]. The average number of post-graduate students by PQ in the medical fields studied (adjusted to the doctoring time) were of 0.53 and 0.33 per year for masters and doctors, respectively. These numbers are close to the ones found in the studies involving PQ in Medicine (0.50 and 0.30)[7]. These numbers are very similar to the ones found by Barata and Goldbaum[11], involving Public Health, in which PQ in category 1 guided on average 0.30 doctoring students and 0.54 master students per year. A greater productivity among the grant holder in category 1 was also observed in the study done in the Dentistry field and as well as in the study on the five medical areas, there was more education of masters[18]. Santos[1], analyzing the performance of PQ in the Nursing areas and Public Health in the historic series of 2000-2012, corresponded the expressive increase in the training of human resources to the increase of the number of post-graduation courses in the country.

Other important piece of information found was the average of the articles per researcher throughout their academic

career observed in the five medical areas, similar to the one found in the study involving 411 PQ in Medicine, in which the average number of articles was 87 publications[7]. We can see an expressive increase in the scientific production in four years' time from 2004-2008 in all studies in other areas, such as Nursing, Dentistry, Public Health and Physioterapy[1,18,19,20]. The increase in the quantity of the Brazilian scientific production in Medicine is related to the general increase of the Brazilian scientific production and possibly reflects various induction mechanisms established by the different Brazilian promotion agencies, such prioritizing the number and quality of the published articles to grade the post-graduation programs by the Coordination of Development of Human Resource in University Level (Capes)[25] or the PQ grants that promote a competition among peers, encouraging the training of new researchers as well as the publication of articles in expressive journals[17,21].

H-index represents an important metric indicator, once it allows distinguishing the scientific production more objectively[26]. In one study in which the impact indicators were compared of two randomly selected populations of Physiotherapy and Comparative Biochemistry researchers, having one group coming from Latin America and the other from developed countries[28]. These numbers were similar to the ones found in the medical areas as well as in the study involving PQ in Public Health[11] – which covers professional in the medical area – and way above the index found in the study with Physiotherapy grant holders[20] (on Scopus database, the average observed was of 5.3; when evaluated on Web of Science database, average 3.0 was found). However, H-index has some limitation to favor the researchers with long careers, as well as the ones who work in areas with high frequency of quotes[29]. An example of this situation, we mention a study involving 42 Spanish researcher doctors with the average of 30 years of experience and a total of 6,655 publications, which H-index was 25[30].

In the same article in which Hirsch introduced the concept of H-index, another metric indicator was also present: M-index, which evaluates the success of the researchers' scientific career by the time since the first scientific article. For Hirsch, M-index close to 1.00, features a successful researcher. M-index close to 2.00 features a researcher with high recognition, found in the best universities, and M-index higher or the same as 3.00 features really unique ones[26]. According to this cut-off, we notice that PQ in Clinical Neuroscience present a M-index closest to 1.00 – the M-indexes from ISI and Scopus were, respectively, 0.77 and 0.82. The other four areas analyzed in the study present, on average, M-index near 0.50 from ISI (0.58) and Scopus (0.58).

The five studies analyzed in this articles show a deficit in the scientific production, regarding patent production. The studies have this information, we can suppose efficient, taking into consideration the other studies in health fileds[1,11] was not found this piece of information. We point out as an exception in Medicine, a study involving PQ in Pediatrics in the three years of 2010-2012, in which shows the registration of only one patent[8]. In Dentistry, it seems to have a more intense production when analyzing one historical series, in the period of 2000-2011, increasing from 1 to 23 patents[1].

This information is important in the means that it can contribute to the decisions of the promotion agencies, responsible to elect candidates to academic position (as PQ scholarship holders), the scientific production and the development of the researcher individualy[20]. A recent study involving PQ in Mathematics reinforce the need to know the scientific production and human resource training for the candidate to be up to hold a PQ grant[10].

CONCLUSION

When comparing the medical specialties, we notice they share among themselves and with other knowledge areas in Brazil in the production of indexed articles, highlighting Clinical Neuroscience, and an increase of human resource education. We notice that there is still the predominance of male gender among the grant holders, even though there is a tendency of a balance with more participation of women in the academic activities in general. Another important aspect seen was the greater concentration of grant holders in the Southeastern region, coherent with a bigger number of courses offered in the region. However there are Science and Technology's challenges in Brazil have to overcome: it's a country with the dimensions of a continent, where there is a great regional inequality also in the scientific production and there are scarce reports about patent production, fact observed specially in the studies involving the Medical field.

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Galeno Hassen Sales colaborou na revisão da literatura, coleta de dados e redação do artigo científico. Daniella Reis Barbosa Martelli e Verônica Dias construíram o banco de dados e análise dos mesmos. Maria Christina L. A. Oliveira colaborou na revisão da literatura e análise dos resultados. Eduardo Araújo de Oliveira elaborou o método no qual o estudo se baseou e na redação do artigo científico. Hercílio Martelli Júnior foi o orientador do estudo e colaborou na discussão dos resultados e na redação do artigo científico.

CONFLICT OF INTEREST

None.

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