



General Review

Latin America Research Output Within the Top 5 Vascular Surgery Journals

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Background: Dedicated studies on patient outcomes are crucial to the development of effective policies aimed at prevention and management of vascular diseases. This study aims to determine the scientific productivity of Latin American countries through a bibliometric analysis of top 5 vascular journals.

Methods: The 5 dedicated vascular journals indexed in the “surgery” category were selected for analysis. These were the European Journal of Vascular and Endovascular Surgery (EJVES), the Journal of Vascular Surgery (JVS), the Journal of Endovascular Therapy (JEVT), the Journal of Vascular Surgery: Venous and Lymphatic Disorders (JVS-VL) and the Annals of Vascular Surgery (AVS). Databases were queried with the combination of each journal’s name + each of the 21 Latin American countries. All possible combinations were searched. Inclusion criteria were articles affiliated with a university, medical center, or hospital from any Latin American country.

Results: A total of 501 articles were retrieved, 104 (20.7%) were published between 2000 and 2011, and 397 (79.2%) between 2012 and 2022. The journal with the most publications was AVS with 221 (43.9%), followed by JVS with 135 (26.9%), EJVES with 60 (11.9%), JEVT with 49 (9.9%), and JVS-VL with 36 (7.1%). Brazil had the highest volume of publications at 346 (69.0%), followed by Argentina at 54 (10.7%), Chile at 35 (6.9%), and Mexico at 32 (6.3%). JVS had a higher median citation when compared with AVS, JVS-VL, and JEVT, 18 vs. 5, 5.5, and 7, respectively ($P = <0.001$). Furthermore, JVS had a greater median citation than EJVES, at 18 vs. 12.5, respectively ($P = 0.005$). Median citation per year from 2000 to 2011 was 1.59 (range: 0–45), and 1.50 (range: 0–114.5) from 2012 to 2022 ($P = 0.02$).

Conclusions: Latin America’s research output within the vascular surgery field has increased over the years. Efforts must be made to increase research output in this region and translate findings into effective interventions for these populations.

INTRODUCTION

The prevalence of chronic diseases has increased over the last years and current projections estimate that by 2030, these will be responsible for around

70% of the leading causes of death.¹ Among these, vascular diseases such as peripheral arterial disease (PAD) has received increased focus attention in recent years, in both epidemiological and clinical research. PAD is the third leading cause of

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atherosclerotic vascular morbidity after coronary heart disease and stroke.^{2,3} Effective public policy and interventions rely on a robust framework of research providing guidance on population surveillance data, studies of risk factors, and patients' outcomes. High-quality research is common in high-income countries (HIC), but particularly scarce in low–middle-income countries (LMIC).² Additionally, publications allow for communication between physicians or scientists around the globe, allowing the dissemination of data that can potentially impact clinical practice to improve patient outcomes.⁴

Most vascular surgery guidelines are both published and cited in articles from high-impact journals. For example, in the 2019 Global Vascular Guidelines on the Management of Chronic Limb-Threatening Ischemia published in the European Journal of Vascular and Endovascular Surgery (EJVES), 21.7% ($n = 148$) of the 675 citations used in the guideline were from the Journal of Vascular Surgery (JVS), 11.5% ($n = 78$) were from the EJVES, the Annals of Vascular Surgery (AVS), or the Journal of Endovascular Therapy (JEVT), and the remaining 449 citations were, in the majority, from high impact journals.⁵

The developing economies of Latin American countries have led to a significant rise in scientific output over the last decades; however, given the region's share of the global population and gross domestic product (GDP), publication rates are lower than expected. Latin America's share of world publications has grown from 1.6% in 1996 to 4% in 2020.⁶

There are no data on the academic output in vascular surgery from Latin American countries. This study aimed to perform a bibliometric analysis of the scientific production of Latin American countries in the top 5 vascular surgery journals. We previously published an introductory letter on the topic.⁷

MATERIALS AND METHODS

Data Source

The National Library of Medicine and the National Institute of Health PubMed Database® (Bethesda, MD, United States) was used for the search in August 2022. The top 5 vascular surgery journals with higher CiteScore-impact factor (IF) were chosen according to Scopus® (Elsevier, The Netherlands) ranking platform. H indexes were also gathered from Google Scholar. The journals were searched under the “all subject area” by

“medicine” and “all subject category” in the “surgery” category. The journals in descending order were EJVES (IF:7.1, *h-index*:125), JVS (IF: 6.5, *h-index*: 202), JEVT (IF: 5.3, *h-index*: 105), Journal of Vascular Surgery: Venous and Lymphatic Disorders (JVS-VL) (IF: 4.3, *h-index*: 34), and AVS (IF: 2.3, *h-index*: 75). Journals of general surgery or combined areas such as thoracic, cardiac, or interventional radiology were excluded (i.e.: International Journal of Surgery, British Journal of Surgery, Journal of Thoracic and Cardiovascular Surgery, Journal of Cardiovascular Surgery, etc.).

The 21 Latin American countries were included (Mexico, Cuba, Haiti, Dominican Republic, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama, Colombia, Venezuela, Ecuador, Guyana, Brazil, Peru, Bolivia, Paraguay, Uruguay, Chile, and Argentina).

Search Strategy

The search terms used were a combination of the name of the 21 Latin American countries in Spanish and English and the name of the 5 journals previously mentioned, searching for all combinations possible. The literature search was limited from January 2000 until July 2022. Inclusion criteria were articles affiliated with a university, medical center, or hospital from any Latin American country. If several authors published an article from different Latin American countries, this article was counted individually for each country. Exclusion criteria were “New Mexico” and all abstracts-only texts. Informed consent was not required because these data are secondary data without personal information.

Data Collection

Articles were organized by year, country, and by journal. Published articles were classified as national collaborations, Latin American countries collaborations, international collaboratives, or no collaboratives. The type of study was categorized by letter to the editor or editorial, case report, review (narrative, systematic, or meta-analysis), retrospective study, prospective study, clinical trial, or guideline. Articles were classified according to the area of study: aorta, PAD, carotid diseases, venous (all types), lymphatic, or others (venous access, vasculitis, miscellaneous). The number of citations of each article was gathered according to Google scholar.

Data Extraction

Two authors completed the title, abstract screening, and full-text review (MGU, DPA). Data were

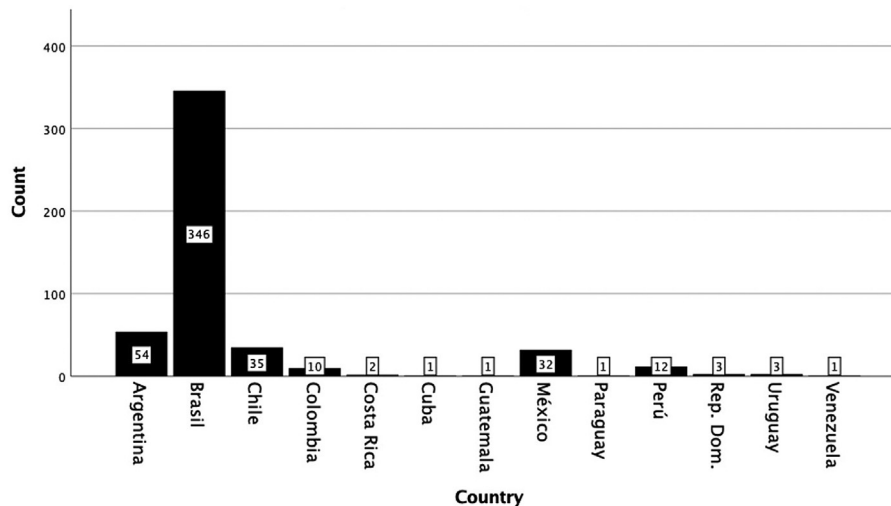


Fig. 1. Number of publications by country.

extracted by 3 authors (MGU, DPA, DHG). Data extracted by 1 author were verified by another for each article. Discrepancies were reviewed and resolved by the senior author (MAF).

Data Analysis

Data were analyzed using SPSS v25 (IBM, Boston, USA). Normality was tested using the Kolmogorov–Smirnov test. Nonparametric testing was performed through Mann–Whitney U-test, Kruskal–Wallis, and Wilcoxon pairwise where appropriate, and results were reported in median and ranges. The frequency of events is described as frequency and percentages, with testing performed through chi-square or Fisher’s exact where applicable. *P* values of <0.05 were considered statistically significant.

RESULTS

A total of 501 articles were retrieved. The journal with the most publications was AVS with 221 (43.9%), followed by JVS with 135 (26.9%), EJVES with 60 (11.9%), JEVT with 49 (9.9%), and JVS-VL with 36 (7.1%). The country with the most publications was Brazil ($n = 346$, 69.0%) followed by Argentina ($n = 54$, 10.7%), Chile ($n = 35$, 6.9%), and Mexico ($n = 32$, 6.3%). Total publications per country are displayed in [Figure 1](#).

The most frequent type of article were original articles followed by case reports, 308 (61.5%) and 106 (21.2%), respectively. Of the 308 identified original articles, 202 (65.5%) were retrospective and 106 (34.4%) prospective. Editorials/letters to the editor

and reviews accounted for 8.2% ($n = 41$) and 8.0% ($n = 40$), respectively. Of the 40 reviews, 16 (40.0%) papers were narrative reviews, 13 (20.0%) systematic reviews, and 13 (20.0%) meta-analysis. [Table I](#) displays article types by country.

International and national collaborations accounted for 16.5% ($n = 83$) and 11.1% ($n = 56$) of identified publications, respectively. Only 2 (0.3%) articles were collaborations between Latin American countries.

Overall, the 501 articles had 12,484 citations. The JVS had 6635 (53.1%) citations, the EJVES had 2098 (16.8%), the AVS had 2,062 (16.5%), the JEVT had 895 (7.1%) and the JVS-VL had 803 (6.4%). Brazil was the most cited country, followed by Argentina, Chile, and Mexico, with 8,373 (67%), 2,327 (18.6%), 1,573 (12.6%), and 1,349 (10.8%) citations respectively. [Table II](#) shows citations per country.

Overall, 104 (20.7%) articles were published between 2000 and 2011, and 397 (79.2%) between 2012 and 2022. The median citation count was 26 (range: 0–710) in the first period and 5 (0–229) in the second period ($P = <0.001$). The median citation per year from the first period was 1.59 (range: 0–45). The second period had a median of 1.50 citations (range: 0–114.5) ($P \leq 0.02$) [Figures 2 and 3](#) show the trend of publications and citations over the years.

The most frequent published topics were aortic and PAD, in 24.6% ($n = 123$) and 22.2% ($n = 111$), respectively. Venous topics were covered in 86 (17.2%) publications, and carotid diseases were studied in 40 (8.0%) articles. The rest, 28.1% ($n = 141$), covered miscellaneous topics such as vasculitis, vascular health policies, genetic disorders,

Table I. Type of articles published by country

Country	Original <i>N</i> (%)	Case report <i>N</i> (%)	Editorial/Letter to the editor <i>N</i> (%)	Reviews <i>N</i> (%)	Guidelines <i>N</i> (%)	Total	<i>P</i>
Argentina	19 (32.2)	14 (25.9)	13 (24.1)	7 (13.0)	1 (1.9)	54	<0.001
Brazil	235 (67.9)	68 (19.7)	17 (4.9)	24 (6.9)	2 (0.6)	346	
Chile	18 (51.4)	12 (34.3)	4 (11.4)	0 (0)	1 (2.9)	35	
Colombia	5 (50)	0	3 (30)	1 (10)	1 (10)	10	
Costa Rica	2 (100)	0	0	0	0	2	
Cuba	1 (100)	0	0	0	0	1	
Guatemala	1 (100)	0	0	0	0	1	
Mexico	18 (56.3)	7 (21.9)	4 (12.5)	2 (6.3)	1 (3.1)	32	
Paraguay	1 (100)	0	0	0	0	1	
Peru	3 (25)	5 (41.7)	0	4 (33.3)	0	12	
Dominican Republic	2 (66.7)	0	0	1 (33.3)	0	3	
Uruguay	2 (66.7)	0	0	1 (33.3)	0	3	
Venezuela	1 (100)	0	0	0	0	1	
Total	308 (61.5)	106 (21.2)	41 (8.0)	40 (8.0)	6 (1.2)	501	

Table II. Citations per country

Country	Total citations <i>N</i> (%)	Median (range)	Citations per year median (range)	<i>P</i>
Argentina	2,327 (18.6)	7 (0–1042)	0.9 (0–14.0)	0.027
Brazil	8,373 (67)	8 (0–710)	1.7 (0–114.5)	
Chile	1,573 (12.6)	8 (0–1042)	1.0 (0–19.0)	
Colombia	1,125 (9.0)	2 (0–1042)	0.6 (0–7.5)	
Costa Rica	38 (0.3)	19 (17–21)	4.3 (3.4–5.2)	
Cuba	14 (0.1)	14	1.7	
Guatemala	3 (0.02)	3	1.0	
Mexico	1,349 (10.8)	5 (0–1,042)	1.0 (0–13.8)	
Paraguay	34 (0.2)	34	11.3	
Peru	417 (3.3)	9.5 (0–119)	3.3 (0–21.3)	
Dominican Republic	259 (2.0)	61 (6–192)	12.2 (3.0–21.3)	
Uruguay	10 (0.08)	3 (1–6)	3.0 (1.0–3.0)	
Venezuela	88 (0.70)	88	6.2	
Total	12,484			

lymphatic diseases, and basic science, among others. [Tables III and IV](#) show published articles categorized by type and topic by journal.

A Wilcoxon signed rank pairwise test revealed higher median citations of the JVS compared with the AVS, the JVS-VL, and JEVT, 18 vs. 5, 5.5, and 7, respectively ($P = <0.001$). Furthermore, the JVS had a greater median citation compared with the EJVES, 18 vs. 12.5, respectively ($P = 0.005$). [Table V](#) shows the citation score by journal.

DISCUSSION

A bibliometric analysis is a standardized method of quantifying research output; furthermore, it is an effective tool for describing the current status,

assessing the strengths and gaps of a specific topic, and predicting future directions.⁸ This analysis was performed on the top 5 dedicated vascular surgery journals as stratified by Scopus® (Elsevier, The Netherlands).

We aimed to assess vascular research within Latin American countries and further illustrate comprehensive trends in vascular topics, as well as the clinical relevance of these publications. The field of vascular surgery research has undergone remarkable expansion in Latin America in the past decades. As shown in [Figure 2](#), the number of publications has progressively increased over the years, with a higher citation rate in the period 2000–2011; however, due to a lag bias, it is well known that older articles are more likely to be cited. We also gathered

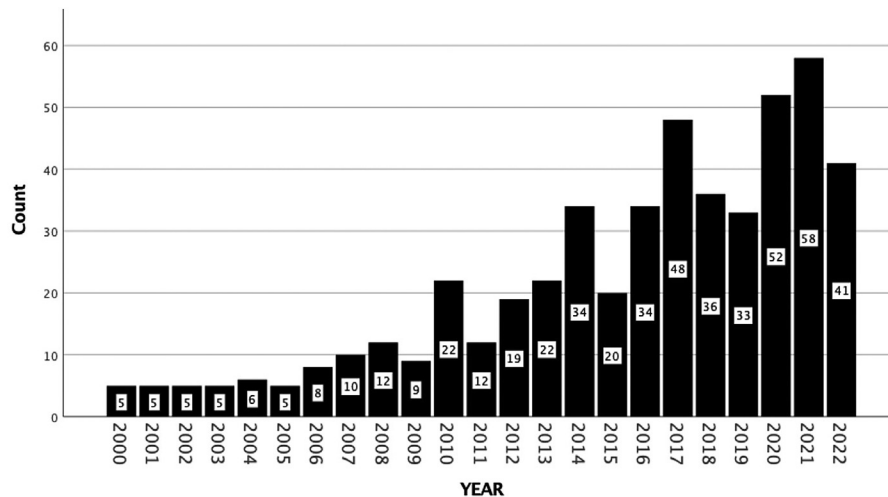


Fig. 2. Number of publications from 2000 to 2022.

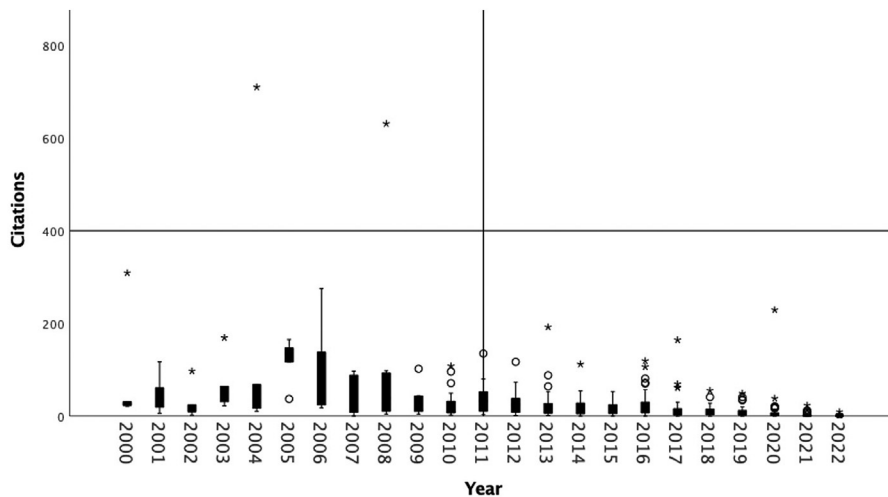


Fig. 3. Box-plot showing citations trend by years.

the metrics citations per year, finding it was similar between both periods, which means that in both periods, published articles have had relatively similar relevance.

Brazil has been responsible for two-thirds of South America's research output.⁶ On the present analysis, Brazil was the most productive country; moreover, 7 of the 10 most productive institutions were from this country. The University of Sao Paulo was the most productive institution with 158 publications. [Supplementary Table 1](#) shows the institutions in Latin America with at least 3 publications. Furthermore, Brazil was the most cited country with 8,373 citations; additionally, the most cited

paper, excluding global guidelines, was a randomized control trial (RCT) of the effects of atorvastatin after vascular procedures from the University of Sao Paulo with 710 citations.⁹

The total number of citations reflects a country's publications' quality and scholarly impact.¹⁰ [Table VI](#) shows the top 5 most cited articles of Latin American countries within the top 5 vascular surgery journals. The Global Vascular Guidelines on the Management of Chronic Limb-Threatening Ischemia with 1,042 citations,⁵ and The 2020 update of the CEAP classification system and reporting standards with 220 citations,¹¹ were excluded from the list.

Table III. Types of articles per journal

Journal	Original N (%)	Case reports N (%)	Editorial N (%)	Reviews N (%)	Guidelines N (%)	Total N (%)	P
AVS	140 (63.3)	62 (28.1)	3 (1.4)	16 (7.2)	0	221	<0.001
EJVES	29 (48.3)	7 (11.7)	15 (25.0)	4 (6.7)	5 (8.3)	60	
JEVT	22 (44.9)	15 (30.6)	9 (18.4)	3 (6.1)	0	49	
JVS	94 (69.6)	20 (14.8)	10 (7.4)	11 (8.1)	0	135	
JVS-VL	23 (63.9)	2 (5.6)	4 (11.1)	6 (16.7)	1 (2.8)	36	
Total	308 (61.5)	106 (21.2)	41 (8.2)	40 (8.0)	6 (1.2)	501	

AVS, annals of vascular surgery; EJVES, European journal of vascular and endovascular surgery; JEVT, journal of endovascular therapy; JVS, journal of vascular surgery; JVS-VL, journal of vascular surgery-venous and lymphatic disorders

Table IV. Published articles categorized by topic

Journal	Aorta	PAD	Carotid	Venous	Lymphatic	Others	Total	P
AVS	51 (23.2)	52 (24.1)	22 (10)	25 (11.4)	0	69 (31.4)	220	<0.001
EJVES	10 (16.9)	25 (42.4)	4 (6.8)	10 (16.9)	0	11 (18.3)	60	
JEVT	32 (65.3)	4 (8.2)	4 (8.2)	2 (4.1)	0	7 (14.3)	49	
JVS	30 (22.2)	29 (21.5)	10 (7.4)	15 (11.1)	0	51 (37.8)	135	
JVS-VL	0	0	0	34 (94.4)	2 (5.6)	0	36	
Total	123 (24.6)	111 (22.2)	40 (8.0)	86 (17.2)	2 (0.4)	139 (27.6)	501	

PAD, peripheral arterial diseases; AVS, annals of vascular surgery; EJVES, European journal of vascular and endovascular surgery; JEVT, journal of endovascular therapy; JVS, journal of vascular surgery; JVS-VL, journal of vascular surgery-venous and lymphatic disorders.

Table V. Metric citations per journal

Journal	Overall citations median (range)	P	Citations per year median (range)	P
AVS	5 (0–64)	<0.001	1.3 (0–23)	<0.001
EJVES	12.5 (0–1,042)		1.1 (0–12.4)	
JEVT	7 (0–135)		1.0 (0–13.5)	
JVS	18 (0–710)		3.0 (0–45.0)	
JVS-VL	5.5 (0–229)		2.5 (0–114.5)	

AVS, annals of vascular surgery; EJVES, European journal of vascular and endovascular surgery; JEVT, journal of endovascular therapy; JVS, journal of vascular surgery; JVS-VL, journal of vascular surgery-venous and lymphatic disorders.

Only one other bibliometric analysis of vascular research output from a specific region has been published. This analysis reported the scientific production of individual vascular surgeons in Australia and New Zealand over 20 years. The authors reported a research output of 2,120 articles, being the most popular topics of thoracoabdominal aortic diseases (24%), followed by PAD (15%).⁴ Similarly, in the present analysis, aortic diseases and PAD were the most popular topics covered in 24.6% and 22.2% of the entire research production. They also reported a higher prevalence of low-quality evidence articles, such as observational studies, case reports, or editorials, than prospective studies or RCTs. Likewise, the present study's most prevalent studies were retrospective studies, case reports, and editorials. It is well known high-quality evidence studies involve greater needs for funding and

resources, as well as higher knowledge of scientific methodology.¹²

The disparities in academic output between HIC and LIC are well established. In the former, researchers are incentivized to publish to obtain grants and promotions.¹³ In LIC, researchers often have less protected time for research, underequipped departments, and arduous clinical responsibilities.¹⁴ Nonetheless, LMICs in Latin America has proven to overcome these barriers. International collaborations between Latin America, Europe, and the United States have flourished, such as the PRESTO study,¹⁵ The El-COVID Survey,¹⁶ and The DETOUR system results,¹⁷ among others.^{18,19}

This analysis demonstrates the lack of collaboration in Latin America. There are no nationwide or international patient databases facilitating large volume analysis, and thus research is limited most of

the times to individual center volume. Efforts must be made to create strong collaborations between Latin America countries, such as creating common databases and projects for improving patients' outcomes. Another strategy might be creating a single independent vascular surgery society unifying all Latin American vascular surgery societies, such as the European Society of Vascular Surgery exists for Europe. This new independent Latin America Society of Vascular Surgery (LASVS) might help diminish the gap between our countries. A new journal can be created by this society, focused on publishing high-quality results from Latin America countries. Moreover, this society could have an annual meeting, seminars, and other activities for sharing knowledge in research and vascular surgery education.

In the present study, we found that a total of 13 countries out of the 21 countries in Latin America have published at least 1 article in the top 5 vascular surgery journals, representing 61.9% of the countries in this region. Research in non-English speaking countries is a challenge. Much of the impactful literature globally has been written in English, and authors mostly prefer to publish in this language to increase readability and citations scores. This preference acts as a barrier, as it is well-known motive for scientific rejections are the critiques of language. Some journals suggest English-editing services, yet this comes with a high cost. Consequently, authors decide to publish in non-English journals, which sometimes are not indexed and thus, not noticed.²⁰

There are several limitations in the present study. First, articles were screened based on reported author affiliations; nevertheless, on occasions, institutional affiliations do not reflect the country in which the authors live and work. Furthermore, this bibliometric analysis does not reflect the total research output of vascular surgery within Latin American countries, as there is a lot of research on vascular surgery published in cardiology, diabetology, general surgery, vascular medicine, and general medicine journals, to mention a few. Furthermore, there are other vascular surgery journals with lesser impact factor where many high-quality articles are published. Said all this, we want to highlight that this is the first bibliometric analysis of vascular surgery research production in Latin America and gives an overview of how our region stands within the vascular surgery community. Future studies, including vascular surgery research output in other vascular surgery journals and other related specialties journals, are warranted for more accurate knowledge

Table VI. Top 5 most cited articles

Year	Country	Article	Total citations	Citations/year	Journal	Type of study
2004	Brazil	Reduction in cardiovascular events after vascular surgery with atorvastatin: a randomized trial	710	39.4	Journal of Vascular Surgery	Clinical Trial
2008	Brazil	Meta-analysis of infrapopliteal angioplasty for chronic critical limb ischemia	631	45.0	Journal of Vascular Surgery	Meta-analysis
2000	Argentina	Initial evaluation of carotid angioplasty and stenting with 3 different cerebral protection devices	309	14.0	Journal of Vascular Surgery	Retrospective
2006	Brazil	Meta-analysis of femoropopliteal bypass grafts for lower extremity arterial insufficiency	275	17.19	Journal of Vascular Surgery	Meta-analysis
2006	Brazil	Meta-analysis of popliteal-to-distal vein bypass grafts for critical ischemia	212	13.2	Journal of Vascular Surgery	Meta-analysis

of Latin American vascular surgery research production.

More high-quality research in Latin America is needed to diminish the knowledge gap in vascular diseases between HIC and LMIC and in the near future, contributing more in-depth to the worldwide guidelines of these diseases.

CONCLUSION

This bibliometric analysis explored the research output of Latin American countries in the top 5 vascular surgery journals. Brazil had the most scientific production, followed by Argentina, Chile, and Mexico. Two-thirds of the countries of Latin America have published at least 1 article in these journals. The most frequent topics covered were aorta and PAD. On the present review, it was noticed that there is a scarcity of scientific collaborations between Latin American countries. There is ample room for vascular surgery research improvement on this region, and efforts must be made for conducting collaborative projects for improving patients' outcomes.

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SUPPLEMENTARY DATA

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.avsg.2023.03.024>.

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