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Latin American research on cardiovascular diseases: A bibliometric-network approach

Antony Paul Espíritu-Martínez [1], Rafael Romero-Carazas [2,*], Dometila Mamani-Jilaja [3], Salvador Gerardo FLores-Chambilla [3], Miriam Zulema Espinoza-Véliz [1], Melvi Janett Espinoza-Egoavil [1], Katerine Karen Gomez-Perez [1], Karina Liliana Espinoza-Véliz [4], Fabrizio Del Carpio-Delgado [2], Tania Quiroz Quesada [5]

[1] Universidad Nacional Autónoma Altoandina de Tarma, Junín, Perú
[2] Universidad Nacional de Moquegua, Moquegua, Perú
[3] Universidad Nacional del Altiplano de Puno, Perú
[4] Universidad Nacional Daniel Alcides Carrión, Pasco, Perú
[5] Universidad César Vallejo, Lima, Perú

Abstract

The increase in the global prevalence of cardiovascular diseases has raised great concern among health professionals worldwide, making the advancement of knowledge in this field even more important. The aim of the study was to perform a bibliometric analysis of the scientific literature in Latin America on cardiovascular pathologies from 2003 to 2023. The methodology was based on a bibliometric and quantitative analysis of the literature. The scientific production indicators were generated from 6660 documents selected from Scopus using keywords in English ("diseases" and "pathologies"). The number of publications devoted to the subject increased by 89% between 2009 and 2022. Brazil is the country with the highest scientific production (63.9%), and the Universidade de São Paulo with the most publications (n=1277). The journal Arquivos Brasileiros de Cardiologia had 684 publications, with Lotufo, P.A. (n=60) being the author with the most papers. It is concluded that cardiovascular diseases are important, as they are the main cause of disability and premature death, and both have an impact on increasing the cost of medical care. As a consequence, there has been an increase in the number of medical studies dedicated to this pathology in Latin America and the rest of the world.

Keywords: Pathologies, Cardiovascular, Latin America, bibliometric, scientific production; social network analysis

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*Corresponding author. Email: rromeroc@unam.edu.pe

1. Introduction

Regarding global mortality rates, cardiovascular diseases rank high, contributing significantly to disability and premature death [1]. Consequently, between 1990 and 2019, the prevalence of cases worldwide doubled, reaching 500 million [2]. Similarly, the number of deaths caused by cardiovascular diseases increased (>6 million), while the number of years of life lost due to disability doubled (from 17 to 34 million). Furthermore, 80% of these deaths occur in low- and middle-income countries, where these figures are even higher [3].

On the other hand, research in cardiology is crucial due to the global increase in mortality and morbidity from cardiovascular diseases, which has caused great concern in healthcare systems worldwide, especially in countries with limited medical resources, like Latin America [4].

Therefore, preventing cardiovascular diseases remains a major concern in our society [5]. Additionally, in both primary and secondary prevention, monitoring cardiovascular risk factors is crucial [6]. Thus, an intervention aimed at reducing cardiovascular morbidity and increasing the adoption of healthy lifestyles would include calculating global cardiovascular risk and appropriately monitoring affected individuals [7].

Given the importance of the topic, scientific research provides a means to understand and improve the health of citizens and contain the growing burden of chronic non-communicable diseases through the development of public policies, evidence-based medicine, and government funding allocation [8,9]. Given this, the new scientific society is driven by knowledge and data presented in academic works, which presents new opportunities for developing methods, indicators, and metrics to conduct more rigorous assessments of authors, journals, and institutions' practices [10]. As a result, bibliometric indicators are developed to quantify the data obtained from the metric analysis of scientific production related to various disciplines of study [11].

In that sense, when applied to literature and other forms of media that include information, "bibliometrics" denotes the use of quantitative methods such as mathematical calculation and statistics [12]. It integrates various quantitative methods that can be used to characterize and quantify scientific literature, with citation analysis as the main method to rank the importance of individual scientific articles [13]. Therefore, most research published in scientific journals is useful for estimating research output and understanding the main collaboration networks among researchers and institutions at the local, regional, or global scale [14].

Thus, categorizing data according to country, year of publication, thematic area, source, document type, and authorship is crucial to explain and represent the understanding of the academic community in Latin America regarding cardiovascular diseases. Building upon this premise, this study aims to conduct a bibliometric analysis of scientific literature in Latin America on cardiovascular pathologies from 2003 to 2023.

2. Methods

Using the Scopus database from Elsevier, a descriptive bibliometric evaluation of all Latin American scientific production on cardiovascular pathologies from 2003 to 2023 was conducted. Bibliometrics, defined as "the systematic and quantitative analysis of published research," was used for data analysis [15].

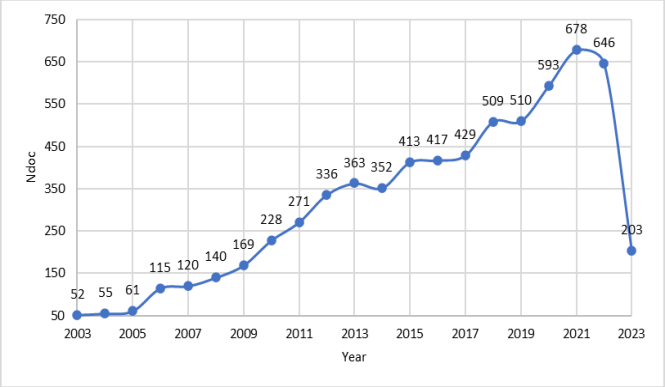
To initiate the information selection process, a comprehensive search was performed on the abstract, title, or keywords of the documents using the terms "cardiovascular" AND "diseases" AND "pathologies" [2,16]. Filters were created based on the applied descriptors and were used to extract the resulting metadata, including aspects such as publication year (2003-2023), Latin American countries, and document type. After removing duplicates and normalizing the information from the central dataset of 15,585 articles and reviews, a subset of 6,660 documents was obtained for analysis.

Finally, the co-occurrence structure of keywords and other general characteristics of scientific production was analyzed. This included publication year, journal, country, author, document type, thematic area, and institutional affiliation. Additionally, VOSviewer V_1.6.19 was used to visualize the co-occurrence map data, and Excel was used to compile and analyze descriptive statistics.

3. Results

The bibliometric analysis allowed the selection of 6,660 documents from the scientific production in Latin America, published in Scopus, on cardiovascular pathologies between 2003 and 2023. As shown in Figure 1, there was an 89% increase in scientific production from 2009 to 2022, with 5,914 publications. Furthermore, the years with the highest scientific production were 2021 and 2022, each accounting for 10% of the total published works in Latin America.

Figure 1. Documents published by year



Source: Scopus data (2023)

The main regions in which research papers have been published on the topic studied are highlighted in Table 1, based on the scientific production of the 20 Latin American countries. Most papers (77%) are written in English, while 16% are in Spanish and only 7% in Portuguese. On the other hand, Brazil (63.9%), Mexico (11.6%), and Colombia (8.3%) top the list in terms of the number of scientific publications on cardiovascular disorders.

Table 1. Publication of documents by country

N°	Country	Ndoc	%Ndoc	N°	Country	Ndoc	%Ndoc
1	Brazil	4253	63.9%	12	Panama	13	0.2%
2	Mexico	774	11.6%	13	Paraguay	12	0.2%
3	Colombia	552	8.3%	14	Guatemala	11	0.2%
4	Chile	383	5.8%	15	Bolivia	4	0.1%
5	Argentina	361	5.4%	16	Dominican Republic	4	0.1%
6	Peru	89	1.3%	17	Honduras	4	0.1%
7	Uruguay	46	0.7%	18	Nicaragua	3	0.0%
8	Ecuador	45	0.7%	19	El Salvador	2	0.0%
9	Cuba	40	0.6%	20	Haiti	1	0.0%
10	Venezuela	36	0.5%	**Total Country**		**20**	
11	Costa Rica	27	0.4%				

Source: Scopus data (2023)

The sample of scientific articles was elaborated using information from 159 different databases. Table 2 shows the main journals regarding the number of articles published on the study topic. In addition, the journal Arquivos Brasileiros De Cardiología published the largest number of articles (n=682), followed by Revista Colombiana De Cardiología (n=219), Plos One (n= 187), Brazilian Journal Of Cardiovascular Surgery (n=95) and Brazilian Journal Of Medical And Biological Research (n=94). Likewise, the journals from Brazil, Mexico, and Colombia have more documents in high-impact sources, with most of the publications classified in the top two quartiles.

Table 2. Publication of papers by source or journal

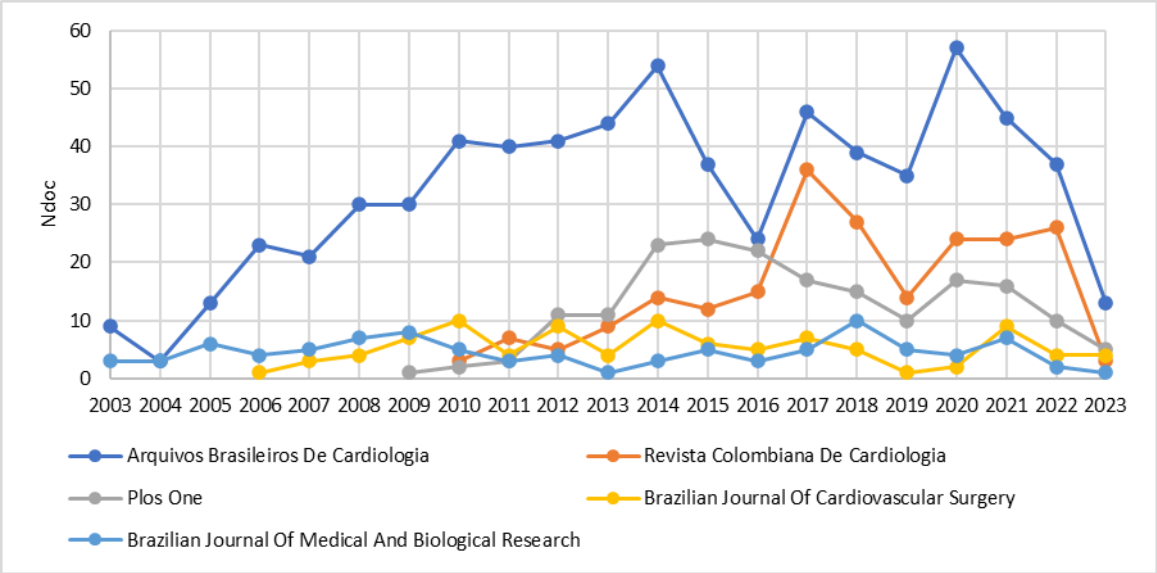
Source	Ndoc	Source	Ndoc	Source	Ndoc
Arquivos Brasileiros de Cardiología	682	Nutrients	54	Lipids in Health and Disease	36
Revista Colombiana de Cardiología	219	Clinics	53	Arquivos de Neuro Psiquiatría	35
Plos One	187	Revista Argentina de Cardiología	49	Jornal de Pediatría	35
Brazilian Journal of Cardiovascular Surgery	95	Diabetology and Metabolic Syndrome	47	Nutrición Hospitalaria	34
Brazilian Journal of Medical and Biological Research	94	Revista Brasileira de Medicina Do Esporte	47	Revista Chilena de Nutrición	34
Archivos de Cardiología de México	92	Sao Paulo Medical Journal	47	Gaceta Médica de México	32
Revista Médica De Chile	91	Revista Brasileira de Epidemiologia	44	Jornal Brasileiro de Nefrologia Orgao Oficial de Sociedades Brasileira E Latino Americana de Nefrologia	32
Revista Da Associacao Médica Brasileira	77	Jornal Vascular Brasileiro	42	BMC Cardiovascular Disorders	31
Cadernos de Saude Pública	73	International Journal of	41	Medicine United States	31

		Cardiovascular Sciences			
Ciencia E Saude Coletiva	73	Revista de Nutricao	39	Revista Da Sociedade Brasileira de Medicina Tropical	31
Revista de Saude Pública	62	Archives of Endocrinology And Metabolism	37	Revista Latino Americana de Enfermagem	29
Arquivos Brasileiros de Endocrinología E Metabologia	61	Scientific Reports	37	Undefined (más 122)	1648
International Journal of Environmental Research and Public Health	57	American Journal of Hypertension	36	**Total revistas**	**159**

Source: Scopus data (2023)

On the other hand, Figure 2 shows the behavior of publications in Latin America on cardiovascular pathologies in the five main journals. The journal Arquivos Brasileiros de Cardiología stands out, with constant publications from 2003 to the present, with 2020 being the year with the most documents (n=57) published. Similarly, the Revista Colombiana de Cardiología records publications from 2010-2023, with the highest production in 2017 (n=36).

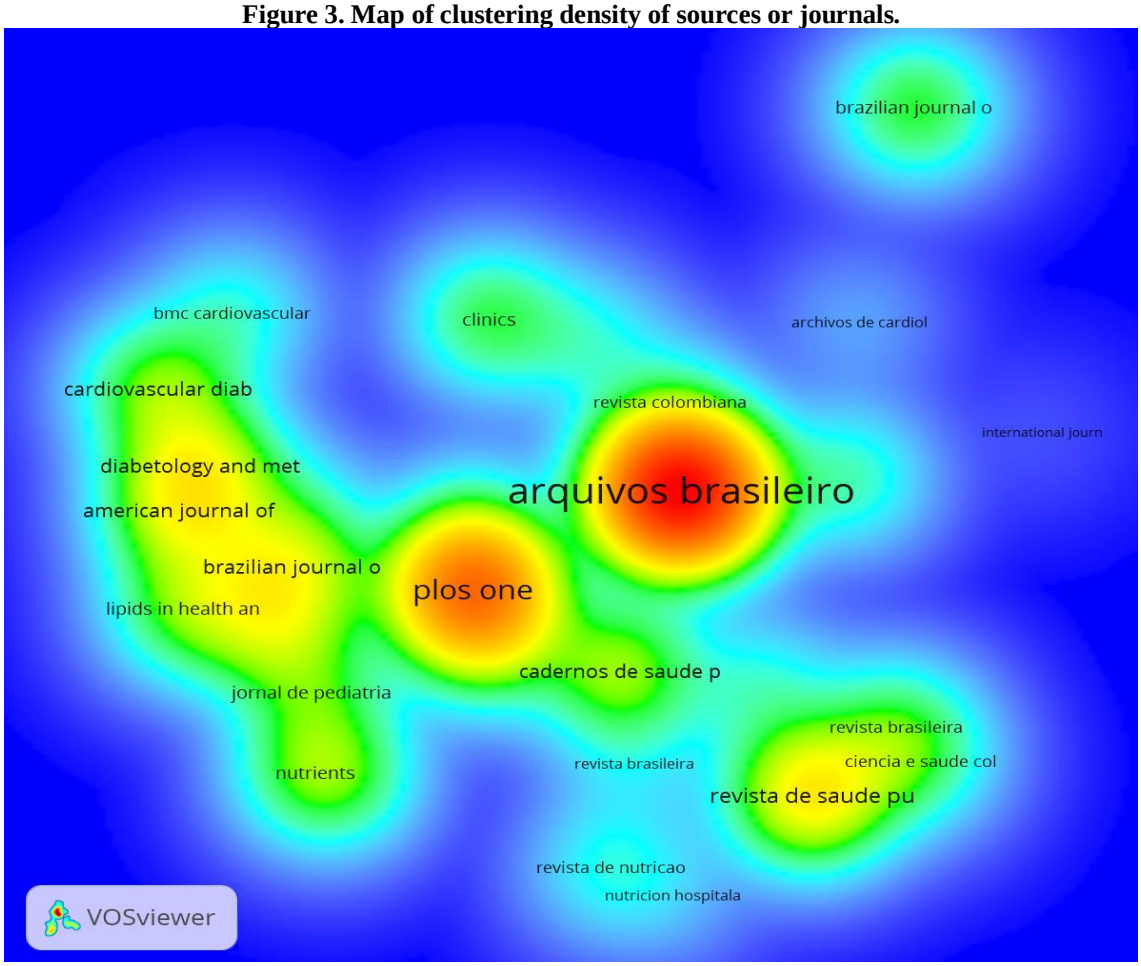
Figure 2. Publication of documents in the main sources.



Source: Scopus data (2023)

Based on the data published by the selected sources, a bibliographic clustering analysis was performed to establish the sets of sources or journals with the most citations (Figure 3). Consequently, four main groups were determined: the first focus was the journal Arquivos Brasileiros de Cardiologia (with 7421 citations), followed by Plos One (4081 citations), and another whose focus was the Revista de Saude Pública (with a citation of 1855). Finally, the fourth highlights the journal Brazilian Journal of Medical and Biological Research (1185 citations). In other words, it was found that the sources that share a high number of citations with these journals tend to be paired according to the bibliographic clustering analysis.

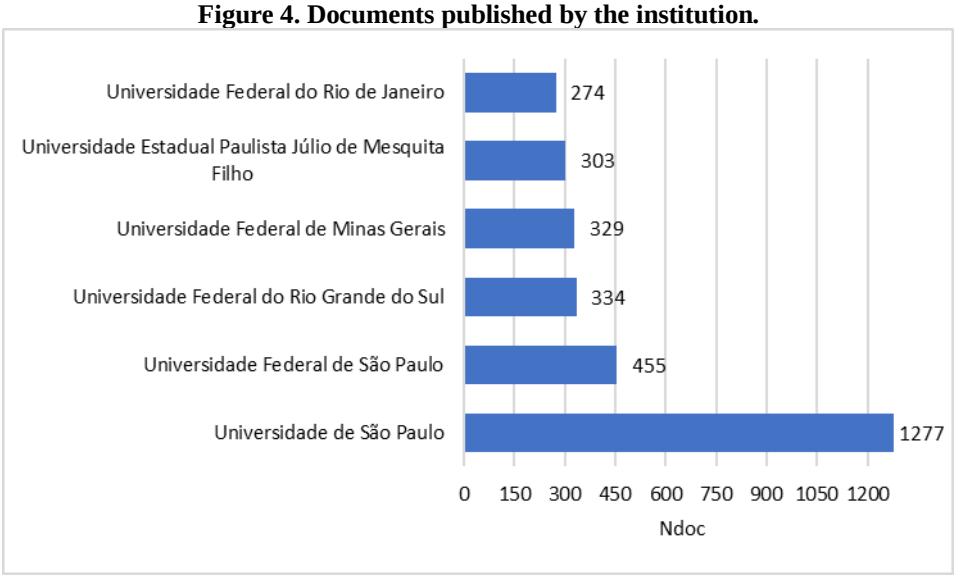
Figure 3. Map of clustering density of sources or journals.



Source: Scopus data (2023)

Researchers from 160 universities wrote the documents. Figure 4 shows that most of the documents on cardiovascular pathologies during the selected study period were published by the Universidade de São Paulo (n=1277), followed by the Universidade Federal de São Paulo (n=455). Universidade Federal do Rio Grande do Sul, Universidade Federal de Minas Gerais, and Universidade Estadual Paulista Júlio de Mesquita Filho have an average of 300 scientific papers published each.

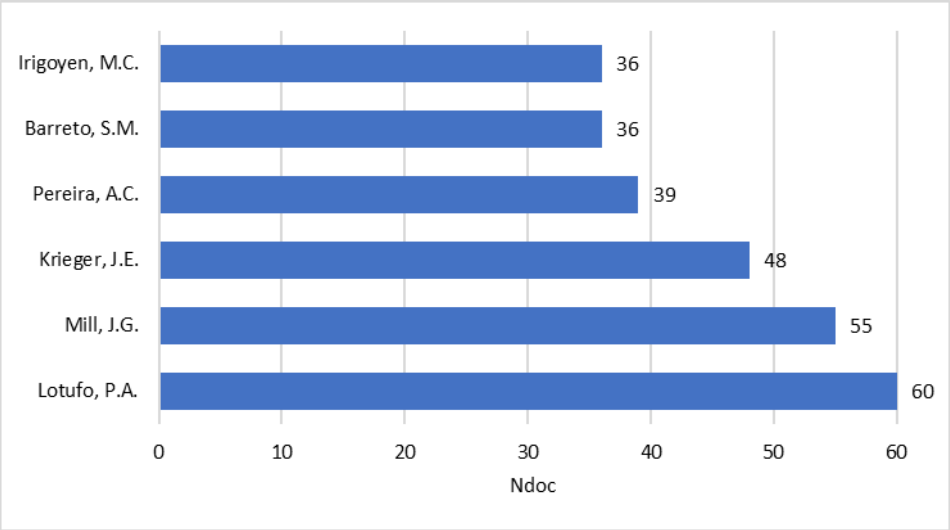
Figure 4. Documents published by the institution.



Source: Scopus data (2023)

Likewise, as can be seen in Figure 5, out of 159 authors from the main Latin American institutions, Lotufo, P.A. stands out with 60 scientific publications related to cardiovascular pathologies, followed by Mill, J.G., with 55 developed documents. Krieger, J.E., Pereira, A.C., Barreto, S.M., and Irigoyen, M.C. stand out with an average of more than 35 publications each.

Figure 5. Papers published by author.



Source: Scopus data (2023)

Table 3 shows the Latin American research on cardiovascular pathologies during the study period (2003-2023), broken down by area and type. Data analysis shows that among the 27 thematic categories analyzed, medicine and biochemistry, genetics, and molecular biology represent more than 68% of the published literature.

Table 3. Publication of papers by subject area and type

Subject area	**Ndoc**	**%Ndoc**
Medicina	5170	57%
Bioquímica, Genética y Biología Molecular	969	11%
Enfermería	529	6%
Farmacología, Toxicología y Farmacia	398	4%
Ciencias Agrarias y Biológicas	354	4%
Inmunología y Microbiología	274	3%
Multidisciplinar	250	3%
Neurociencia	235	3%
Profesiones de la Salud	162	2%
Ciencias Ambientales	115	1%
Otras áreas	625	7%
Total	**9081**	**100%**
Document Type	**Ndoc**	**%Ndoc**
Artículo	6576	98.74%
Ponencia	77	1.16%
Capítulo de libro	4	0.06%
Libro	3	0.05%
Total	**6660**	**100%**

Source: Scopus data (2023)

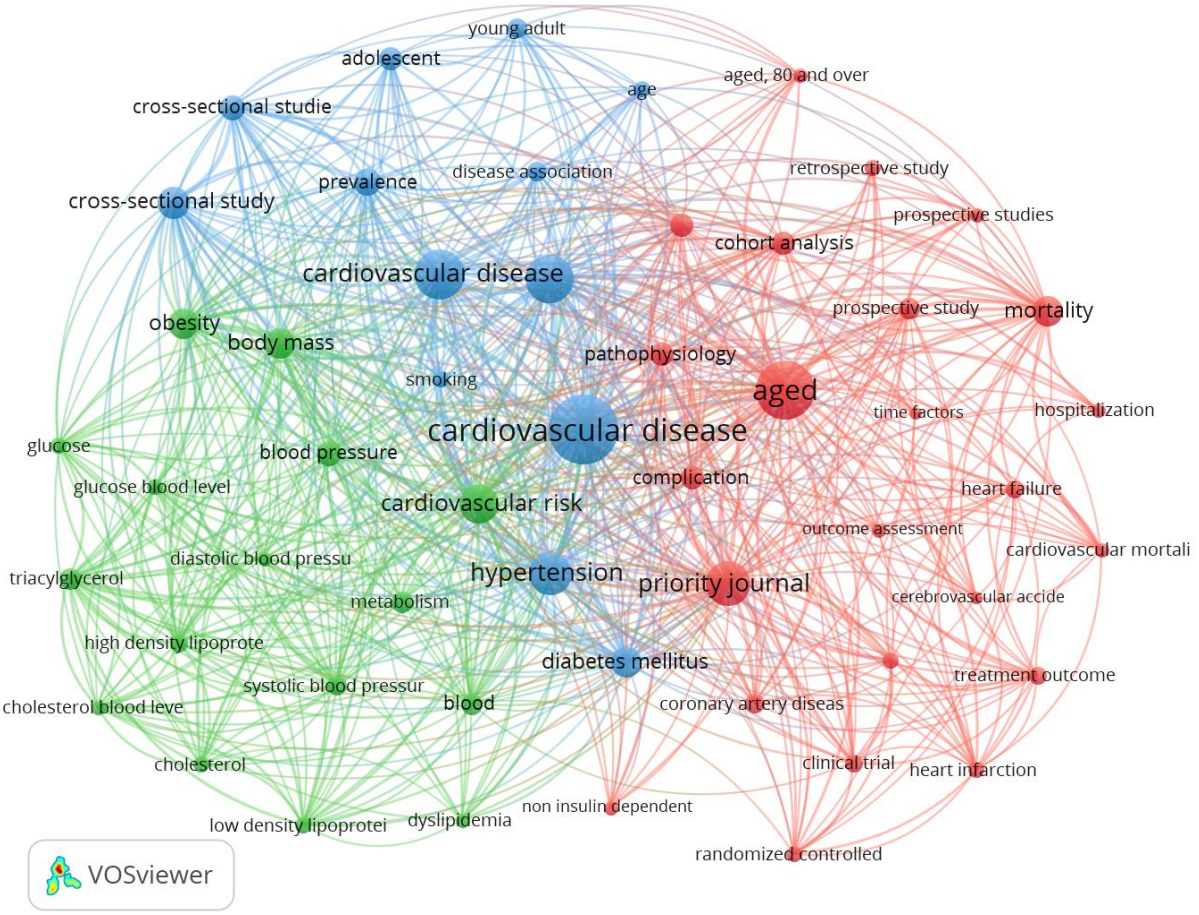
According to the data presented in Figure 6, the area of medicine is responsible for 57% of the total scientific production, while the areas of biochemistry, genetics, and molecular biology account for 11%. On the other hand, if the production is analyzed according to the different types of documents created, it can be seen that scientific articles account for most of the production (98.7%). In comparison, papers represent 1.16%, and book chapters (0.06%) and books (0.05%) an even smaller number.

Selecting terms that appeared more than five times in the title, keywords, and abstract fields yielded the data shown in Figure 7. The degrees of connectedness estimated by VOSviewer were used to designate each color to a set of words related to each other.

- Blue cluster. "cardiovascular disease" (n=7228 occurrences) is associated with the words: disease association, prevalence, smoking, hypertension, diabetes mellitus, young adult, adolescent, cross-sectional study.
- Red cluster. "aged" (n=3628 occurrences) clusters the following words: mortality, complication, myocardial infarction, stroke, temporal factors, age 80 years or older, outcome assessment, treatment outcome, clinical trial, cohort analysis, retrospective and prospective study, heart failure, noninsulin-dependent, cardiovascular mortality.
- Green cluster. "cardiovascular risk" (n=2207 occurrences) refers to a cluster of related words, including obesity, glucose, cholesterol, body mass, blood pressure, metabolism, triacylglycerol, blood glucose level, high-density lipoprotein, blood cholesterol level, dyslipidemia, systolic blood pressure.

The groupings show that the most commonly used terms are inextricably related to the subject of the study.

Figure 6. Keyword co-occurrence map.



Source: VOSviewer (2023)

4. Discussion

The results demonstrate a growing trend in the number of scientific documents addressing this thematic area, with the highest concentration of publications in Latin America between 2018 and 2022 (n=2936; 44% of the total) in the Scopus database. According to Segura-Saldaña et al. [17], there has been an increase in the volume of literature on the topic in recent years. This is because cardiovascular diseases negatively impact public health, necessitating further study of these conditions and their consequences [18-23].

On the other hand, the Universidade de São Paulo, a Brazilian public university, stands out among the most significant institutions in terms of the number of publications it has produced, with 1277. Brazil, in turn, has the highest rate of scientific production (63.9%), with most articles being in English (77%). Additionally, Lotufo, P.A., from the University of São Paulo, is the author with the highest number of publications (n=60). Furthermore, Arquivos Brasileiros de Cardiologia (n=682) and Revista Colombiana de Cardiología (n=219) were the most common sources of articles. However, the most cited journals were the Brazilian Journal of Medical and Biological Research, Arquivos Brasileiros de Cardiologia, Plos One, and Saude Pública.

According to Benítez et al. [20], international cooperation is crucial for academic advancement. Cardiovascular diseases have surpassed all others as the leading causes of death worldwide in recent years [24-29]. Therefore, researchers have new avenues to explore the major disorders associated with this pathology, such as hypertension, type II diabetes, coronary heart disease, and stroke [30]. Consequently, this helps researchers address the challenge of scientific production and establish healthy habits such as physical exercise, a good diet, and necessary medical monitoring (diabetes, cholesterol, tobacco consumption, body weight, hypertension) that benefit cardiovascular health [31-33].

Furthermore, the field of medicine is well-represented in the reviewed articles. However, there is evidence of interdisciplinary work in other fields, such as biochemistry, genetics, molecular biology, nursing, etc. Regarding document type, scientific articles accounted for 98.7% of the total. While the keyword "cardiovascular

disease" was the most frequent, other terms such as "aged" and "cardiovascular risk" did not significantly differ from what researchers explored. Therefore, given that heart diseases are the leading cause of mortality among the population, with over 75% of those deaths occurring in low- and middle-income nations [34-37], the economic burden of cardiovascular pathologies is substantial in Latin American countries where they are prevalent [38-42].

Lastly, terms related to cardiovascular pathology suggest a multidisciplinary approach. While deaths have significantly decreased from the 1980s to the early 2020s, there has been an alarming increase in overall mortality in recent years [43-49]. Consequently, improving cardiovascular health requires new approaches and research [50-52]. Therefore, co-occurrence maps are informative as they reveal how various academic disciplines work together to produce research articles [53-56].

5. Conclusions

This research aimed to conduct a bibliometric analysis of scientific literature on cardiovascular pathologies in Latin America between 2003 and 2023. The analysis of 6660 Scopus articles on cardiovascular disorders throughout the research period shows that this condition encompasses a variety of heart and vascular problems. 89% of all production (5914 publications) was published between 2019 and 2022. Additionally, Brazil accounts for 63.9% (4253 publications) of Latin American scientific research. Furthermore, more articles have been published in Arquivos Brasileiros de Cardiologia (682, to be exact) than in any other journal. The University of São Paulo stands out with 1277 articles. Lotufo, P.A. is the author with the most related articles (n=60). Scientific articles represent 98.7% of production in medical topics (57%). VOSviewer keyword analysis determined that "cardiovascular disease" was the most used term.

Furthermore, research on cardiovascular diseases has expanded its scope as medical, biochemical, genetic, nursing, and pharmacological research has advanced, incorporating these resources in a wide range of clinical settings and scenarios. As the topic's relevance inspires new studies, bibliometric analysis can help stay up-to-date and recognize new researchers. Finally, from the evaluation of publications on cardiovascular pathology, it can be concluded that cardiovascular diseases are significant due to being the leading cause of disability and premature mortality, contributing to increased healthcare expenditures. Therefore, medical research on this condition thrives throughout Latin America and the world.

References

[1] Lago Y, Labrada D, Breijo A, Lago D, Sosa D. Factores de riesgo de las enfermedades cardiovasculares en pacientes mayores de 18 años. Multimed 2022; 26(1):1-17. http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1028-48182022000100010

[2] Vargas-Fernández R, Visconti-López F, Barón-Lozada F, Basualdo-Meléndez G. Análisis bibliométrico de la producción científica peruana en cardiología y medicina cardiovascular. Archivos Peruanos de Cardiología y Cirugía Cardiovascular 2021; 2(3):167-174. https://apcyccv.org.pe/index.php/apccc/article/view/157

[3] Lugo Torres T. Intervención educativa sobre factores de riesgo desencadenantes de la angina de pecho. Interdisciplinary Rehabilitation / Rehabilitación Interdisciplinaria. 2021;1:4. https://doi.org/10.56294/ri20214

[4] Escobar G, Orozco A, Núñez J, Leonardo F. Mortalidad por Enfermedades Cardiovasculares en Colombia 1993-2017. Un análisis de las políticas públicas. Revista Salud Uninorte 2020; 36(3):558-570. http://www.scielo.org.co/scielo.php?pid=S0120-55522020000300558&script=sci_arttext

[5] Unina-Jassir M, Jaimes-Reyes M, Martínez-Vernaza S, Urina-Triana M. The Need for Creating a Unified Knowledge of Cardiovascular Diseases in Latin America. Brazilian Journal of Cardiovascular Surgery 2022; 37(3):1-2. doi: 10.21470/1678-9741-2022-0954

[6] Riganti P, Franco J, Ruiz M, Brito J, Kopitowski K. Prevención primaria cardiovascular y toma de decisiones compartida. Revista Clínica de Medicina de Familia 2019; 12(3):132-139. https://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1699-695X2019000300132

[7] Revueltas M, Valdés Y, Serra S, Suárez R, Ramírez J, Betancourt J. Evaluación del riesgo cardiovascular en una muestra poblacional con dos tablas predictivas en La Habana. Revista Cubana de Medicina General Integral 2022; 38(1):1-17. http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S0864-21252022000100008

[8] Krauskopf E. Cardiovascular disease: The Brazilian research contribution. Brazilian Journal of Cardiovascular Surgery 2019; 34(5):1-9. doi: 10.21470/1678-9741-2019-0285

[9] Ledesma F, Malave González BE. Bibliometric indicators and decision making. Data & Metadata. 2022;1:9. https://doi.org/10.56294/dm20229

[10] Andrade Gontijo MC, Hamanaka RY, Ferreira de Araújo R. Research data management: production and impact from Dimensions database data. Advanced Notes in Information Science. 2022;2:112-20. https://doi.org/10.47909/anis.978-9916-9760-3-6.89

[11] Giaccaglia G, Galarza J, Román P, Costanzo M, Garay S, Rodríguez J, Bellini O, Pérez B. Promoción de la salud cardiovascular y prevención desde etapas tempranas de la vida. Medicina (Buenos Aires) 2023; 83(1):42-45. http://www.scielo.org.ar/scielo.php?pid=S0025-76802023000100042&script=sci_arttext

[12] Robaina Castillo JI. Identifying promising research areas in health using bibliometric analysis. Data & Metadata. 2022;1:10. https://doi.org/10.56294/dm202210

[13] Álvarez L, Frías J, Fernández J, Díaz M. Prevalencia de factores de riesgo cardiovascular en trabajadores de un

hospital terciario de Madrid. Revista de la Asociación Española de Especialistas en Medicina del Trabajo 2020; 29(4):274-288. https://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1132-62552020000400274

[14] Romaní F. Análisis bibliométrico de las publicaciones científicas originales del Instituto Nacional de Salud del Perú en el periodo 1998-2018. Revista Peruana de Medicina Experimental y Salud Publica 2020; 37(3):485-494. http://www.scielo.org.pe/scielo.php?script=sci_arttext&pid=S1726-46342020000300485

[15] Díaz NM. Propuesta de procedimiento para auto-gestionar conocimientos en salud desde la Web, mediante dispositivos móviles y ordenadores. Bibliotecas Anales de investigación 2021;17:3-13.

[16] Alarcón-Ruiz C, Cortez-Soto A, Romero-Cerdan A, Benites-Bullón A, Altamirano-Farfán E, Pino-Zavaleta D, Paredes-Huanca K, Soto-Becerra P, Apolaya-Segura M, Maguiña J. Producción científica y redes de colaboración en la Seguridad Social del Perú (EsSalud): Análisis bibliométrico 2008-2020. Revista del Cuerpo Médico Hospital Nacional Almanzor Aguinaga Asenjo 2021; 14(2):145-154. http://www.scielo.org.pe/scielo.php?script=sci_arttext&pid=S2227-47312021000200006

[17] Coimbra FS, Dias TMR. Use of open data to analyze the publication of articles in scientific events. Iberoamerican Journal of Science Measurement and Communication. 2021;1(3):1-13. https://doi.org/10.47909/ijsmc.123

[18] Caló L. Métricas de impacto y evaluación de la ciencia. Rev Perú Med Exp Salud Pública 2022; 39(2):236-240. https://www.scielosp.org/pdf/rpmesp/2022.v39n2/236-240/es

[19] Corrales Pérez R. Impacto de las lesiones domésticas en la salud pediátrica: una perspectiva epidemiológica. Salud, Ciencia y Tecnología - Serie de Conferencias. 2022;1(2):30. https://doi.org/10.56294/sctconf202230

[20] García L, Fernández A, Bécquer A. Análisis Bibliométrico de la Producción Científica 2001-2020. Revista Electrónica Cuba: Medio Ambiente y Desarrollo 2021; 21(40):1-9. https://cmad.ama.cu/index.php/cmad/article/view/297

[21] Maradiaga E. Análisis bibliométrico de la Revista Médica Hondureña, 1990-2020. Revista Médica Hondureña 2021; 89(1):45-51. https://doi.org/10.5377/rmh.v89i1.11641

[22] Gómez Lima A. Intervención educativa para el manejo del Síndrome Coronario Agudo. Interdisciplinary Rehabilitation / Rehabilitación Interdisciplinaria. 2022;1:1. https://doi.org/10.56294/ri20211

[23] Salinas K, García A. Bibliometrics, a useful tool within the field of research. Journal of Basic and Applied Psychology Research 2022; 3(6):10-17. https://doi.org/10.29057/jbapr.v3i6.6829

[24] Flores A, Saelzer L, Cartagena-Ramos D. Determinantes Sociales de la Salud que influyen en la incidencia/prevalencia de las enfermedades cardiovasculares. Salud, Ciencia y Tecnología. 2023;3:343. https://doi.org/10.56294/saludcyt2023343

[25] Vitón-Castillo A, Díaz-Samada R, Pérez D, Casín-Rodríguez S, Casabella S. Análisis bibliométrico de la producción científica sobre cardiología publicada en las revistas científicas estudiantiles cubanas (2014-2018). Sociedad Cubana de Cardiología 2019; 11(1):37-45. http://scielo.sld.cu/pdf/cs/v11n1/2078-7170-cs-11-01-39.pdf

[26] Carestia DR, Beltran AF, Cerdera F, Sanchez ML, Ibáñez F. Impacto fisiológico de la respiración, en la salud y en el nivel del estrés. Interdisciplinary Rehabilitation / Rehabilitación Interdisciplinaria. 2023;3:46. https://doi.org/10.56294/ri202346

[27] Segura-Saldaña P, Álvarez-Vargas M, Nieto-Gutiérrez W, Pariona-Javier M, Morán-Mariños C. Producción científica en insuficiencia cardiaca en Perú: un estudio bibliométrico. Archivos de Cardiología de México 2022; 92(4):476-483. https://www.scielo.org.mx/pdf/acm/v92n4/1405-9940-acm-92-4-476.pdf

[28] Hernandez-Cruz N. Mapping the thematic evolution in Communication over the first two decades from the 21st century: A longitudinal approach. Iberoamerican Journal of Science Measurement and Communication. 2021;1(3):1-10. https://doi.org/10.47909/ijsmc.88

[29] Dávila C. Tendencia e impacto de la mortalidad por enfermedades cardiovasculares en México, 1990-2015. Revista Cubana de Salud Pública 2019; 45(4):1-18. https://scielosp.org/pdf/rcsp/2019.v45n4/e1081/es

[30] Echevarria-Cruz A, Gracia-Peña EA, Suárez López DE, García Acosta A, Prieto Suárez M. Riego tromboembólico y hemorrágico en la fibrilación auricular no valvular permanente. Salud, Ciencia y Tecnología. 2022;2:162. https://doi.org/10.56294/saludcyt2022162

[31] Suárez M, Navarro M, Caraballo D, López L, Recalde A. Estilos de vida relacionados con factores de riesgo cardiovascular en estudiantes Ciencias de la Salud. Ene 2020; 14(3):1-13. https://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1988-348X2020000300007

[32] Benítez MM, Sandoval VI, Mendoza F. Análisis comparativo entre guías de prevención de enfermedad cardiovascular en la práctica clínica, europea, americana y de costa rica entre los años 2016 y 2019. Revista Médica Sinergia 2022; 7(7):1-16. https://revistamedicasinergia.com/index.php/rms/article/view/868/1660

[33] Gelman Constantin F, Sy A, Derossi P, Sapienza C, Moglia B. Compartir resultados de la investigación: sentidos y sentires en el regreso al hospital. Salud, Ciencia y Tecnología - Serie de Conferencias. 2023;2(1):78. https://doi.org/10.56294/sctconf202378

[34] Cuentas Figueroa R, Cuentas Correa G, Pimienta Gomez S del R. Statistical analysis of social networks as a means of communication for children in educational institutions in Riohacha, La Guajira, Colombia. Metaverse Basic and Applied Research. 2023;2:53. https://doi.org/10.56294/mr202353

[35] Troncoso-Pantoja C, Martínez-Sanguinetti M, Ulloa N, Celis-Morales C. La mayoría de las enfermedades cardiovasculares se atribuyen a factores de riesgo que podrían ser modificados con cambios de los estilos de vida. Revista médica de Chile 2020; 148(1):126-128. https://www.scielo.cl/scielo.php?script=sci_arttext&pid=S0034-98872020000100126

[36] Blundell VLF, Aguirre-Liguëra N, Barité M. Aporte latinoamericano a la investigación en Organización del Conocimiento: una aproximación bibliométrica. Bibliotecas Anales de investigación 2022;18:109-29.

[37] Ballone A. Programa de inmersión en Medicina del Estilo de Vida y sus efectos sobre los factores de riesgo cardiovasculares. Revista de la Facultad de Medicina Humana 2022; 22(1):120-126. http://www.scielo.org.pe/scielo.php?script=sci_arttext&pid=S2308-05312022000100120

[38] Silva-Nieves DS, Serrato-Cherres AG, Soplin Rojas JM, Pomacaja Flores AC, Sullca-Tapia PJ. Contrastando Estrategias Educativas en Ciencias de la Salud vs. Disciplinas No Relacionadas con la Salud: Reflexiones desde la Base de Datos Scopus. Salud, Ciencia y Tecnología. 2023;3:439. https://doi.org/10.56294/saludcyt2023439

[39] Gontijo MCA, Hamanaka RY, de Araujo RF. Research data management: a bibliometric and altmetric study based on Dimensions. Iberoamerican Journal of Science Measurement and Communication. 2021;1(3):1-19. https://doi.org/10.47909/ijsmc.120

[40] Gómez Cano CA, Sánchez Castillo V, Clavijo Gallego TA. Unveiling the Thematic Landscape of Generative Pre-trained Transformer (GPT) Through Bibliometric Analysis. Metaverse Basic and Applied Research. 2023;2:33. https://doi.org/10.56294/mr202333

[41] Nicolau L. Can Intermittent Fasting Associated with a Low-Carb Diet Prevent Cardiovascular Disease in Pre-Diabetics? Arquivos Brasileiros de Cardiología 2023; 120(4):1-2. https://www.scielo.br/j/abc/a/J4CvqMLTf3xxkpD6Q3rgfdk/?lang=pt

[42] Salvatierra Rojo DG, Lucila Silveti L, Florencia Muñoz Padilla AM. Psicología y salud pública: revisión sistemática y caracterización de los procesos de trabajo. Salud, Ciencia y Tecnología - Serie de Conferencias. 2023;2(1):189. https://doi.org/10.56294/sctconf2023189

[43] Bohórquez DP, Chaviano OG. Implementación de aplicaciones móviles para la gestión de la investigación a partir de información bibliométrica. Bibliotecas Anales de investigación 2021;13:162-72.

[44] Lima Rodriguez JM, Auza-Santiváñez JC, Guerra-Chagime R, Suárez López DE. Cuban Scientific Production on Intensive Care and Emergency Medicine in Scopus (2019-2021). Data & Metadata. 2022;1:3. https://doi.org/10.56294/dm20223

[45] Guilherme L, Resende M, Martins M, Vieira L, Teixeira C, Nunes E, Mendes F, Fernandes D, Rocha M, Teodoro G, Taniguchi F, Pinho A. Cardiovascular Statistics from the Good Practices in Cardiology Program – Data from a Brazilian Tertiary Public Hospital. Archivos Brasileños de Cardiología 2023; 120(2):1-10. https://www.scielo.br/j/abc/a/psvkhMSYnK5vNMZkcRw8czC/?lang=pt

[46] Herrera Miranda GL, Godínez Linares R, Sánchez Robaina D, Rodríguez León R de la C. Analysis of the scientific production on the use of ultrasound in cardiopulmonary resuscitation in Scopus. Data & Metadata. 2023;2:37. https://doi.org/10.56294/dm202337

[47] Díaz-Chieng LY, Auza-Santiváñez JC, Robaina Castillo JI. The future of health in the metaverse. Metaverse Basic and Applied Research. 2022;1:1. https://doi.org/10.56294/mr20221

[48] Alves L, Ziegelmann P, Ribeiro V, Carisi P. Hospital Mortality from Myocardial Infarction in Latin America and the Caribbean: Systematic Review and Meta-Analysis. Archivos Brasileños de Cardiología 2022; 119(6):970-978. https://www.scielo.br/j/abc/a/y67FD7NZyzdvKnDtsmxRqMy/?lang=pt

[49] Sembay MJ, Jeronimo de Macedo DD. Health information systems: proposal of a provenance data management method in the instantiation of the W3C PROV-DM model. Advanced Notes in Information Science. 2022;2:192-201. https://doi.org/10.47909/anis.978-9916-9760-3-6.10

[50] Mesa Trujillo D, Zayas Argos C de la C, Verona Izquierdo AI, García Mesa I, López Zamora A. Caracterización de la capacidad funcional en Adultos Mayores. Interdisciplinary Rehabilitation / Rehabilitación Interdisciplinaria. 2022;2:17. https://doi.org/10.56294/ri202217

[51] Chandran R. Human-Computer Interaction in Robotics: A bibliometric evaluation using Web of Science. Metaverse Basic and Applied Research. 2022;1:22. https://doi.org/10.56294/mr202222

[52] Moraes G, Kass N. Managing Women's Cardiovascular Diseases: It's Everyone's Job. Archivos Brasileños de Cardiología 2023; 120(3):1-3. https://www.scielo.br/j/abc/a/GGPfKn5bDDSC79nmBwbdPYC/?lang=pt

[53] Aguirre MH. Producción científica sobre seguridad del paciente en el área de Enfermería en Latinoamérica. Salud, Ciencia y Tecnología. 2021;1:17. https://doi.org/10.56294/saludcyt202117

[54] Rahimi K, Lam CSP, Steinhubl S. Cardiovascular disease and multimorbidity: A call for interdisciplinary research and personalized cardiovascular care. PLoS Med 2018; 15(3): e1002545. https://doi.org/10.1371/journal.pmed.1002545

[55] Ruiz-Mori I, Romero-Carazas R, Espíritu-Martínez AP, Mamani-Jilaja D, Valero-Ancco VN, Flores-Chambilla SG. Análisis bibliométrico de la producción científica sobre competencia y brecha digitales. Bibliotecas Anales de investigación 2023;19.

[56] García Miranda AI, Valle Campo MC, González Serra JL, Valdés López Y, Perdomo Falcón Y. Discapacidad y funcionabilidad de los adultos mayores. Interdisciplinary Rehabilitation / Rehabilitación Interdisciplinaria. 2022;2:11. https://doi.org/10.56294/ri202211