

## GENDER DIFFERENCES IN PERUVIAN NURSING: A BIBLIOMETRIC ANALYSIS IN SCOPUS AND WEB OF SCIENCE

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### ABSTRACT

This paper aims to perform a bibliometric and gender perspective analysis of scientific publications in Scopus and Web of Science in the area of Peruvian nursing. A bibliometric analysis design was used. The analysis comprised 130 articles in Scopus and 104 articles in Web of Science. The main indicators included the annual production of articles, the most cited authors and articles, and a thematic analysis of the keywords. In terms of authorship in Scopus, there are seven women among the first 10 authors, but in Web of Science, there are only 3. For citations, female nurses and authors at Scopus receive a higher proportion of citations than males. However, in Web of Science, male nurses receive proportionately more citations. Regarding the first 10 journals we found on the Web of Science, Emerging Source Citation Index journals have more indexed articles than Journal Citation Reports journals. The statistical correlation coefficient between the articles published in Scopus and Web of Science is 0.92. The scientific production in Peru in the nursing field shows no female bias in Scopus, but that is not the case for Web of Science. In addition, the total number of articles published in Peru respecting other fields is low, as is the level of international collaboration between the authors.

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**Keywords:** Bibliometrics; Gender Perspective; Gender Studies; Nursing Research; nurses; Gender differences; Scopus; Web of Science; Peru.

## *Diferencias de Género en enfermería peruana: Un análisis bibliométrico en Scopus y Web of Science*

### RESUMEN

El objetivo de este trabajo es realizar un análisis bibliométrico y con perspectiva de género de las publicaciones científicas en Scopus y Web of Science en el área de la enfermería peruana. Se utilizó un análisis bibliométrico. El análisis comprendió 130 artículos en Scopus y 104 artículos en Web of Science. Los principales indicadores fueron la producción anual de artículos, los autores y artículos más citados y un análisis temático de las palabras clave. En cuanto a la autoría, en Scopus hay siete mujeres entre los 10 primeros autores, pero en Web of Science sólo hay 3. En cuanto a las citas, las mujeres enfermeras y los autores en Scopus reciben una mayor proporción de citas que los hombres. Sin embargo, en Web of Science, los enfermeros varones reciben proporcionalmente más citas. Con respecto a las 10 primeras revistas, encontramos que en Web of Science, las revistas Emerging Source Citation Index tienen más artículos indexados que las revistas del Journal Citation Reports. El coeficiente de correlación estadística entre los artículos publicados en Scopus y Web of Science es de 0,92. La producción científica en Perú en el campo de la enfermería no muestra un sesgo femenino en Scopus, pero no es el caso de Web of Science. Además, el número total de artículos publicados en Perú con respecto a otros campos es bajo, así como el nivel de colaboración internacional entre los autores.

**Palabras clave:** Bibliometría; perspectiva de género; estudios de género; investigación en enfermería; enfermeras; diferencias de género; Scopus; Web of Science; Peru.

### Introduction

Bibliometric studies allow researchers to analyze trends, scientific production, relationships between authors, and the emergence of new research frontiers (De Freitas Mattos et al., 2021; Paz Enrique & Ponjuán Dante, 2022). In the field of nursing, it also allows the analysis of research methods, patient groups, or education (Chang et al., 2021).

Bibliometric indicators in Latin America are normally higher than those of Peru. A bibliometric study focused on scientific production in health sciences in Latin American countries between 2006-2015 of the SciELO database showed that Brazil, Cuba, and Colombia contributed 77.57% of total publications, while Peru contributed 2.74%, presenting a moderate production with an annual growth rate of 5.53% compared to other countries that have a negative growth rate (Carvajal Tapia & Carvajal Rodríguez, 2019).

Peru has one of the largest gender gaps in all areas of knowledge. Together with Chile, Costa Rica, and Mexico, it has the lowest participation of women in terms of scientific production. This impedes women's access to teaching in higher education, research, and managerial

positions (OCTS-OEI, 2018). García-Aguilar et al. (2019) conducted a bibliometric study in the Peruvian Journal of Experimental Medicine and Public Health on female participation in articles between 1997 and 2017. Of the 1,606 articles analyzed, they found that in 29.6% of the articles, a woman was the first author, 27.8% had a woman as a senior author, and 26.9% had a woman as a corresponding author.

According to the Science and Technology Indicators Network (RICYT), between 2009 and 2018 in Peru, the national scientific production in Scopus per 100,000 habitants is less than that of Latin America, the Caribbean, and Ibero-America (RICYT, 2020). In addition, a report published by the National Council of Science and Technology of Peru (CONCYTEC) found that between 2012 and 2017, there was very little scientific production (five articles) in Scopus in the field of nursing in Peru when compared to other areas such as Agricultural Sciences (197 articles) or Biomedical Sciences (66 articles) (CONCYTEC, 2019, pp. 91-92).

Despite the low rate of publications, nursing studies in Peru are relevant as there are 94 universities according to the university information system (TUNI), also coordinated by SUNEDU (TUNI, 2021; Millones-Gómez et al., 2021). TUNI indicates that 52 universities have an undergraduate nursing program, distributed in 28 public and 24 private universities. Likewise, there are also 23 universities offering master's programs and 10 universities offering doctoral programs since 2000 with interdisciplinary participation (Pan American Health Organization, 2017). In addition, according to the College of Nurses of Peru (hereafter CEP) there are 100,395 registered nurses: 91,324 women and 9,071 men (CEP, 2021). Because of the number of doctoral programs that allow access to the academic career, we explore scientific production through a bibliometric analysis to observe gender differences.

This article aims to conduct a bibliometric and gender perspective study of the scientific articles published in Scopus and Web of Science (WoS) on the topic of nursing in Peru.

Along with a bibliometric analysis, we focus on the following research questions:

RQ 1: How is the scientific production in Peru linked to nursing in Scopus and WoS?

RQ 2: How is gender represented in Peruvian scientific activity in nursing?

## Background

Bibliometric research offers valuable information about publications in specialized journals and their positioning in any scientific field. Since 1960, the reports generated by bibliographic indexes such as the Science Citation Index (SCI) have played a significant role in bibliometric studies (Hernández-Socha, 2020). In a study of 67 doctoral dissertations on the subject of tutoring in Spanish universities between 1980 and 2014, combining content analysis and bibliometrics, it was found that more women than men wrote the analyzed dissertations, while the Spanish National University of Distance Education, the University of Granada, and the Autonomous University of Barcelona published the greatest number of dissertations (López Gómez, 2016).

## **Gender differences in nursing in publications and projects**

Gender inequalities in scientific production are widely described in the literature (Larivière et al., 2013). In a study conducted at the University of Pennsylvania, the gender of the corresponding author and senior author of 5,554 articles was analyzed. It concluded that women were less likely to be published as corresponding authors, and when they did, their publications were cited less frequently (Chatterjee & Werner, 2021). Feral-Pierssens et al. (2021) analyzed 60 articles with 322 authors from three high-impact nursing journals. They found that the rate of female authorship is still lower than the ratio of women in nursing, which is a mostly female profession.

Amaya et al. (2019) conducted a study on the gender gap among 252 Peruvian doctors with at least one indexed publication, and found that women are less likely to be the first authors, be the senior researcher, or be eligible for a project funding.

Another question to consider is the presence of women in scientific congresses. Ruzycski et al. (2019) analyzed the gender of speakers in 181 medical conference programs held in Canada and the United States. They concluded that, although the proportion of women increased significantly over time, their presence as speakers at medical congresses remained scarce. Similar results were found in five scientific programs of critical care congresses over seven years, where male speakers outnumbered female speakers in all programs, and the presence of nursing speakers was underrepresented (0-25%) (Mehta et al., 2018).

## **Bibliometric studies in nursing**

Scientific article production in nursing is growing considerably. In a bibliometric study in the field of nursing, 1,434 articles were analyzed. Researchers found that the most intensively studied topics were stress, burnout, and environmental factors, which cause nurses to leave the profession (Bilik et al., 2020). In addition, another study analyzed 839 nursing articles between 2008 and 2018 in Scopus from six English-speaking countries. They concluded that there were numerous differences in nursing research in English-speaking countries, such as patient groups, skills, theory, and research methods (Thelwall & Mas-Bleda, 2020).

Imani et al. (2019) analyzed the scientific production of the International Journal of Nursing Studies between 1963 and 2018 and analyzed 3,203 articles from Scopus. They found that 60% of the articles were written by researchers from the United Kingdom, USA, and Australia. There was a marked upward growth in both the number of publications and citations, as well as the journal itself. Prado-Gascó et al. (2019) conducted a bibliometric analysis on job insecurity in nursing, finding 128 articles in WoS between 1993 and 2020. As a result, the most productive countries were the United States, Canada, Australia, Finland, and the United Kingdom. It was concluded that job insecurity had significant implications for the professional development of nurses.

## **The situation in Peru regarding bibliometric studies**

Bibliometric studies in Peru allow us to study trends in both international and national publications. Limaymanta Alvarez et al., (2020) analyzed the scientific production of Peru and Ecuador in WoS between 2009 and 2018. They found that Peru had more scientific production accumulated in journals indexed in WoS than Ecuador. However, Ecuador produced more scientific publications than Peru between 2016 and 2018.

In regard to universities, Millones-Gómez et al. (2021) analyzed 94 higher education institutions in Peru between 2016 and 2020. They found that 59.32% of the researchers were affiliated with public universities, and 40.68% were affiliated with private universities, and the scientific production of higher education institutions in Peru, on average, increased during the years of study.

Finally, in the field of health sciences, Arias Chávez et al., (2019) analyzed Peruvian scientific research on the training of health professionals from 2014 to 2018. They concluded that publications relating to the training of health professionals were scarce in the last five years and the indicators show a decreasing trend.

## **Materials & Methods**

### **Data acquisition and search strategy**

In this study, we use the Scopus and WoS databases. In addition, two of the authors have access to both Scopus and WoS. The other two authors only have access to Scopus through CONCYTEC, but not from the services offered by their university.

We performed searches in WoS in all possible indexes and Scopus without a time or language limit with the keyword "nurs\*" in titles and keywords limited to Peru. We identified 136 records in WoS and 166 records in Scopus.

### **Inclusion and exclusion criteria**

We proceeded to read all the articles to determine the inclusion and exclusion criteria. The inclusion criteria were: research articles and review articles in any language. We included those articles where we could identify the gender of the corresponding author through their name and the profession of nurse. We also performed author searches in different search engines such as Google Scholar. If the authors were Peruvian, we checked the National Registry of Science, Technology, and Technological Innovation of Peru (RENACYT). Knowing the author's gender was necessary to evaluate the gender perspective in our study.

We excluded articles for which the article's content was not found or where it was not possible to identify the author's gender, profession, or institutional position. The total number of final records was WoS=104 and Scopus=130 (Table 1). The final dataset is provided (Boté-Vericad et al., 2021)

Table 1. Number of documents and sources in WOS and Scopus until 2020

<b>Articles</b>	<b>SCOPUS</b>	<b>WOS</b>	<b>TOTAL</b>
Initial Sample	166	136	302
Discarded	36	32	68
Final Sample	130	104	234
Overlap	57		57
Unique	73	104	177
<b>Journals</b>	<b>SCOPUS</b>	<b>WOS</b>	<b>TOTAL</b>
Initial Sample	87	76	163
Overlap	43		43
Unique	44	76	120

Source: Authors

## Analysis tool

We reviewed and normalized the two bibliographic files. We used Bibliometrix (Aria & Cuccurullo, 2017) to perform the complete bibliometric analysis. Bibliometrix is an open-source R package that allows bibliometric analysis from files extracted from Scopus and Web of Science (WoS). Since the package authors recommend using WoS to perform bibliometric studies, Bibliometrix has functions to merge databases from Scopus and Web of Science. Bibliometrix also allows running the Biblioshiny application. Biblioshiny has a graphical interface where it is also possible to perform bibliometric analysis. It allows the representation of different networks visually. In our study, we combined Bibliometrix using R programming and Biblioshiny. Finally, we calculated the percentage of overlap between WoS and Scopus (Gluck, 1990) as well as their relative overlap (Bearman & Kunberger, 1997 in Rodríguez-Rojas, et al., 2019).

## Results

### Authorship

#### Distribution of male and female authors in publications

Of the entire bibliographic record, 76 people were flagged as women, nurses, and corresponding authors. The number of women (Table 2) who publish as a corresponding author in Scopus

predominates slightly (N=50, 38.46%). On the other hand, men in nursing have little presence as a corresponding authors (N=13, 10%). In terms of citations, female nurses have a higher number of citations in both Scopus (TC=160) and WoS (TC=88). The proportion of citations for women (C/A=3.20) in Scopus is higher than for men (C/A=1). In WoS, despite having a greater number of female nurses listed as corresponding authors (N=26, C/A=3.38), the proportion of citations per person for women is lower when the number of men as a corresponding authors increases (N=6, C/A=3.33). In articles where the corresponding author is not a nurse, women receive many fewer citations (TC=227) than men (TC=1018). Their proportion is much lower (W=227/23=9.87; M=1018/44=23.13). Men's the highest citations in WoS may be caused because they publish research articles in journals with the presence of the journal citation report (JCR) and international collaborations.

**Table 2.** List of corresponding authors that are linked to nursing in Scopus and WoS.

	SCOPUS						WOS				
	Gender	N	%	TC	%	C/A	N	%	TC	%	C/A
<b>Nursing</b>	Women	50	38.46	160	11.10	3.20	26	25.00	88	12.07	3.38
	Men	13	10.00	13	2.5	1	6	5.76	20	2.74	3.33
<b>Other</b>	Women	23	17.69	227	15.75	9.86	25	24.03	219	30.04	8.76
	Men	44	33.84	1018	70.65	23.11	47	45.19	402	55.14	8.55
<b>Total</b>		130	100	1441			104	100	729		

N = number of nursing researchers

TC =Total Citations

C/A = Citations per author

Source: Authors

### Ranking of authors

Table 3 lists the 10 most productive authors in both Scopus and WoS as well as the 10 most productive Peruvian authors. Some authors are repeated due to duplicate records. In Scopus, there are five Peruvian women researchers who account for half the published articles (N=21, 48.84%). In WoS, this presence is reduced to two authors (N=6, 16.22%). This can be explained by a number of reasons. For instance, fewer articles are published in WoS than in Scopus.

To check the category of Peruvian authors, we searched in RENACYT, which evaluates and classifies researchers into two groups on an annual basis: Carlos Monge Medrano (CM;

senior researcher) and María Rostworowski (MR; junior researcher). Researchers can change groups and levels based on their assessment (RENACYT, 2019).

Among the Peruvian researchers in Scopus, there are only eight identified in nursing, and five of them are women (N=21, 48.84%). In WoS, we only found two women nurses and corresponding authors (N=6, 16.22%). For Peruvian authors in Scopus, seven of the 10 most productive are women (N=27, 75%) and seven are senior researchers at different levels, and one is a junior researcher. WoS listed three women (N=8, 26.66%), only one of whom was categorized as a senior researcher.

In the case of the most productive authors, Juan Manuel Leyva-Moral is the most productive. One of the reasons is because he had postdoctoral mobility in Peru and also has research grant projects in Peru. The rest of them are Peruvian, and those who are not are because they have published collaboration articles with Peruvian peers.

Concerning Peruvian researchers have Carlos Monge Medrano qualification. They are senior researchers at different levels of their careers. For those who have no qualifications, causes are varied. They are not in the RENACYT system, or they are professional nurses publishing research articles, and they do not need for any reason RENACYT qualification.

**Table 3.** Ranking of the 10 most productive authors and the 10 most productive Peruvian authors with their current evaluation on RENACYT

10 most productive authors			
Authors	Scopus	Authors	WoS
Leyva-Moral, Juan Manuel	7	Leyva-Moral, Juan Manuel	6
Díaz-Manchay, Rosa Jeuna(P)*	6	Diez-Canseco, Francisco(P)	4
Tejada-Muñoz, Sonia(P)†	5	Huicho, Luis(P)	4
Huicho, Luis(P)	4	Miranda, Juan Jaime(P)	4
Miranda, Juan Jaime(P)	4	Palmieri, Patrick Albert(P)	4
Musayón Oblitas, Flor Yessenia(P)†	4	Aguayo-Gonzalez,	3



				Mariela Patricia		
Palmieri, Patrick Albert(P)		4		Becerra, Rosario(P)†		3
Aguayo-Gonzalez, Patricia	Mariela	3		Edwards, Joan		3
Chalco, Katuska(P)†		3		Mallma, Gabriela(P)†		3
Dominguez-Cancino, Aileen(P)†	Karen	3		Nielsen, Katie Ruth		3
<b>TOTAL</b>		<b>43</b>		<b>TOTAL</b>		<b>37</b>
(P) - Peruvian researchers						
†Peruvian Women Nursing Researchers						
<b>10 most productive Peruvian authors</b>						
<b>SCOPUS</b>				<b>WOS</b>		
<b>Authors</b>	<b>Articles</b>	<b>RENACYT</b>	<b>Authors</b>	<b>Articles</b>	<b>RENACYT</b>	
Diaz-Manchay, Rosa Jeuna†	6	CM-III	Diez-Canseco, Francisco	4	n.a.	
Tejada-Muñoz, Sonia†	5	CM-IV	Huicho, Luis	4	CM-I	
Huicho, Luis	4	CM-I	Miranda, Juan Jaime	4	CM-I	
Miranda, Juan Jaime	4	CM-I	Palmieri, Patrick Albert	4	CM-II	
Musayón Oblitas, Yessenia*	Flor 4	CM-III	Becerra, Rosario†	3	n.a.	
Palmieri, Patrick Albert	4	CM-II	Mallma, Gabriela†	3	n.a.	
Chalco, Katuska†	3	n.a.	Araya, Ricardo	2	n.a.	

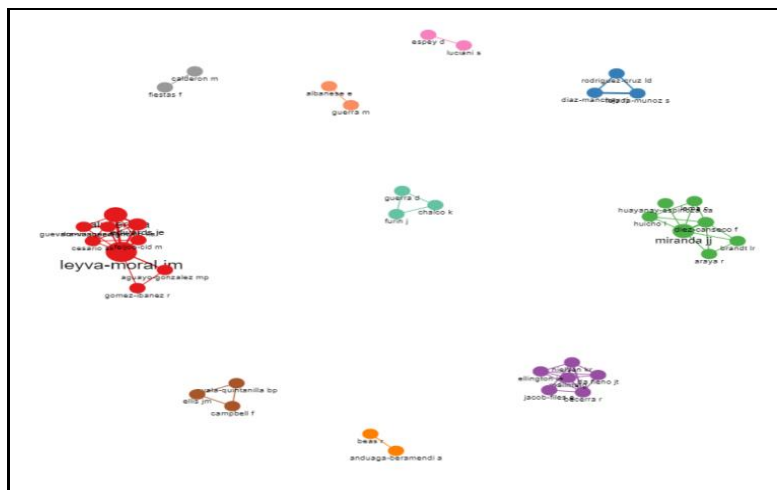
Dominguez-Cancino, Aileen*	Karen	3	MR-I	Ayala-Quintanilla, Beatriz Paulina*	2	CM-I
Santos Falcón, Gladys†		3	n.a.	Bernabe-Ortiz, Antonio	2	CM-I
Rodríguez Dolores*	Cruz, Lisseth	3	n.a.	Carcamo, César Paul	2	CM-I
<b>TOTAL</b>		<b>36</b>		<b>TOTAL</b>	<b>30</b>	

† = Peruvian Women Nursing Researchers  
 Source: Authors

### Collaboration between authors

We merged the two bibliographic databases to examine the collaboration between authors, eliminating duplicates following Echchakoui (2020). In Figure 1, there are 10 clusters of authors without a relationship among them. Moreover, there are three large groups with six authors (purple), seven authors (green), and nine authors (red). As mentioned, these clusters have no relations among them. Reasons are varied, and one of the causes might be because they do not share research topics.

Figure 1. Author collaboration among Scopus and WoS



Source: Authors

### **Most cited articles**

Table 4 shows the 10 most cited articles in both Scopus and WoS, all articles are multiauthor, and some papers appear in both databases. Only three articles in both databases have a Peruvian researcher as a first author. In addition, only two of the most cited papers were less than five years old. Moreover, there is only one specific nursing journal, *International Nursing Review*.

The most cited paper in Scopus is the work of Goss et al., (2013) which is about cancer control in Latin America and the Caribbean. However, it is the only one covering this topic among the most cited articles. Other papers are in both databases because the papers are indexed on both sites. This is the case in the work of Huicho et al. (2005) or Chalco et al. (2006).

**Table 4.** 10 most cited articles in Scopus and WoS

SCOPUS				
Paper	Title	Year	Source	Total Citations
Goss, PE and Lee, BL and Badovinac-Crnjevic, T and Strasser-Weippl, K and Chavarri-Guerra, Y, et al.	Planning cancer control in Latin America and the Caribbean	2013	The Lancet Oncology	266
Prince, M. and Ferri, C.P. and Acosta, D. and Albanese, E. and Arizaga, R. et al.	The protocols for the 10/66 dementia research group population-based research program	2007	BMC Public Health	224
Aranaz-Andres, J.M. and Aibar-Remón, C. and Limon-Ramirez, R. and Amarilla, A. and Restrepo, F.R. et al.	Prevalence of adverse events in the hospitals of five Latin American countries: results of the 'Iberoamerican study of adverse events' (ibeas)	2011	BMJ Quality and Safety	83

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Skalet, A.H. and Quinn, G.E. and Ying, G.-S. and Gordillo, L. and Dodobara, L. Et al.	Telemedicine screening for retinopathy of prematurity in developing countries using digital retinal images: a feasibility project	2008	Journal of AAPOS	59
Huicho, L. and Davila, M. and Campos, M. and Drasbek, C. and Bryce, J. and Victora, C.G.	Scaling up integrated management of childhood illness to the national level: achievements and challenges in Peru	2005	Health Policy and Planning	54
Chow, F. and Espiritu, N. and Gilman, R.H. and Gutierrez, R. and Lopez, S. et al.	La cuerda dulce - a tolerability and acceptability study of a novel approach to specimen collection for diagnosis of pediatric pulmonary tuberculosis	2006	BMC Infectious Diseases	49
Larson, E.L. and McGinley, K.J. and Foglia, A. and Leyden, J.J. and Boland, N. and Larson, J. and Altobelli, L.C. and Salazar-Lindo, E.	Handwashing practices and resistance and density of bacterial hand flora on two pediatric units in Lima, Peru	1992	AJIC: American Journal of Infection Control	44
Lassi, Z.S. and Cometto, G. and Huicho, L. and Bhutta, Z.A.	Quality of care provided by mid-level health workers: systematic review and meta-analysis	2013	Bulletin of the World Health Organization	37

Chalco, K. and Wu, D.Y. and Mestanza, L. and Munoz, M. and Llaro, K.	Nurses as providers of emotional support to patients with MDR-TB	2006	International Nursing Review	30
Kristiansson, C. and Reilly, M. and Gotuzzo, E. and Rodriguez, H. and Bartoloni, A. et al.	Antibiotic use and health-seeking behavior in an underprivileged area of Peru	2008	Tropical Medicine and International Health	28
<b>WOS</b>				
<b>Paper</b>	<b>Title</b>	<b>Year</b>	<b>Source</b>	<b>Total Citations</b>
Huicho, L. and Davila, M. and Campos, M. and Drasbek, C. and Bryce, J. and Victora, C.G.	Scaling up integrated management of childhood illness to the national level: achievements and challenges in Peru	2005	Health Policy And Planning	53
Skalet, A.H. and Quinn, G.E. and Ying, G.S. and Gordillo, L. and Dodobara, L. Et al.	Telemedicine screening for retinopathy of prematurity in developing countries using digital retinal images: a feasibility project	2008	Journal Of AAPOS	48
Chow, F. and Espiritu, N. and Gilman, R.H. and Gutierrez, R. and Lopez, S. Et al.	La cuerda dulce - a tolerability and acceptability study of a novel approach to specimen collection for	2006	BMC Infectious Diseases	47

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	diagnosis of pediatric pulmonary tuberculosis			
Rosenthal, VD and Pawar, M and Leblebicioglu, H and Navoa-Ng, JA and Villamil-Gomez, W et al.,	Impact of the international nosocomial infection control consortium (inicc) multidimensional hand hygiene approach over 13 years in 51 cities of 19 limited-resource countries from Latin America, Asia, the Middle East, and Europe	2013	Infection Control And Hospital Epidemiology	39
Zhang, S. X. and Liu, J. and Jahanshahi, A.A. and Nawaser, K. and Yousefi, A., and Sun, S.	At the height of the storm: healthcare staff's health conditions and job satisfaction and their associated predictors during the epidemic peak of covid-19	2020	Brain Behavior and Immunity	38
Lassi, Z.S. and Cometto, G. and Huicho, L. and Bhutta, Z.A.	Quality of care provided by mid-level health workers: systematic review and meta-analysis	2013	Bulletin Of The World Health Organization	35
Levey, E.J. and Gelaye, B. and Bain, P. and Rondon, M.B. and Borba, C.P.C. et al.	A systematic review of randomized controlled trials of interventions designed to decrease child abuse in high-risk families	2017	Child Abuse & Neglect	33

Seclen, S.N. and Rosas, M.E. and Arias, A.J. and Huayta, E. and Medina, C.A.	Prevalence of diabetes and impaired fasting glucose in Peru: report from PERUDIAB, a national urban population-based longitudinal study	2015	BMJ Open Diabetes Research & Care	27
Kristiansson, C. and Reilly, M. and Gotuzzo, E. and Rodriguez, H. and Bartoloni, A. et al.	Antibiotic use and health-seeking behavior in an underprivileged area of Peru	2008	Tropical Medicine And International Health	27
Chalco, K. and Wu, D.Y. and Mestanza, L. and Munoz, M. and Llaro, K.	Nurses as providers of emotional support to patients with MDR-TB	2006	International Nursing Review	26

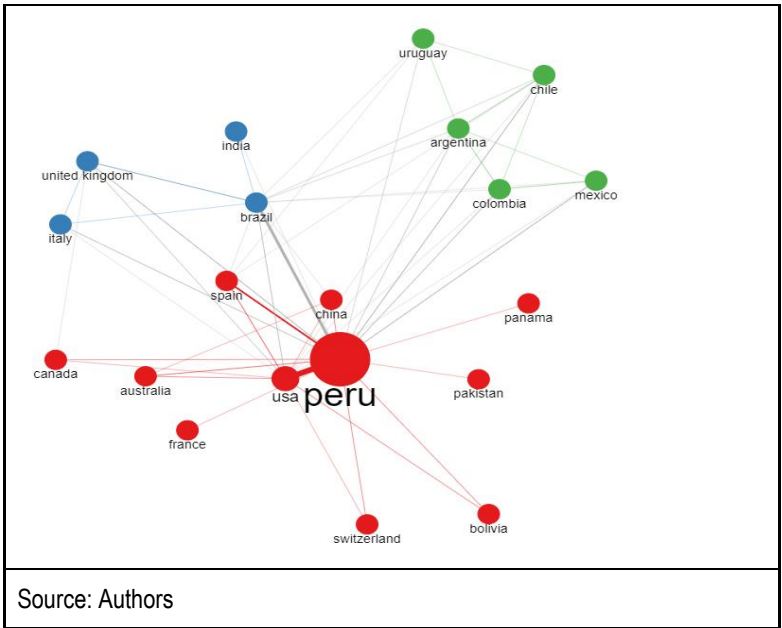
Source: Authors



**International collaboration**

We merged both databases to analyze the international collaboration of Peruvian authors. In (Figure 2) three clusters show a relationship among them. Cluster one (red) is the predominant cluster and demonstrates more international collaboration. Peru is the main country with collaborations with the USA, Spain, and China. The dominance of this cluster is also logical because the subject of the study is Peruvian nursing. Other countries have a presence in this cluster because researchers of these countries maintain continuous numbers of publications and collaboration. Cluster 2 (green) shows a collaboration of Latin American countries with Peru and Brazil as a nexus. There are fewer published papers in numbers of authors from these countries. Cluster 3 (blue), composed of Brazil, India, the United Kingdom, and Italy, occasionally collaborates with Peruvian authors in particular.

Figure 2. Collaboration between countries (WoS and Scopus)



**Analysis by institutions**

The analysis by institutions (Table 5) ranks the universities with the highest participation. However, among the Peruvian institutions, there are only two public institutions in Scopus, the Universidad Nacional Mayor de San Marcos (UNMSM) with 16 publications and the National Institute of Children's Health with 6 publications. Only the UNMSM is found in WoS. This may be because private institutions might enjoy a larger budget than public ones. There are other foreign universities such as Universidade de Sao Paulo, Universitat Autònoma de Barcelona, and the University of Washington. These universities are ranked because of different causes. For example, some Peruvian authors had postdoctoral mobility in Brazil, Spain, or the United States.

**Table 5.** Ranking of the most important institutions

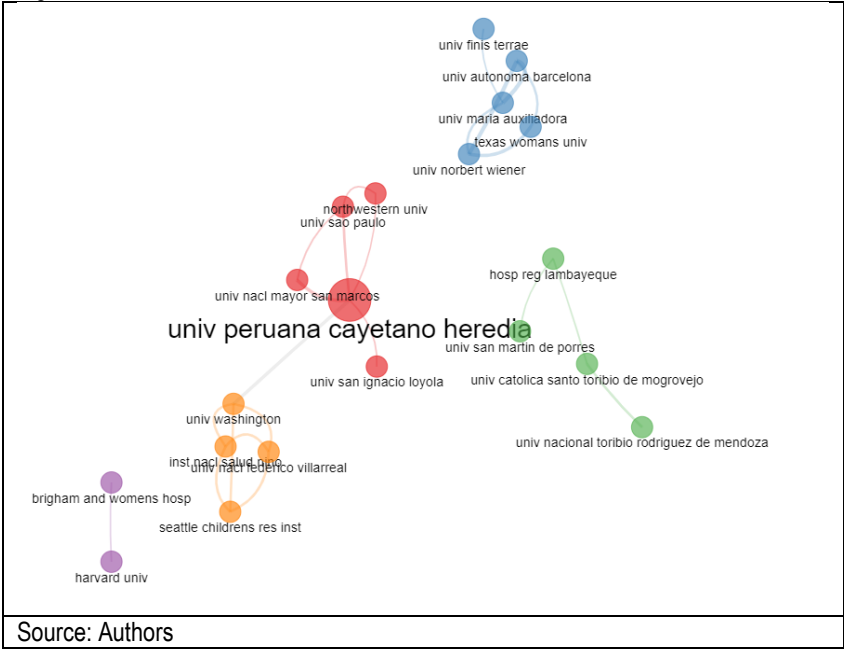
RANKING OF MOST IMPORTANT INSTITUTIONS IN SCOPUS AND WoS				
SCOPUS			WOS	
	Affiliations	Articles	Affiliations	Articles
1	UNIVERSIDAD PERUANA CAYETANO HEREDIA(P)	38	UNIVERSIDAD PERUANA CAYETANO HEREDIA(P)	55
2	UNIVERSIDAD NACIONAL MAYOR DE SAN MARCOS(P)*	16	UNIVERSITY OF WASHINGTON	19
3	UNIVERSIDAD CATOLICA SANTO TORIBIO DE MOGROVEJO(P)	11	UNIVERSIDAD NACIONAL MAYOR DE SAN MARCOS(P)*	16
4	HARVARD MEDICAL SCHOOL	10	UNIVERSIDADE DE SAO PAULO	12
5	UNIVERSITAT AUTONOMA DE BARCELONA	10	UNIVERSITAT AUTONOMA BARCELONA	11
6	UNIVERSITY OF WASHINGTON	10	JOHNS HOPKINS UNIVERSITY	10
7	UNIVERSIDAD NORBERT WIENER(P)	9	UNIVERSIDAD NORBERT WIENER(P)	10
8	JOHNS HOPKINS UNIVERSITY	8	EMORY UNIVERSITY	7
9	INSTITUTO NACIONAL DE SALUD DEL NINO(P)*	6	UNIVERSIDAD MARIA AUXILIADORA(P)	7
10	UNIVERSIDAD MARIA AUXILIADORA(P)	6	UNIVERSIDAD DE SAN MARTIN DE PORRES(P)	7

(P)\*Public Peruvian Institutions; (P) Peruvian institutions  
 Source: Authors

In terms of the degree of collaboration between institutions, only one network (Figure 3) has a connection with another. The rest interact in a grouped way without a connection to the

others. We observe that Universidad Peruana Cayetano Heredia stands out, given that many of the authors have an affiliation with that university.

Figure 3. Institutional collaboration network



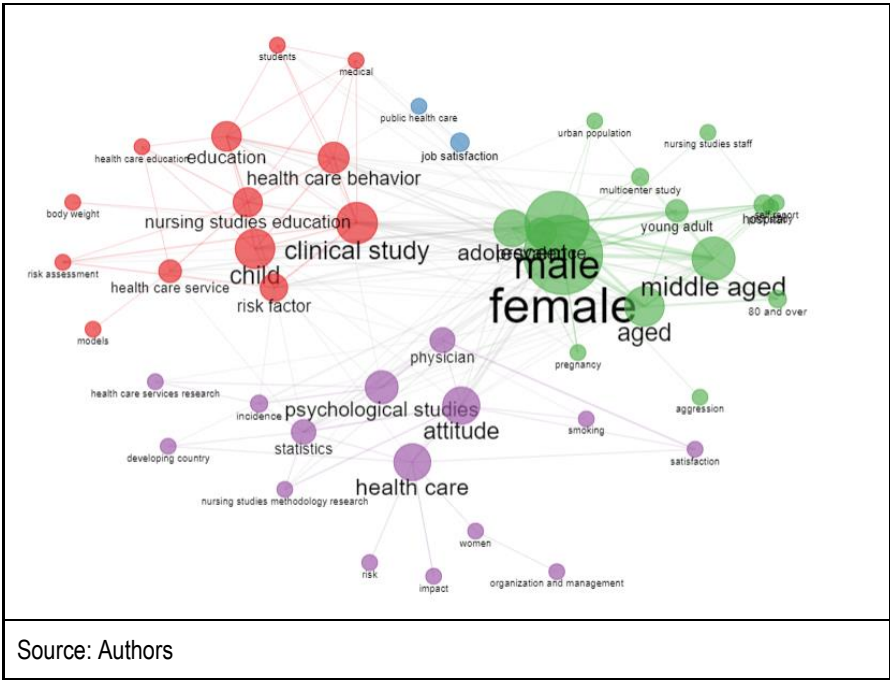
### Thematic analysis

In the thematic analysis, we followed the methodology employed by different authors (Dehdarirad, Villarroya & Barrios, 2014; Echchakoui, 2020) and standardized the articles' keywords, converting all keywords into lowercase, converting plural keywords into a singular, deleting the stop words, and spelling out the acronyms. As a result, a network of co-words was created. In Figure 4, we observe four clusters. Cluster 1 (green), the relevant topics are studies about males and females, and adults. In the same kernel, other areas are adolescents, young adults, pregnancy, or studies based on aged people.

In cluster 2 (red), the relevant research topics are in relation to education and nurses' training. Other research areas are health care services, child, and risk factor studies.

In cluster 3 (purple) e research areas merge research topics as psychological studies in subtopics such as depression or stress. In addition, research topics about women's health care or women's in relation to organization and management. Finally, cluster 4 (blue) appears to main research areas such as job satisfaction and public health care. In summarizing, there are three big areas: adults, nursing education, and psychological studies. Other areas need to be covered by other future studies.

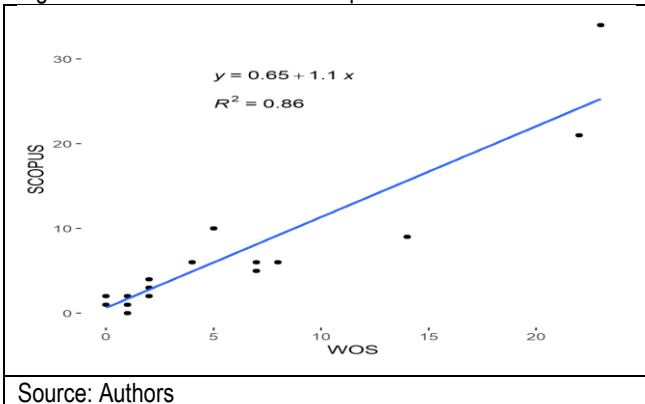
Figure 4. Thematic analysis in WoS and Scopus



### Correlation between Scopus and WoS

We found that there is a strong correlation (0.92 and  $R^2 = 0.86$ ) between the WoS and Scopus databases in terms of the number of articles that these databases incorporate annually, despite the large volume of existing journals contained in Scopus and WoS (Figure 5).

Figure 5. Correlation between Scopus and WoS databases



### Overlap between Scopus and WoS

As shown in Table 1, we found 130 articles and 88 journals in Scopus. There were 104 articles and 76 journals in Web of Science. We found articles (N=57, 23%) that were listed simultaneously in both databases. The percentage of overlapping sources (journals) between WoS and Scopus was 36%.

$$\begin{aligned} \%TO_{Sources}WoS &= 100 * \left( \frac{|WoS \cap Scopus|}{|WoS \cup Scopus|} \right) \Rightarrow \%TO_{Sources} \\ &= 100 * \left( \frac{43}{120} \right) \Rightarrow \%TO_{Sources} = 36\% \end{aligned}$$

We found a 36% similarity, or a 64% separation, in relation to primary sources in nursing in Peru. Further, we found a similarity of 32%, or a separation of 68%, related to articles.

### Percentage of coverage or relative overlap

The percentage of WoS coverage in relation to Scopus and vice versa has also been calculated, that is, the relative overlap.

$$\begin{aligned} \%TO_{Sources}WoS &= 100 * \left( \frac{|WoS \cap Scopus|}{|WoS|} \right) \Rightarrow \%TO_{Sources}WoS \\ &= 100 * \left( \frac{44}{76} \right) \Rightarrow 57\% \end{aligned}$$

This indicates that Scopus covers 57% of the primary sources in WoS in Peruvian nursing. Similarly WoS covers 43% (  $\%TO_{Sources}Scopus = 43\%$ ) of the primary sources in Scopus.

Percentage of coverage of articles:

$$\begin{aligned} \%TO_{Sources}WoS &= 100 * \left( \frac{57}{104} \right) = 54.80\% \\ \%TO_{Sources}Scopus &= 100 * \left( \frac{57}{130} \right) = 43.84\% \end{aligned}$$

The differences in percentages may be due to the indexing policies of the journals. It should be noted that there are 57 shared articles and 43 shared journals between the two databases.

## Limitations

The limitations in the preparation of this article are numerous. First, the way authors sign their articles presented challenges. The authors are inconsistent in terms of the names they use. This means some metrics might not appear with the right values because some authors are named differently in each database. In addition, we checked authors in RENACYT, and in many cases, we found that their names did not exactly match since they used their second surname or used an initial or two. This is important not only in the publication of articles but also in their citation. So, we recommend that Peruvian authors standardize their names when signing articles (Baiget et al., 2016).

Second, although we developed exhaustive search equations, it is possible that some multidisciplinary articles were not included. Finally, in the case of the RENACYT directory, there are nurses classified in areas other than nursing.

## Discussion and conclusions

The goal of this paper was to conduct a bibliometric analysis of scientific production in the field of nursing in Peru and find gender differences. We carried out this analysis using the Scopus and WoS bibliographic databases.

Regarding RQ1, we observe that in Scopus and WoS, the number of females who identify themselves as nurses and publish in the field is higher than males. However, there is a significant difference, especially in the case of WoS where male who identifies as nurses (N=6) is lower than men who do not (N=47). Since male nurse researchers are shorter, they seem to get more impact concerning citations. Therefore, the choice of research front and journal could benefit them. About these findings, the study of Arroyo-Hernández & Ramírez-Soto's (2020) on gender equality in the editorial process of public health journals in the Americas found an increase in female publications, but that there is still a gap, especially in high-impact journals. Moreover, in measuring overlapping between both databases, we observe that Scopus covers half of the sources meaning that WoS has an important number of exclusive sources, and that can be reflected in the journals where Peruvian researchers publish.

In relation to universities, there is a trend that private universities have more publications than public ones as well as international collaboration. Just two public institutions Universidad Nacional Mayor de San Marcos, and Instituto Nacional de Salud del Niño are among the ranking of the most important institutions. These results are similar to what was reported in the II Biennial Report 2020 of SUNEDU, in terms of the ranking of publications in WoS and Scopus, which occupy the first three places: Universidad Peruana Cayetano Heredia, the Pontificia Universidad Católica del Perú and the Universidad Nacional Mayor de San Marcos. On the other hand, 75.0% of private universities have greater access to international bibliographic databases, and only 46.9% of public institutions have subscriptions to relevant bibliographic databases (SUNEDU, 2020). Consequently, not all Peruvian universities have access to the WoS, which is a limitation to researchers and can also be reflected in the number of citations.

Regarding RQ2, from gender differences, the total number of corresponding authors and women is 124. There are 110 male authors. Looking at the nursing criterion, the group of women is higher (W=76, M=19). This female majority may be explained by the predominant proportion of females in Peruvian nursing. According to data provided by the Peruvian Nursing College (CEP, 2021) there are 100,395 nurses registered, of whom 91% are women (N=91,324),

and only 9% are men (9,071). On the other hand, at the citation level in WoS, women are less frequently cited than men.

In addition, in the group of non-nursing authors (W=48, M=91), there are more published articles in WoS, but the number of citations is greater in Scopus overall. There is some inequality regarding the number of citations of women (non-nurses and nurses) who publish in WoS. This has also been verified in other studies such as Málaga-Sabogal & Sagasti (2021) on gender, co-authorship, and its impact on the publications of Peruvian researchers in biology, where it was found that there is a significant imbalance in gender, and women tend to publish less frequently than men. In countries like Chile, Peru, Costa Rica, and Mexico, women have lower participation rates in publications, with values very close to 38% (OCTS-OEI, 2018).

The Peruvian nursing profession is mostly staffed by women. We found that of the top 10 most productive Peruvian authors, there are seven women in Scopus and three in WoS. Women have a positive representation in Scopus, but not in WoS. We further observed that there had been an increase in the total number of articles published annually from the year 2020. This is because there is a classification regulation, RENACYT, which requires that researchers publish scientific articles to advance their academic careers. It also means that there is remuneration for being a RENACYT researcher, and the records of a researcher's publication activities must be updated every three years. Even so, we find that the volume of publications is low in WoS and Scopus. Peruvian nursing researchers publish in other journals indexed in other databases, such as Latindex, where there are 4 Peruvian journals. It is also observed that, unlike other specialties, there are no journals indexed in Scopus or Web of Science in Peru nursing.

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