Profile of Brazilian scientific production on A/H1N1 pandemic influenza

Perfil da produção científica brasileira
sobre a gripe pandemica de influenza A/H1N1

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Abstract *In the last few years, bibliometric studies have proliferated, seeking to provide data on world research. This study analyzes the profile of the Brazilian scientific production in the A (H1N1) influenza field between 2009 and 2011. The research was conducted in MEDLINE, SciELO and LILACS databases, selecting papers in which the term "H1N1" and "Brazil" were defined as the main topics. The data were analyzed taking into consideration the Brazilian state and institution in which the articles were produced, the impact factor of the journal and the language. The research revealed 40 documents (27 from MEDLINE, 16 from SciELO and 24 from LILACS). The journal impact factor ranged from 0.0977 to 8.1230. A similar amount of articles were written in English and Portuguese and São Paulo was the most productive state in the country, with 95% of the Brazilian production originating from the Southern and Southeastern regions. Linguistic data indicate that previous efforts made in order to improve the scientific production of Brazilian researchers making their observations attain a broader scientific audience produced results. It is necessary to assess the scientific studies, especially those conducted with public funds, in order to ensure that the results will benefit society.*

Key words *A (H1N1) influenza, Brazil, Scientometrics*

Resumo *Nos últimos anos, estudos bibliométricos proliferaram, procurando prover dados sobre a pesquisa mundial. O presente estudo analisou o perfil da produção científica brasileira no campo da influenza A (H1N1) durante o período de 2009 a 2011. A pesquisa foi conduzida através das bases de dados Medline, SciELO e Lilacs, selecionando artigos onde os termos "H1N1" e "Brazil" foram definidos como tópicos principais. Os dados foram analisados considerando-se: o estado brasileiro e a instituição onde o trabalho foi produzido, o fator de impacto de periódico e a língua. A pesquisa revelou 40 documentos (27 provenientes do Medline, 16 do SciELO e 24 do Lilacs). O fator de impacto do periódico variou de 0.0977 a 8.1230. Uma quantidade similar de artigos foi escrita em inglês e em português. São Paulo foi o estado mais produtivo no país e 95% da produção eram provenientes das regiões Sul e Sudeste. Os dados linguísticos indicam que esforços anteriores para melhorar a produção científica dos pesquisadores brasileiros, fazendo com que suas observações atingissem um público científico mais amplo, foram alcançados. É necessário avaliar os estudos científicos, especialmente os realizados com fundos públicos, a fim de assegurar que os resultados beneficiem a sociedade.*

Palavras-chave *Influenza A (H1N1), Brasil, Cientometria*

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Introduction

In April 2009, the first cases of human infection with a novel influenza A (H1N1) virus were reported in the United States (US) and Mexico[1]. The novel H1N1 virus has distinct molecular properties of human, avian, and swine influenza, resulting from antigenic drift, which is the main cause of the seasonal epidemic of swine flu[2,3]. Pandemic novel influenza A (H1N1) infection was considered widespread in Brazil on July and, although predominantly a tropical country, Brazil was seriously affected by the disease[4].

There exists an evident interest in developing new scientific indicators, capable of facilitating the analysis of the results of research activities. In spite of its known limitations, bibliometric analysis constitutes a procedure of great utility in evaluating health sciences. In the last few years, bibliometric studies have proliferated, seeking to provide data on the situation of world research or that of certain countries[5]. Brazil has not been excluded from this tendency towards a growing use of bibliometric indicators. To date, some studies on Brazilian scientific production in biomedicine and life sciences are available[6,7].

The influenza A (H1N1) publications during 2009-2011 periods in Medline database notice an elevated number of papers. This trend was observed in most countries and on all continents. The largest number of papers in this field came from US and European Union (EU). The aim of this study was described the profile of the scientific output in influenza A (H1N1) in Brazil, assessing the type of document, its theme, journal impact factor, and the location and nature of the institutions – whether public or private – where influenza A (H1N1) research was carried out and published. The results of this study may shed some light on factors that influence scientific output on influenza A (H1N1) in Brazil. Additionally they may suggest ways to turn the Brazilian scientific production more diffuse and visible.

Methods

This is a retrospective and documental study conducted with printed and Epub ahead of print available online articles published from April 2009 to April 2011. The search was conducted over the Internet using the Medline, SciELO (Scientific Electronic Library Online), and Lilacs (Latin American and Caribbean Health Science Literature Database) databases. The Medline database was chosen because it is a biomedical website often accessed by the international scientific community, and a frequently used toll for studies of scientific production. Moreover, Medline was recently demonstrated to be suitable for bibliometric studies of scientific production in biomedicine[5]. The SciELO and Lilacs databases were included in order to add papers from Latin America and Caribbean countries which might not be present in the Medline database. In order to avoid duplication, the documents indexed in both databases were identified and counted only once.

The data were analyzed in relation to the indexing database (Medline, SciELO and Lilacs), the state in which the Institution is located, type of publication, journal title, impact factor of the journal, language of publication, and the type of the institution the first author was affiliated with (whether public or private). The impact factor of the journal was obtained from the databases where the document was published and/or from the journal home page.

Medline was accessed through the National Library of Medicine[8]. The search was performed in the advanced-search option. The search strategy consisted of entered the terms "H1N1"; or "pandemic flu"; or "influenza A/H1N1"; or "swine flu"; or "pandemic flu 2009"; or "H1N1 2009" in the field "*MeSH Major Topic*" to select papers in which H1N1 2009 pandemic flu was the main topic discussed. Both 'Brazil' and 'Brasil', separated by the preposition "OR", or "AND" were typed in the field "*affiliation*" to select Brazilian papers.

The SciELO database was accessed through its on website[9]. The research review was operationalized through electronic search of articles indexed in "subject index" based on the keywords "H1N1", "pandemic flu", "influenza A/H1N1", "swine flu", "pandemic flu 2009", "H1N1 2009", "Brazil", and "Brazil" and specified in the "all levels" in the search interface SciELO.

The Lilacs database was accessed through the *Biblioteca Virtual em Saúde* website[10]. The search strategy was the same as described for the Medline database. The documents indexed in the Lilacs database considered were: technical-scientific reports, original papers, short communications, and case reports.

Results

The search identified 40 documents in the field of influenza A (H1N1) produced in Brazil from April

2009 to April 2011. There were 27 papers in Medline published in 22 different journals, 16 in SciELO published in 10 journals, and 24 documents in the Lilacs database published in 15 journals. Twelve papers appeared in the three databases. Fifteen documents appeared only in Medline, and 9 in Lilacs (Table 1). The earliest paper found in Medline and SciELO was published in May 2009, and the earliest found in Lilacs was published in April 2009.

The Brazilian documents published during the period comprised 19 original publications, 5 case reports, 5 reviews, 1 current topic, 3 editorials, 1 technical report, 1 testimony, 1 scientific note, and 3 letters. Brazilian investigators published their papers in 29 different journals - 13 national and 16 foreign journals - with impact factor (IF) ranging from 0.0977 to 8.123. Seven Brazilian periodic: Cad Saúde Pública (IF 0.3825), Clinics (São Paulo) (IF 0.3284), Hist Cienc Saúde-Manginhos (IF 0.0977), J Bras Pneumol (IF 0.2829), Mem Inst Oswaldo Cruz (IF 0.418), Rev Assoc Med Bras (IF 0.608), and Rev Saúde Publica (IF 0.4434) are indexed in the Medline database (Table 1).

The state of São Paulo was the most productive in the country, accounting for 23 papers (57.5%), followed by the states of Rio de Janeiro (5 papers, 12.5%), Paraná and Federal District (2 papers, 5.0% each), whereas the state of Minas Gerais (4) and Rio Grande do Sul contributed with 4 paper each (10.0%). Regarding the geographical regions of the country, 80.0% of the papers were produced in the Southeast, 15.1% in the South, and 4.9% in the Middle West.

Table 1. Journals in which Brazilian articles on Influenza A (H1N1) were published during the period between April 2009 and April 2011.

Journal	Impact Factor	Database	Type of document	Nº of papers	%
AIDS Res Hum Retroviruses	2.178	Medline	Article	1	2.5
Am J Respir Crit Care Med	8.123	Medline	Article	1	2.5
Ann Oncol	5.647	Medline	Article	1	2.5
Cad Saúde Publica	0.3825	Medline, SciELO, Lilacs	Editorial	1	2.5
Bone Marrow Transplant	2.998	Medline	Letter	1	2.5
Clinics (São Paulo)	0.3284	Medline, SciELO, Lilacs	Article, Review	4	10.0
Clin J Am Soc Nephrol	4.844	Medline	Article	1	2.5
Clin Rheumatol	1.559	Medline	Case Report	1	2.5
Epidemiol Serv Saúde	NA	Lilacs	Article, Letter	2	5.0
Eur J Radiol	2.339	Medline	Article	2	5.0
Euro Surveill	NA	Medline	Article	1	2.5
Hist Cienc Saúde-Manginhos	0.0977	Medline, SciELO, Lilacs	Testimony	1	2.5
Infect Control Hosp Epidemiol	2.834	Medline	Letter	1	2.5
Int J Gynaecol Obstet	1.721	Medline	Article	1	2.5
Int J High Dilution Res	NA	Lilacs	Review	1	2.5
J Bras Pneumol	0.2829	Medline, SciELO, Lilacs	Article, Case Report	2	5.0
J Trop Pediatr	1.224	Medline	Article	1	2.5
Med Hypotheses	1.274	Medline	Article	1	2.5
Mem Inst Oswaldo Cruz	0.418	Medline, SciELO, Lilacs	Article	1	2.5
Nursing (São Paulo)	NA	Lilacs	Review	1	2.5
Pathol Res Pract	1.142	Medline	Article	1	2.5
Radiol Bras	0.2200	SciELO, Lilacs	Article, Editorial	2	5.0
Rev Bras Ter Intensiva	0.1071	SciELO, Lilacs	Article	2	5.0
Rev Assoc Med Bras	0.608	Medline, SciELO, Lilacs	Editorial	1	2.5
Rev Inst Adolfo Lutz	NA	Lilacs	Scientific Note	1	2.5
Rev Med Minas Gerais	NA	Lilacs	Article, Case Report, Review	4	10.0
Rev Panam Salud Publica	0.1257	Medline, SciELO, Lilacs	Current Topic	1	2.5
Rev Saúde Publica	0.4434	Medline, SciELO, Lilacs	Technical Report	1	2.5
Transplant Proc	1.061	Medline	Case Report	1	2.5
Total				40	100

Not included 2 videos indexed only by the Lilacs database. NA = not available. Impact factors were from the databases where the document was published and/or from the journal home page.

Of the 40 documents, 36 were produced in public institutions, and only 4 in a private organization. Eighteen documents (45.0%) were written in Portuguese, 21 (52.5%) in English, and 1 (2.5%) in Spanish. Of the 27 papers from Medline, 22 were written in English, 4 in Portuguese, and 1 in Spanish. Of the 16 papers from SciELO, 6 were written in English, 9 in Portuguese, and 1 in Spanish. On the other hand, of the 24 documents from Lilacs, 20 were written in Portuguese, 3 in English, and one in Spanish.

Discussion

Scientific publishing is an intrinsic and important part of the process of dissemination scientific knowledge and innovation. The use of the scientific literature as a measure of research activity has acquired great importance in the assessment of the production and utilization of scientific information[6]. The Brazilian scientific production evaluated by the number of scientific publications in periodicals indexed at the Institute for Scientific Information (ISI) has grown significantly[11]. The areas of knowledge with the highest scientific production in Brazil were Medicine, which accounted for about 25% of the Brazilian publications[7].

It is difficult to establish a comparison of the present results with previous data, given that, to the knowledge, specific studies do not exist about scientific production in the Influenza field by authors of Brazil. In addition, two years is a short period of time, in terms of scientific area, and scientific production. For instance, a scientific discovery may last ten years or more to be proved, validated, discussed and observed by the scientific community[12]. Nevertheless, when Brazilian and world production on Influenza A (H1N1) were compared through a simply and general search on Medline database, Brazil presents a very inexpressive production during 2009-2011 period.

Between 1997 and 2007 the number of Brazilian papers in indexed, peer-reviewed journals more than doubled to 19,000 a year. Brazil now ranks 13th in publications, according to Thomson Reuters, having surpassed the Netherlands, Israel, and Switzerland[13]. Although the Brazilian scientific production has improved over the years, efforts need to be taken in order to achieve a better productivity.

On the other hand, the modest scientific production in this field might not reproduce the reality. A model surveillance was implemented, and the Brazilian National Surveillance Notification System showed an elevate number of H1N1 cases[4]. Brazilian laboratories network and National Influenza Centers worked on their limit, regarding timely identification and investigation of the cases. Moreover, a number of epidemiological bulletins reports have been produced in a range of Brazilian states, which account for scientific production. Unfortunately they are not databases-indexed, and could be accessed only over the Internet. This is the case represented by "Boletim Epidemiologico Paulista" (BEPA), that possess the International Standard Serial Number (ISSN) which identifies periodicals worldwide, whether in printed form or other media (including online)[14].

Another issue concern about some inherent limitations of the available databases, once the accuracy of the data cannot be fully relied on. In the search strategy, the field affiliation has not been designed necessarily as an indication of the place where the research was conducted, though, in most cases, it could indicate it. This field indicates only the geographical location of the first author, and only the first author´s institution and address were accounted, even in documents co-authored by investigators in different states or countries. As a result, if Brazilian researchers were not the first authors in international co-authored papers, the work was not considered during this study.

The present paper demonstrates enormous disparities in different geographical areas of Brazil, and the majority of the documents in this field have been produced by investigators working at public institutions. However, quantitative analysis of scientific production is not sufficient to determine the quality and relevance of the scientific activities performed by research institutions[15].

Most of Brazilian papers come from the state of São Paulo in Southeastern region of Brazil. Investigators in Southeastern and Southern Brazil have produced together 95% of the total scientific output in the field of Influenza A (H1N1). This finding may be explained by the fact that over 80% of the research groups in Brazil are located in these areas of the country[16]. Furthermore, the most resource-rich state research funding agency is located in state of São Paulo: the State of São Paulo Research Foundation (FAPESP) that invests in scientific research projects and fellowships for Master´s, Doctoral students and pos-Doctoral students in the state of São Paulo[17].

Historically, influenza peaks in the more temperate regions during winter season, as observed in the South and Southeastern areas, exhibiting

low temperatures and rainfall, which encourage gathering in closed public areas. In fact, large areas of Brazil had very limited sustained pandemic influenza transmission during the period analyzed here, similar to the experience of other countries of similar latitude[4]. These findings may explain the lack of scientific production in North and Northeastern Brazil, taking together with the imbalanced funding resources distribution.

A similar amount of papers on Influenza A (H1N1) were wrote in English and Portuguese language. English language appeared predominantly in foreign periodic with medium and high IF, while Portuguese language was more common in local medical journals with low IF, especially from Lilacs database. Coura and Willcox[12] reported that Lilacs database may have the advantage of showing the "hidden science" published in second-line journals, and not apparent in more restrictive databases such Medline and SciELO. Actually of the 5 only Lilacs-indexed journals, none have available IF.

This observation on language data indicates that previous efforts made in order to improve the scientific production of Brazilian scientists, and making their observations achieve a broader scientific audience were reached. As suggested by Araujo et al[6], the adherence to stricter criteria of quality for carrying out and reporting research, attention to international editorial conventions and the use of English language to communicate the findings contributed to making Brazilian papers appear in international journals with higher IF, and became more visible to the worldwide scientific community. Other improving strategy could be encouraged the residents and undergraduate students to contribute and participate in publications of scientific papers during their residence or study programs. This would train and enabling them to publish their own data in the future.

Conclusion

The present study supplies a first attempt for scientometric approach that visualizes research activity in the field of influenza A (H1N1) pandemic flu 2009. Scientometrics is a mirror of science, and scientific publication is central to the activity of scientific communities and is moreover made available on a large scale by modern databases (Medline, SciELO, and Lilacs), and the Internet[18].

Latin American scientific production is still growing exponentially and Brazil is the most productive one. However, monitoring the results of the scientific activities is essential for formulating, reviewing and improving research policies, and to assure the appropriate use of financial, human and material resources[19]. Furthermore, it is necessary to assess the results of scientific studies especially those conducted with public funds in order to assure that the results benefit society[15].

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