Scientific Output on Transesophageal Echocardiography from Iberoamerican Countries

Alejandro Diaz,1 Viviana Prener,2 Daniela Dominguez,2 Sergio Rivera Varas,2 Lisandro Damian Colantonio3

CCT Tandil. CONICET (National Council of Scientific and Technical Research);1 Centro de especialidades medicas;2 Mar del Plata, República Argentina;3 Departmento de Epidemiologia – University of Alabama at Birmingham,1 Birmingham, AL – EUA

Abstract

Background: Transesophageal echocardiography (TEE) has attracted great attention and is becoming an important, rapid-progressing scientific field.

Objective: To analyse the contribution and characteristics of scientific publications on TEE from Iberoamerica.

Methods: A literature search was conducted in PubMed (US National Library of Medicine National Institutes of Health) to identify scientific publications on TEE indexed before May 1, 2015. Terms used for the literature search included “transesophageal echocardiography”, “transesophageal echocardiogram”, “3D transesophageal echocardiography”, and “three-dimensional echocardiography”. These terms were combined with each Iberoamerican country. Additional data from the journal of each scientific publication were obtained from the SCImago Journal & Country Rank.

Results: Iberoamerica originated 4% of all publications on TEE. The number of publications from Iberoamerica increased from zero before 1990 to 60 in 2015. Spain, Mexico, and Brazil originated 75% of all publications from the region. About 30% of full-texts were freely available. Most of the scientific publications were in English. About 90% of the publications were case reports or case series about infectious endocarditis, tumors or cardiac masses, congenital heart disease, cardioembolic sources of stroke, and invasive interventional cardiology. Spain and Argentina were the countries that originated manuscripts with a higher likelihood of being published in foreign journals. About 40% of Iberoamerican publications were in journals ranked in the top 25% of scientific journals in their field.

Conclusions: The scientific production on TEE from Iberoamerica is limited, but is increasing. The number and characteristics of publications on TEE show notable differences between Iberoamerican countries. (Int J Cardiovasc Sci. 2016;29(6):422‑430)

Keywords: Echocardiography, Transesophageal / trends; Scientific and Technical Publications; Databases, Bibliographic.

Introduction

Transesophageal echocardiography (TEE) is a widely used technique in daily clinical practice. This method overcomes the limitations of transthoracic echocardiography and provides relevant information for use in the clinic, operating room, and catheterization laboratory, and for postoperative control.1 In 1976, Leon Frazin first described his experience with a single-crystal ultrasound transducer attached to a coaxial cable that was introduced into the esophagus.2 In the following decade, technological innovations and the use of flexible probes allowed the development of more convenient models. TEE has attracted great attention in the last years and is becoming an important, rapid-progressing scientific field. Therefore, it is necessary to survey bibliometric characteristics and portray the overall trends in this research field.

Iberoamerica is a term used since the second half of the 19th century to refer collectively to the countries in the Americas that were formerly colonies of Spain or Portugal and in which Ibero-Romance languages are spoken.3 Iberoamerica is one of the largest language
areas and a culturally cohesive world. Cardiovascular disease is the leading cause of death in Iberoamerica. Clinical research is an important tool for disease control and health promotion and protection. Clinical research was included as one of the 11 essential public health functions monitored by the Pan American Health Organization. Spain, Portugal, Brazil, Mexico, and Argentina lead the medical scientific production in Iberoamerica with a significant increase in recent years. This growth may be associated with the regional economic situation and the increase in funding for research and development.

Although TEE is widely used in the clinical practice, there are limited data on the specific scientific output of Iberoamerican countries in this field. The main aims of this study were to determine the specific contribution of Iberoamerican countries to the overall scientific publications on TEE indexed in PubMed, and to analyze the characteristics and impact of Iberoamerican publications. PubMed provides free access to MEDLINE, a bibliographic database that indexes references from international scientific publications in the medical and biomedical fields and is supported by the United States National Library of Medicine. MEDLINE contains citations and abstracts of articles selected by the National Library of Medicine since 1966. PubMed includes over 24 million citations of biomedical literature from MEDLINE, biomedical journals, and books.

Material and methods

A literature search was conducted in PubMed for scientific publications on TEE indexed before May 1, 2015. The following terms for TEE in English, Spanish, and Portuguese were used for the search: “transesophageal echocardiography”, “transesophageal echocardiogram”, “3D transesophageal echocardiography”, and “three-dimensional echocardiography”. To identify scientific publications originating from Iberoamerica, the bibliometric search was repeated combining terms for TEE with the name of each Iberoamerican country, including Argentina, Brazil, Bolivia, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Portugal, Spain, Uruguay, and Venezuela.

Data retrieved from scientific publications were collected by a single reviewer following a standard protocol and using standard data collection forms and a checklist. Two investigators selected the studies, extracted the data independently, cross-checked the data, and resolved disagreements by consensus. Variables extracted for each research publication included: language of publication, country of the first author, number of authors, year of publication, journal’s name, citation using Vancouver style, free full-text availability, number of authors, publication type (i.e., case report, case series, review, clinical trial, consensus or guideline for clinical practice, editorial, letter to the Editor), and main scientific topic.

Additional data from the journal were obtained from the SCImago Journal & Country Rank website for the retrieved scientific publications. Data obtained from journals included the country of publication, the SCImago Journal Rank (SJR) indicator and its corresponding ranking group among journals in the same scientific field, and the H index. The country of publication was used to determine whether scientific manuscripts were published in a local or foreign journal. Specifically, publications were defined to have been published in a foreign journal if the country of publication and the country of the first author were different. The SJR indicator, its corresponding ranking group among journals in the same research field, and the H index on the year of publication were used to determine the impact of each scientific publication retrieved. The SJR indicator is an impact index provided by Scopus, which is calculated by analyzing citations from publications in a 3-year period. Journals are subsequently ranked in descending order into four groups of equal size (Q1 to Q4) based on their SJR indicator. The first group (Q1) includes the top 25% journals (i.e., those with the highest indicator), and the fourth group (Q4) includes the bottom 25% journals (i.e., those with the lowest indicator). The H index expresses the total number of articles in the journal that have received at least H citations. This index quantifies the scientific productivity of the journal and its scientific impact and is also applicable to scientists, countries, etc. Data were entered into a Microsoft Office Excel® spreadsheet and were exported for analysis with Infostat® statistical software.

Statistical analysis

The number and proportion of scientific publications on TEE were calculated globally and for the following geographic regions: Iberoamerica, Europe (excluding countries in Iberoamerica), North America (excluding
countries in Iberoamerica), Asia, Africa, and Oceania. The number and proportion of publications from each Iberoamerican country were also calculated.

Descriptive statistics were used to analyze characteristics of scientific publications from Iberoamerica and the impact of these publications. Characteristics analyzed included the language of publication, free full-text availability, the number of authors, publication type, and main scientific topic. The proportion of scientific manuscripts published in local or foreign journals was calculated for each country with more than 10 publications. The impact of all scientific publications was analyzed using the SJR indicator and its corresponding ranking group, and the H index. The proportion of scientific manuscripts published in journals ranked in groups Q1 through Q4 was calculated for Iberoamerican countries. Also, the proportion of scientific manuscripts published in the top 25% journals with the highest SJR indicator (i.e., Q1) was calculated for Iberoamerican countries with more than 10 publications.

Results

More than 22,255 publications on TEE were retrieved from PubMed. The first publication originating from an Iberoamerican country was identified in 1990. From 1990 to 2015, a total of 866 scientific publications on TEE from Iberoamerican countries were indexed in PubMed, representing 4% of the total world publications on this scientific field (Figure 1). Overall, the number of publications from Iberoamerica increased from zero before 1990 to 60 in 2015. Figure 2 shows trends on worldwide scientific publications on TEE since the first publication in 1976 and trends on scientific publications on TEE from Iberoamerican countries.

Characteristics of scientific publications from Iberoamerica

Iberoamerican countries with the highest volume of publications were Spain (n = 376), Mexico (n = 154), Brazil (n = 121), and Portugal (n = 97). Argentina and Chile contributed with 58 and 40 publications, respectively. The remaining countries generated less than 10 publications in this period (Puerto Rico = 7, Colombia = 4, Costa Rica = 4, Peru = 2, Uruguay = 2, Panama = 1). No scientific publications were retrieved from Bolivia, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Paraguay, or Venezuela. Figure 3 shows the proportional contribution of each Iberoamerican country. As shown in Figure 4, most of the scientific publications from Iberoamerica were in English, while 13% were in Spanish. Overall, 8% of the publications were in Portuguese or Portuguese and English.

Free full-text was available for 31.5% of all publications from Iberoamerica. The mean ± standard deviation number of authors per research publication was 6.1 ± 2.1 (median 3.5, range 1–25). About the publication type, 48.1% were case reports, 40.8% were case series report, 7.2% were reviews, and 2.2% were clinical trials. Consensuses or guidelines for clinical practice represented 0.5% of all scientific publications from this region. Editorials or letters to the Editor represented the remaining 0.7% and 0.5%, respectively. The scientific topics most commonly analyzed in TEE publications from Iberoamerican countries were infective endocarditis (13% of the publications), cardiac tumors or masses (12%), congenital heart diseases (12%), cardioembolic sources of stroke (9%), and invasive interventional cardiology (9%). These five topics accounted for 55% of all publications.

Spain and Argentina were the countries with the highest proportion of publications in foreign journals (89.3% and 84.2%, respectively) (Figure 5). Conversely, Chile and Portugal were the countries with the lowest proportion of publications in foreign journals (45.0% and 52.6%, respectively). Mexico and Brazil were in an intermediate position.

Impact of scientific publications from Iberoamerica

The mean SJR indicator of Iberoamerican publications was 1.4 (median 0.6). Figure 6 shows the distribution of all publications on TEE from Iberoamerican countries according to their SJR rank group. About 40% of Iberoamerican publications were in journals ranked in the top 25% of scientific journals in their field. Spain was the country with the highest proportion of scientific manuscripts published in journals ranked in Q1 with 54.7%, followed by Argentina (38.6%), Brazil (31.9%), Mexico (29.2%), Portugal (24.5%), and Chile (12.5%). The H index was available for about 50% of the journals. The mean H index of the journals was 75 (median 45). Figure 7 shows the temporal trend in H index of journals from the retrieved scientific publications. With some fluctuations, the H index remained stable over time.
Figure 1 – Distribution of scientific publications on transesophageal echocardiography by geographic region.

Figure 2 – Trends in scientific publications on transesophageal echocardiography, overall and from Iberoamerican countries.
Figure 3 – Distribution of scientific publications on transesophageal echocardiography by country in Iberoamerica.

Figure 4 – Language of scientific publications on transesophageal echocardiography from Iberoamerican countries.
Discussion

TEE offers imaging through a n acoustic window sitting directly behind the heart. In consequence, this approach allows a more comprehensive evaluation of many cardiovascular conditions. Recent advances in image quality and improvements in post-processing capabilities have conducted to new applications in TEE, including three-dimensional TEE. TEE has made the diagnosis of complex pathologies more accurate and is essential for guiding procedural interventions in real time. In this way, with the advent of new technologies, the interest in this subspecialty has increased dramatically, and the scientific outputs in this field have risen substantially. To the best of our knowledge, this is the first literature review of scientific output on TEE from Iberoamerican countries. Iberoamerica represents about 15% of the global land area and accounts for 9.2% of the world population.8 Spanish is the second language in the world by the number of speakers (over 500 million) and the second language of international communication, with a significant increase in the number of publications in Spanish.9 Following the trend of cardiovascular research
publications in Latin America, most scientific production on TEE from Iberoamerican countries analyzed in this study was published in English, while 13% was published in Spanish and a lower frequency in Portuguese.

Scientific research is essential for the growth and economic development of the countries. Communicating scientific findings through publications allows the scientific knowledge to advance and constitutes the beginning and end in the flow of scientific work. Our work shows that Spain, Mexico, and Brazil are the leaders in scientific output on TEE in Iberoamerica; however, Spain and Argentina are the countries that achieved more publications in foreign journals.

Many studies from Latin America are published in foreign journals because Latin American Journals have low impact factors. Moreover, it is common for journals with a high impact factor to be published in English. However, most of the Latin American publishers consider the impact factor secondly and highlight the role of local journals as a mean for dissemination of scientific knowledge in their own countries.

Another aspect to consider is that journals that publish original research in non-English languages are often not covered by the major databases and are not included in systematic reviews or receive a low number of citations. In Latin America, there are 1,498 biomedical journals that publish original clinical research in Spanish. Only 3% of them had an impact factor. Most of these journals are in the fourth ranking group (Q4) in their category. Furthermore, only 4.1% of these journals were indexed in MEDLINE before 2012. Also, there are 14 cardiology journals in Latin America, but only two are indexed in MEDLINE.

In 2003, Latin America and the Caribbean published 2.2% of the references in MEDLINE, representing an increase of 30% compared with 1999. Jahangir et al. performed a bibliometric analysis of cardiovascular research articles from Latin America identified through PubMed in the period of 2001–2010 and reported that the total number of publications increased 18 times, from 41 publications in 2001 to 726 in 2010. The magnitude of the growth in the number of items in cardiology since 1987 was 5.9 to 15 times in the three leading countries (Brazil, Mexico, and Argentina). Cardiovascular publications from Latin America increased by 12.9% annually between 1999 and 2008, according to another study. Our study showed that 4% of the publications in TEE emerged from Latin American countries. Our study is also consistent with an increase in the number of publications over time.

Scientific production in cardiology from Latin America differs significantly among the countries in the region. A prior bibliometric analysis reported a high concentration of cardiovascular publications.
in four leading countries in Latin America: Brazil, Argentina, Mexico, and Chile. Our work shows that this tendency appears to be similar in the area of TEE, with Spain, Mexico, and Brazil as leader countries in scientific output.

A quarter of the articles from Mexico, Brazil, Argentina, and Chile are published in local journals indexed in MEDLINE. The contribution of Latin America to the 50 biomedical journals is made to only 0.4% of the total medical journals. Mexico is the country that publishes more in local journals (32%), followed by Chile (24%), and Brazil (22%). Argentina is the country with fewer publications in local journals (6%). Brazil is the leader in scientific production on cardiovascular disease. However, Argentina and Chile are better positioned with respect to the impact of their publications. In our study, Argentina and Spain were the countries with the highest proportion of publications on TEE in foreign countries. Overall, the H index of scientific publications on TEE from Iberoamerican countries seems to remain stable over time.

Financial support is crucial to the promotion and support of scientific research. Brazil is the leading country in Latin America in terms of total funds for research. Argentina and Chile are other countries in the region that devote substantial financial resources to support scientific research, particularly in noncommunicable diseases. Argentina spends more than 40% of these funds for research in noncommunicable diseases.

This study has known weaknesses. First, the analysis was conducted based exclusively on scientific publications retrieved from MEDLINE using PubMed. Although MEDLINE is the most important bibliographic database, it may not include all scientific publications on TEE from Iberoamerican countries. Specifically, local journals may be underrepresented. Second, the classification of publications in local versus foreign journals was defined based on the country of the first author, which may underestimate the contribution of the other coauthors in collaborative studies across the countries.

Conclusions

The scientific output of Iberoamerican countries in the field of TEE represented one in 20 publications in PubMed and showed a sustained increase in the last 25 years. One-third of the full-texts from the publications were freely available. Case reports and case series were the principal types of publications. Infective endocarditis, cardiac masses, and congenital heart diseases were the main reported topics. A substantial proportion of Iberoamerican publications were in journals ranked in the top 25% of scientific journals in their field. Scientific publications on TEE from Iberoamerica show an important concentration in three countries: Spain, Mexico, and Brazil. Results from this study highlight the importance of promoting scientific publications on TEE in other Iberoamerican countries.

Author contributions

Conception and design of the research: Diaz A, Prener V, Dominguez D, Varas SR, Colantonio LD. Acquisition of data: Diaz A, Prener V, Dominguez D, Varas SR, Colantonio LD. Analysis and interpretation of the data: Diaz A, Prener V, Dominguez D, Varas SR, Colantonio LD. Statistical analysis: Diaz A, Prener V, Dominguez D, Varas SR, Colantonio LD. Writing of the manuscript: Diaz A, Prener V, Dominguez D, Varas SR, Colantonio LD. Critical revision of the manuscript for intellectual content: Diaz A, Prener V, Dominguez D, Varas SR, Colantonio LD.

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