Research Article

Achievements and Visibility of Scientific Publications of All Peruvian Medical Schools: A 5-Year Scientometric Analyses

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Objective. To evaluate the bibliometric profile of the national academic production of public and private medical schools in Scopus after the publication of a new university law (2015–2020). Methods. A descriptive bibliometric study was conducted. The secondary data corresponding to the 42 Peruvian medical schools that had scientific publications in Scopus from 2015 to 2020 were evaluated, and the Affiliation ID of each Peruvian institution was considered. Data were analysed using SciVal. Results. The total production of the Peruvian medical schools was 5406 manuscripts (100%), of which 3018 (56%) were included in the 'clinical medicine' category. The total production of publications in Peru from 2015 to 2020 was 21597 manuscripts, of which medical publications accounted for 7950, with only 5406 manuscripts belonging to the Faculties of Medicine of Peru. The Peruvian Journal of Experimental Medicine and Public Health had published the highest number of manuscripts (500 articles), with an approximate publication citation of two. Conclusion. There was a constant increase in the scientific production of Peruvian medical schools from 2015 to 2020. Additionally, it was found that medical publications contribute the most to the total scientific production of Peru.

1. Introduction

Scientometrics consists of the application of different statistical methods to analyse results of scientific research indexed in databases such as Embase, Scopus, Medline, and Web of Science. This area measures the scientific productivity of institutions, especially in the field of medicine [1].

Bibliometric studies generally analyse the quantitative characteristics of scientific publications to obtain findings in relation to scientific communication. This type of research enables drawing contrasts between countries, affiliations, and/or authors. Consequently, bibliometrics is the numerical analysis of scientific publications in a certain period, field, or institution, and the collaborations between them [2].

Scientometrics analyses study the impact of scientific production in an area of knowledge, such as collaborative networks that help identify dynamics between authors, countries, and institutions [3, 4]. In this sense, it is important to know the activities related to scientific publication in the faculty of human medicine and quantify their impact based on number of citations. Medical schools play an important role in the creation of knowledge based on scien-
tific evidence, especially for optimal decision-making [5].

However, a lack of methodological uniformity can be observed in the evaluation of scientific production by medical schools, which may directly impact their reputation. For example, when evaluating the scientific production of medical schools in Europe, different bibliometric data have been used to track the amount of international collaboration, volume, and increases in research production, integrating different bibliometric techniques that could provide a more nuanced and accurate interpretation of the research output of medical schools [6].

Thus, this research was aimed at determining the scientometric profile of the national academic production of all Peruvian medical schools in Scopus.

2. Methods

2.1. Study Design. This scientometric study was of retrospective, descriptive, and observational design. All medical schools in Peru that had a Scopus ID were evaluated, which corresponded to 42 faculties. The scientific production of these faculties was evaluated between 2015 and 2020 (Table 1).

2.2. Search Strategy. The search strategy was developed based on the institutional profiles (Affiliation ID) of Peruvian universities that had a school of human medicine. Afterwards, the profiles found in the Scopus database were exported to a CSV file, which was then imported into the SciVal tool to proceed with the bibliometric analysis. This analysis included indicators such as scientific production by sub-subject area, total scientific production, type of collaboration, scientific production by university, and indexed journals with the highest publication of Peruvian medical manuscripts.

2.3. Medicine School Selection. All Peruvian colleges were evaluated according to the licensing pattern issued by the regulatory entity SUNEDU (National Superintendency of Higher Education). The following selection criteria were applied:

Inclusion criteria are as follows:

(i) public Peruvian medicine schools
(ii) private Peruvian medicine schools
(iii) public and private Peruvian medicine schools with institutional licensing by SUNEDU

Exclusion criteria are as follows:

(i) Peruvian medicine schools that do not have Scopus registration

2.4. Statistical Data Analysis. A descriptive statistic of the scientific production of all the evaluated medical schools was obtained and tabulated in Excel. Bibliometric analysis was performed using the SciVal tool from Scopus.

3. Results

3.1. Scholarly Output of Peruvian Medical Schools. The total production of the Peruvian medical schools was 5406 manuscripts (100%), of which 3018 (56%) were included in the “clinical medicine” category. In contrast, the “basic medicine” and “health sciences” categories were represented by 36% and 34%, respectively. Finally, only 1% of the investigations were in the “medical biotechnology” category (Table 2).

3.2. Scientific Production of All Medical Schools in Peru. Of the 42 Peruvian universities with a faculty of medicine, the leading institutions were Universidad Peruana Cayetano Heredia, Universidad Nacional Mayor de San Marcos, and Universidad Peruana de Ciencias Aplicadas, with 2172, 975, and 705 manuscripts, respectively. In relation to other institutions, a progressive increase was observed from 2015 to 2020 (Table 3).

3.3. Top 10 Scientific Journals which Publish Manuscripts from the Medical Schools of Peru. The Revista Peruana de Medicina Experimental y Salud Publica had the highest number of manuscripts at 500, with an approximate publication citation of two. The American Journal of Tropical Medicine and Hygiene was in the second place with a total of 130 published manuscripts and a higher average publication citation of 7.2. The Revista de Gastroenterología del Peru was in the third place with 115 published manuscripts, although its average publication citation (0.7) was one of the lowest (Table 4).

3.4. Top 10 Authors Who Published Manuscripts from the Medical Schools of Peru. The most productive authors that exceeded 100 publications in this category were Miranda, Juan Jaime; Bernabe-Ortiz, A; and Mejia, Christian R, from the Universidad Peruana Cayetano Heredia and Universidad Continental, with 213, 126, and 110 published manuscripts, respectively. The first two authors had an average of 44 and 56.8 citations per publication, while the third author had 2.6. Finally, the authors with the best h-index were Gilman, Ribert Hugh; Gotuzzo, Eduardo H.; García, Héctor Hugo; and Hernandez, Adrian V., with an h-index of 55, 49, and 48, respectively (Table 5).

4. Discussion

Scientometric analysis is a conglomeration of statistical methods used to quantify scientific production. Bibliometric mapping provides an excellent method for visualizing publication and citation information. This allows information to be represented in ways that make relationships objective and easy to understand [7].

Citation analysis of scientific articles is a method used to evaluate the quality of published scientific articles. The number of citations is generally correlated with the quality of the research. Citation analysis matches well with other indices of scientific recognition; therefore, it is frequently used to evaluate the academic production of a certain subject, author, or institution. Therefore, this bibliometric study can help
researchers understand published scientific information and help doctors make decisions [8–12]. The present study used different bibliometric methods to measure factors such as scientific production, collaboration, and citations. However, it may include undue biases since it uses secondary data published in databases.

Another study reported that health science research has increased in recent years. For instance, Saudi Arabia currently leads the Arab world in medical education and research. According to a bibliometric study conducted in Jordan, an increase in the number of research articles and international collaborations was reported from years 2008 to 2017 [13]. An analysis of the distribution by subject area reveals that the area of medicine has the highest number of publications compared to other areas in the health sciences. This implies that these other areas need more attention from politicians and researchers to achieve a global research approach [13].

This study only analysed the number of manuscripts, quality, and impact of publication citations. Furthermore, it was limited to scientific databases such as Scopus. Future research should compare the productivity of health research with other high-income, scientifically advanced countries [8–12].

For example, in Peru, there are a few studies that measure the thesis rate of medical postgraduate students in the Doctorate program for Health Sciences in Lima. A study by Fernandez-Giusti et al. mentioned that the highest thesis defense production took place between 2014 and 2020. Additionally, there was an enhanced relationship between the students’ doctoral thesis defense and their career doctorate [14]. Other studies have shown that the academic

Table 1: All faculties of health of sciences or medicine in Peru.

| N°  | Scopus ID | University                        | N°  | Scopus ID | University                        |
|-----|-----------|-----------------------------------|-----|-----------|-----------------------------------|
| 1   | 60071237  | Universidad Peruana Cayetano Heredia | 22  | 60105266  | Universidad Nacional San Luis Gonzaga de Ica |
| 2   | 60071231  | Universidad Nacional Mayor de San Marcos | 23  | 60113141  | Universidad Privada San Juan Bautista |
| 3   | 60103706  | Universidad Peruana de Ciencias Aplicadas | 24  | 60109730  | Universidad Católica Los Ángeles de Chimbote |
| 4   | 60089535  | Universidad Nacional San Agustín de Arequipa | 25  | 60105265  | Universidad Nacional Toribio Rodríguez de Mendoza de Amazonas |
| 5   | 60078122  | Universidad Científica del Sur       | 26  | 60105267  | Universidad Nacional Micaela Bastidas de Apurímac |
| 6   | 60104616  | Universidad de San Martín de Porres  | 27  | 60105305  | Universidad Peruana Unión |
| 7   | 60104719  | Universidad San Ignacio de Loyola    | 28  | 60105284  | Universidad Nacional Hermilio Valdizán |
| 8   | 60071256  | Universidad Nacional San Antonio Abad del Cusco | 29  | 60112059  | Universidad Norbert Wiener |
| 9   | 60108878  | Universidad Continental             | 30  | 60105109  | Universidad Nacional San Cristóbal de Huananga |
| 10  | 60071251  | Universidad Nacional de Trujillo     | 31  | 60110655  | Universidad Nacional de Tumbes |
| 11  | 60078117  | Universidad Privada del Norte        | 32  | 60071259  | Universidad Nacional de Cajamarca |
| 12  | 60105261  | Universidad Ricardo Palma            | 33  | 60109322  | Universidad Católica Santo Toribio de Mogrovejo |
| 13  | 60071261  | Universidad Nacional Federico Villarreal | 34  | 60105303  | Universidad Nacional Jorge Basadre Grommann |
| 14  | 60105306  | Universidad César Vallejo           | 35  | 60089536  | Universidad Nacional Santiago Antúnez de Mayolo |
| 15  | 60105309  | Universidad Católica de Santa María  | 36  | 60105304  | Universidad Peruana los Andes |
| 16  | 60105301  | Universidad Privada Antenor Orrego   | 37  | 60112678  | Universidad Privada de Tacna |
| 17  | 60071253  | Universidad Nacional de la Amazonia Peru | 38  | 60105286  | Universidad Nacional Amazónica de Madre de Dios |
| 18  | 60071260  | Universidad Nacional del Altiplano de Puno | 39  | 60105328  | Universidad Nacional José Faustino Sánchez Carrión |
| 19  | 60105110  | Universidad Nacional del Centro del Perú | 40  | 60105262  | Universidad Nacional del Santa |
| 20  | 60105282  | Universidad Nacional Pedro Ruiz Gallo | 41  | 60105285  | Universidad Nacional Daniel Alcides Carrión |
| 21  | 60104034  | Universidad Nacional de Piura        | 42  | 60120619  | Universidad San Pedro |

Table 2: Scientific production of the Peruvian Medicine Faculties by sub-subject area.

| Subcategory                        | Scholarly output | % Citations | Authors | Citations per publication | Field-weighted citation impact |
|------------------------------------|------------------|-------------|---------|---------------------------|--------------------------------|
| Faculties of Medicine in Peru      | 5406             | 100         | 43249   | 5983                      | 8                             | 1.1                             |
| Clinical medicine                  | 3018             | 56          | 23332   | 3388                      | 7.7                           | 1.0                             |
| Basic medicine                     | 1927             | 36          | 22103   | 2682                      | 11.5                          | 1.4                             |
| Health sciences                    | 1861             | 34          | 8506    | 2709                      | 4.6                           | 0.8                             |
| Other medical science              | 802              | 15          | 13315   | 1311                      | 16.6                          | 2.2                             |
| Medical biotechnology              | 61               | 1           | 131     | 147                       | 2.1                           | 0.3                             |
production of public and private Peruvian colleges has increased notably, especially since 2014. This could be a result of greater investment, further incentives, improvement of laboratories, and hiring of researchers with extensive experience, among other reasons [15].

Table 3: Scientific production of all medical faculties in Peru.

| Peruvian medical schools                                      | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | Overall |
|---------------------------------------------------------------|------|------|------|------|------|------|---------|
| Universidad Peruana Cayetano Heredia                          | 304  | 343  | 349  | 338  | 373  | 465  | 2172    |
| Universidad Nacional Mayor de San Marcos                      | 103  | 110  | 149  | 163  | 165  | 285  | 975     |
| Universidad Peruana de Ciencias Aplicadas                     | 114  | 131  | 99   | 126  | 136  | 99   | 705     |
| Universidad de San Martín de Porres                           | 40   | 83   | 76   | 92   | 92   | 124  | 507     |
| Universidad Científica del Sur                                | 35   | 46   | 24   | 52   | 97   | 227  | 481     |
| Universidad San Ignacio de Loyola                             | 1    | 4    | 17   | 34   | 90   | 148  | 294     |
| Universidad Continental                                       | 3    | 11   | 24   | 37   | 54   | 77   | 206     |
| Universidad Ricardo Palma                                      | 6    | 28   | 13   | 25   | 31   | 44   | 147     |
| Universidad Nacional de Trujillo                               | 7    | 22   | 19   | 19   | 33   | 42   | 142     |
| Universidad Privada Antenor Orrego                            | 10   | 27   | 35   | 20   | 18   | 29   | 139     |
| Universidad Nacional San Agustín de Arequipa                  | 5    | 8    | 16   | 21   | 35   | 41   | 126     |
| Universidad Nacional Federico Villarreal                      | 6    | 8    | 13   | 16   | 20   | 50   | 113     |
| Universidad Privada del Norte                                 | 0    | 6    | 25   | 25   | 17   | 34   | 107     |
| Universidad Nacional San Antonio Abad del Cusco                | 5    | 16   | 13   | 20   | 21   | 22   | 97      |
| Universidad Nacional “San Luis Gonzaga” de Ica                 | 4    | 21   | 21   | 12   | 17   | 13   | 88      |
| Universidad Católica Los Ángeles de Chimbote                   | 0    | 12   | 13   | 6    | 16   | 33   | 80      |
| Universidad Privada San Juan Bautista                          | 0    | 5    | 7    | 8    | 20   | 33   | 73      |
| Universidad Católica De Santa María                            | 9    | 8    | 8    | 8    | 12   | 24   | 69      |
| Universidad César Vallejo                                     | 3    | 5    | 7    | 7    | 12   | 30   | 64      |
| Universidad Nacional de la Amazonia Peruana                    | 8    | 10   | 4    | 13   | 10   | 17   | 62      |
| Universidad Nacional de Piura                                  | 7    | 9    | 11   | 7    | 7    | 10   | 51      |
| Universidad Nacional Pedro Ruiz Gallo                          | 6    | 9    | 6    | 7    | 10   | 13   | 51      |
| Universidad Norbert Wiener-UNW                                 | 1    | 2    | 2    | 3    | 11   | 31   | 50      |
| Universidad Nacional del Altiplano de Puno                     | 3    | 4    | 9    | 6    | 11   | 13   | 46      |
| Universidad Católica Santo Toribio de Mogrovejo               | 2    | 8    | 9    | 6    | 5    | 14   | 44      |
| Universidad Nacional Hermilio Valdizán                         | 1    | 2    | 1    | 4    | 6    | 29   | 43      |
| Universidad Peruana Unión                                      | 1    | 1    | 0    | 2    | 10   | 25   | 39      |
| Universidad Nacional del Centro del Perú                       | 0    | 1    | 3    | 5    | 11   | 17   | 37      |
| Universidad Peruana los Andes                                 | 0    | 6    | 1    | 2    | 6    | 19   | 34      |
| Universidad Nacional de San Cristóbal de Huamanga              | 2    | 1    | 3    | 3    | 13   | 11   | 33      |
| Universidad Nacional de Cajamarca                             | 2    | 5    | 2    | 2    | 7    | 3    | 21      |
| Universidad Privada de Tacna                                  | 0    | 1    | 2    | 6    | 5    | 5    | 19      |
| Universidad Nacional Toribio Rodríguez de Mendoza de Amazonas  | 0    | 0    | 0    | 4    | 12   | 16   | 16      |
| Universidad Nacional de Tumbes                                 | 1    | 0    | 2    | 1    | 8    | 3    | 15      |
| Universidad Nacional Santiago Antúnez de Mayoló                | 0    | 0    | 3    | 3    | 3    | 3    | 12      |
| Universidad Nacional José Faustino Sánchez Carrión             | 0    | 1    | 2    | 1    | 3    | 2    | 9       |
| Universidad Nacional Jorge Basadre Grohmann                    | 0    | 1    | 0    | 1    | 3    | 2    | 7       |
| Universidad Nacional Micaela Bastidas de Apurímac              | 1    | 0    | 3    | 2    | 0    | 0    | 6       |
| Universidad Nacional Amazónica de Madre de Dios                | 0    | 1    | 0    | 1    | 0    | 2    | 4       |
| Universidad Nacional Daniel Alcides Carrión                    | 0    | 2    | 0    | 0    | 1    | 1    | 4       |
| Universidad Nacional del Santa                                 | 0    | 0    | 0    | 1    | 1    | 2    | 4       |
| Universidad San Pedro                                         | 0    | 1    | 0    | 1    | 0    | 0    | 2       |
| Total                                                          | 944  | 1085 | 1184 | 1267 | 1431 | 2039 | 7950    |
important to mention that the licensing process that the human medicine schools in Peru have to follow drives the current and constant increase in scientific publications. Similarly, interinstitutional collaboration with other national and foreign universities produces quality information [17].

The main limitation to the present study was that it was only possible to show the scholarly output of the Peruvian medical schools in the Scopus database, although future studies could be carried out to evaluate other databases such as Web of Science, Medline, and Embase. Another limitation was that only a specific period (2015–2020) was evaluated, although it is predicted that the highest production peak is expected in the years following 2020.

This research will help determine the scientometric profile of the academic production of all Peruvian medical schools in Scopus. It will also help in the choice of journals, research fields, and topics. Because the main strength of a scientometric study is to provide a statistical analysis of the scientific publications of the Peruvian medical schools.

5. Conclusions

There has been a notable and constant increase in the scholarly output of the Peruvian medical schools from 2015 to 2020. Additionally, it was found that medical publications contribute the most to the total scientific production of Peru. This coincides with the enactment of a new university law that, among other aspects, encourages research in Peru.

Data Availability

The data used in this bibliometric study will be available upon authorization of the corresponding author.
Conflicts of Interest

The authors declare that they have no conflicts of interest.

References

[1] S. Zoukal, A. Ben Abdelaziz, N. Tahiri Jouti, A. Lakhdar, A. A. Bousliha, and S. Hassoune, “Bibliometric profile of medical publication at Faculty of Medicine of Casablanca (2008-2017),” *La Tunisie Médicale*, vol. 97, no. 5, pp. 613–618, 2019.

[2] E. Demir, E. Yasar, V. Ozuçoak, and E. Yıldırım, “The evolution of the field of legal medicine: a holistic investigation of global outputs with bibliometric analysis,” *Journal of Forensic and Legal Medicine*, vol. 69, article 101885, 2020.

[3] Y. Angulo-Bazán, “Indicadores bibliométricos de la producción científica peruana en plantas medicinales,” *Revista Peruana de Medicina Experimental y Salud Pública*, vol. 37, no. 3, pp. 495–503, 2020.

[4] C. Madden, R. O’Malley, P. O’Connor, E. O’Dowd, D. Byrne, and S. Lydon, “Gender in authorship and editorship in medical education journals: a bibliometric review,” *Medical Education*, vol. 55, no. 6, pp. 678–688, 2021.

[5] W. Liaw, S. Petterson, V. Jiang et al., “The scholarly output of faculty in family medicine departments,” *Family Medicine*, vol. 51, no. 2, pp. 103–111, 2019.

[6] D. Hendrix, “An analysis of bibliometric indicators, National Institutes of Health funding, and faculty size at Association of American Medical Colleges medical schools, 1997-2007,” *Journal of the Medical Library Association*, vol. 96, no. 4, pp. 324–334, 2008.

[7] S. Bazm, S. M. Kalantar, and M. Mirzaei, “Bibliometric mapping and clustering analysis of Iranian papers on reproductive medicine in Scopus database (2010-2014),” *International Journal of Reproductive Biomedicine*, vol. 14, no. 6, pp. 371–382, 2016.

[8] P. Ahmad, J. A. Asif, M. K. Alam, and J. Slots, “A bibliometric analysis of periodontology 2000,” *Periodontology*, vol. 82, no. 1, pp. 286–297, 2020.

[9] A. Bonaccursi, P. Belingheri, and L. Secondi, “The research productivity of universities. A multilevel and multidisciplinary analysis on European institutions,” *Journal of Infometrics*, vol. 15, no. 2, article 101129, 2021.

[10] G. G. Haddow and P. Genoni, “Citation analysis and peer ranking of Australian social science journals,” *Scientometrics*, vol. 85, no. 2, pp. 471–487, 2010.

[11] J. N. Parker, S. Allesina, and C. J. Lortie, “Characterizing a scientific elite (B): publication and citation patterns of the most highly cited scientists in environmental science and ecology,” *Scientometrics*, vol. 94, no. 2, pp. 469–480, 2013.

[12] M. Ghani, R. Hurrell, A. C. Vercelles, M. T. McCurdy, and A. Papali, “Geographic, subject, and authorship trends among LMIC-based scientific publications in high-impact global health and general medicine journals: a 30-month bibliometric analysis,” *Journal of Epidemiology and Global Health*, vol. 11, no. 1, pp. 92–97, 2021.

[13] I. Ul Haq, S. Ur Rehman, H. M. Al-Kadri, and R. K. Farooq, “Research productivity in the health sciences in Saudi Arabia: 2008-2017,” *Annals of Saudi Medicine*, vol. 40, no. 2, pp. 147–154, 2020.

[14] A. Fernández-Giusti, G. Ronceros, J. Matzumura-Kasano, L. Podestá, J. Canchis-Aremburgo, and F. Mayta-Tovalino, “Productivity characteristics of the thesis rate of PhD students in biomedical areas of the different doctoral programs in Lima, Peru: a 20-year retrospective study,” *Journal of International Society of Preventive and Community Dentistry*, vol. 30, pp. 19–25, 2021.

[15] F. Mayta-Tovalino, J. Pacheco-Mendoza, A. Diaz-Soriano, F. Perez-Vargas, A. Munive-Degregori, and S. Luza, “Bibliometric study of the national scientific production of all Peruvian schools of dentistry in Scopus,” *International Journal of Dentistry*, vol. 2021, Article ID 5510209, 8 pages, 2021.

[16] P. Herrera-Añazco, G. Valenzuela-Rodriguez, J. Pacheco-Mendoza, and G. Málaga, “Scientific production of vice chancellors for research in Peruvian universities with a medical school,” *Medwave*, vol. 17, no. 8, article e7074, 2017.

[17] P. Mayta-Tristán, C. J. Toro-Huamanchumo, J. Alhuay-Quispe, and J. Pacheco-Mendoza, “Producción científica y licenciamiento de escuelas de medicina en el Perú,” *Revista Peruana de Medicina Experimental y Salud Pública*, vol. 36, no. 1, pp. 106–115, 2019.