

## Bibliometric Study of African Publications in Dental Medicine in Indexed Journals between 2008 and 2018

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### ABSTRACT

**Introduction:** The objective of this work is to make a bibliometric analysis of publications in odontology of African universities between January 2008 and December 2018 based on publications published in indexed journals on Pubmed.

**Material and Methods:** Our work is a comprehensive retrospective descriptive study intended to carry out a bibliometric analysis of articles in odontology published between January 1, 2008 and December 31, 2018 by professor researchers from African universities. For each selected article, we determined the authors, the title, their affiliations, the year of publication.

**Results:** Based on our sample of 19 African countries (Morocco, Algeria, Tunisia, Egypt, Nigeria, Cameroon, Côte d'Ivoire, Ethiopia, Ghana, Guinea, Kenya, Libya, Madagascar, Mali, South Africa, DRC Congo, Senegal, Sudan, Zimbabwe) that included 66 faculties; the results of our study showed:

- In terms of the number of global publications, Egypt, Nigeria, Morocco and South Africa are the leading countries. With them 4, they account for nearly 80% of the published articles. Côte d'Ivoire, Cameroon, Guinea and Mali do not participate.
- The number of African authors who have published is 489, which represents 38.99 per cent of all teaching researchers.
- South Africa Pr. Feller L ranks 1st with 61 published articles.
- Cross-sectional descriptive studies lead with an overall percentage of 37.84%.
- In vitro experimental studies account for 27.75%.
- Literature and systematic journals 10.50%.
- Case reports studies represent only 9.38%.
- Clinical trials with a percentage of 9.35%.
- Prospective and retrospective studies account for 3.44%.
- Meta-analyses 1.39%.
- In the disciplines of published articles, conservative odontology represents 22.82%, periodontology 20.19%, surgical odontology 16.50%, orthodontics 16.42%, prosthesis 15.35% and pedodontics 8.70%.
- The contribution of Moroccan authors is 12.47%.
- Moroccan Pr. Bourzgui ranks 4th with 16 items.

**Discussion:** The results show that African universities have made significant progress; however, they are still very far behind European and American universities in terms of scientific publications in odontology.

**Conclusion:** Despite the efforts of academic teachers in the publication of scientific articles in odontology, the number of publications remains low, hence the obligation to adopt a new approach in the future.

African academic institutions need to make greater efforts in the field of scientific research in all its forms by creating departments focused primarily on research and by increasing the budget

Devoted to this purpose.

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## Keywords

Publications, African universities,

## Introduction

Bibliometrics is the application of statistical and mathematical methods for measuring, evaluating, studying, producing and disseminating books, articles and other publications. Like Scientometry, bibliometry is a sub-discipline of information science.

Bibliometry has produced indicators that are now used to evaluate research at different scales: researcher, team, laboratory, institution, country, continent. It would be difficult to provide an exhaustive list of bibliometric indicators; the list has increased over the years. The most well-known indicators are presented here [1].

The doctoral student is led to hear about bibliometrics, or even, in STM (Science, Technology, Medicine), to use bibliometric indicators:

- When choosing the thesis subject, to evaluate the thematic environment
- At the time of the state of the art on a subject, to identify and locate journals and other publications in the field, or to identify research units specialized in certain fields
- When publishing its own articles, to target its publisher,
- When looking for collaborations by his unit to set up a project...

Originally conceived as an aid to bibliographic research, bibliometry has become a method of quantitative analysis of research activity, applicable to all research entities: individuals, teams, institutions and countries, to measure the level of scientific production and its impact.

The method thus consists in developing indicators (or algorithms) based on scientific publications (number of articles published over a given time interval, origin of authors, corresponding disciplines, journals used, number and sources of citations received for these publications) which may support the criteria for evaluating the research.

Bibliometrics is currently considered the only widely accessible "objective" quantitative measure and the most operational quantitative tool. As such, it is increasingly used in certain disciplines of the academic and political world to assess the productivity of research.

Bibliometrics systematically exploits databases on scientific publications.

Bibliometric analyzes have been used relatively little in odontology. For the most part, the work published in odontological bibliometry concerns the last century are focused on emerging disciplines such as implantology and cover only one or 2 years [19].

## Aim

The aim of this research work is to do a bibliometric analysis of publications in odontology of African universities, between

January 2008 and December 2018; based on publications published in indexed journals on PubMed.

## Materials and Methods

Our work is a comprehensive retrospective descriptive study designed to carry out a bibliometric analysis of articles in odontology published between January 1, 2008 and December 31, 2018 by professor researchers from African universities.

We used the bibliometric approach, which is the most widely adopted method for analyzing bibliographic indices, comparing data and identifying statistical indices, which are essential for our study. To assess scientific productivity in dentistry, we began with the compilation of the corpus of scientific publications of authors of African faculties of dentistry.

For this purpose, we have identified the scientific articles indexed in the database specialized in the medical field "PubMed," subsequently we have imported the metadata of the articles published in the international medical journals (the authors, the co-authors, the title, their affiliations, the year of publication and the keywords).

## Inclusion Criteria

Included in the study are scientific productions in dentistry translated into articles indexed on PubMed by authors affiliated to African faculties between 2008 and 2018. It should be noted that the articles listed in the study in question were found after to have carried out meticulous research in the sites of each faculty.

Thanks to these sites we were able to establish a list of names of the teaching staff and by the same to find the articles of each of its members.

## Bibliometric Analysis

2-2-1. Bibliometric indicators:

The bibliometric indicators used concern 3 aspects: the author (s), the geographical origin and the categorization of the research work reported by the article.

## The Authors

The number of authors who signed the articles obtained was recorded and classified according to the department of affiliation and their respective faculties.

## Geographical origin of the article

The geographical authorship of the article is attributed to the first author. The nationality of the article is thus considered to be that of the first author.

## Categorization of the research work reported in the article

The different articles have been classified according to their "originality" in:

- Meta-analysis.
- *In vitro* experimental study.

- Literature review.
- Systematic review.
- Descriptive cross-sectional study.
- Retrospective descriptive study.
- Prospective descriptive study.
- Case report (a clinical case or a series of cases).
- Clinical trials.

The articles were published by 489 research professors belonging to 66 African faculties in 15 countries.

### Distribution of African Universities

In Africa, there are 66 African dental schools in 19 countries (Morocco, Algeria, Tunisia, Egypt, Nigeria, South Africa, Cameroon, Ivory Coast, Ethiopia, Ghana, Guinea, Kenya, Libya, Madagascar, Mali, DRC Congo, Senegal, Sudan, Zimbabwe):

- 49 public faculties.
- 17 private faculties.
- 21 whose language of instruction is French.
- 45 whose language of instruction is English.

## Results

During the period from January 1, 2008 to December 31, 2018, 1218 articles were published in the indexed journals. This count excludes editorials, letters to the editor and answers from authors, announcements of scientific events and tributes to deceased scientific authorities.

**Table 1 :** Breakdown of African universities by type (private or public) and language of instruction.

	Faculty	Language Teaching	Type	Country
1	Mentouri University	French	Public	Algeria
2	Oran University	French	Public	Algeria
3	Saad Dahlab University	French	Public	Algeria
4	Abu Bekr Belkaid University	French	Public	Algeria
5	University of Algiers Benyoucef Benkhedda	French	Public	Algeria
6	Badji Mokhtar University	French	Public	Algeria
7	Farhat Abbas University	French	Public	Algeria
8	Mouloud Mammeri University	French	Public	Algeria
9	Cocody University of Abidjan	French	Public	Ivory Coast
10	University of the mountains	French	Private	Cameroon
11	Suze Canal University	English	Public	Egypt
12	Ahram Canadian University	English	Private	Egypt
13	Nahda University	English	Private	Egypt
14	The British University	English	Private	Egypt
15	Pharos University	English	Private	Egypt
16	Future University	English	Private	Egypt
17	International University	English	Private	Egypt
18	Alexandria University	English	Public	Egypt
19	Azhar University	English	Public	Egypt
20	Fayoum University	English	Public	Egypt
21	Cairo University	English	Public	Egypt
22	Minia University	English	Public	Egypt
23	Tanta University	English	Public	Egypt
24	Ain Shams University	english	ublical	Egypt
25	Mansoura University	English	Public	Egypt
26	Assiut University	English	Public	Egypt
27	University of Kafr el-Sheik	English	Public	Egypt
28	Zagazig University	English	Public	Egypt
29	October 6th University	English	Private	Egypt
30	MSA University	English	Private	Egypt
31	Egyptian-Russian University	English	Private	Egypt
32	Delta University for Science and Technology	English	Private	Egypt
33	Horus University	English	Private	Egypt
34	Misr University For Science And Technology	English	Private	Egypt
35	University of Jimma	English	Public	Ethiopia
36	University of Ghana School of Medicine and Dentistry	English	Public	Ghana
37	College of Health Sciences Kwame Nkrumah University of Science & Technology	English	Public	Ghana
38	National Hospital Ignace Deen in Conakry	French	Public	Guinea
39	Me University	English	Public	Kenya
40	UNIVERSITY OF NAIROBI	English	Public	Kenya
41	Zaouia University	English	Public	Libya

42	Sebha University	English	Public	Libya
43	Sirte University	English	Public	Libya
44	Mahajanga University	French	Public	Madagascar
45	Bamako University Hospital	French	Public	Mali
46	Mohammed V University	French	Public	Morocco
47	Hassan II University	French	Public	Morocco
48	Mohammed 6 University of Health Sciences of Casablanca	French	Private	Morocco
49	International University of Rabat	French	Private	Morocco
50	Abulcasis International University of Health Sciences in Rabat	French	Private	Morocco
51	Bayero University Kano	English	Public	Nigeria
52	University of Nigeria	English	Public	Nigeria
53	University of Ibadan	English	Public	Nigeria
54	University of Lagos	English	Public	Nigeria
55	University of Kinshasa	French	Public	DRC Congo
56	Cheikh-Anta-Diop University	French	Public	Sénégale
58	Al Neilain University	English	Public	Sudan
59	University of Medical Sciences and Technology Khartoum	English	Private	Sudan
60	University of the Western Cape	English	Public	South Africa
61	Wits University	English	Public	South Africa
62	Sefako Makgath University	English	Public	South Africa
63	University of Limpopo	English	Public	South Africa
64	University of Pretoria	English	Public	South Africa
65	Monastir University	French	Public	Tunisia
66	University of Zimbabwe Faculty of Medicine	English	Public	Zimbabwe

**Table 2:** Distribution of research professors according to the department of affiliation.

	<b>AUTHOR</b>	<b>Affiliate Department</b>	<b>Country</b>	<b>Number of publications</b>
1	Feller L	Periodontology	South Africa	61
2	Mickenautsch S	Concervative Odontology	South Africa	37
3	Elsyad MA	Prosthesis	Egypt	21
4	Bourzgui F	Orthodontics	Morocco	16
5	Kemoli AM	Pedodontics	Kenya	14
6	Khammissa RA	Periodontology	South Africa	14
7	Chukwuneke FN	Surgical dentistry	Nigeria	13
8	Diouf JS	Orthodontics	Senegal	13
9	Ousehal L	Orthodontics	Morocco	12
10	Wood NH	Periodontology	South Africa	11
11	Yengopal V	Concervative Odontology	South Africa	11
12	Du Toit J	Periodontology	South Africa	11
13	Aboushelib MN	Prosthesis	Egypt	11
14	Stander S	Periodontology	South Africa	10
15	Ayad MF	Prosthesis	Egypt	10
16	Umezudike KA	Surgical dentistry	Nigeria	10
17	Chindia ML	Surgical dentistry	Kenya	10
18	El Tantawi M	Pedodontics	Egypt	9
19	Mobarak E	Concervative Odontology	Egypt	9
20	Elkassas DW	Concervative Odontology	Egypt	9
21	Peeran SW	Periodontology	Libya	9
22	Halimi A	Orthodontics	Morocco	9
23	Ennibi OK	Periodontology	Morocco	9
24	Hashem AA	Concervative Odontology	Egypt	8
25	El Housseiny AA	Pedodontics	Egypt	8
26	Hazzaa HH	Periodontology	Egypt	8
27	Elnaghy AM	Concervative dentistry	Egypt	8
28	Adeyemi BF	Surgical dentistry	Nigeria	8
29	Dosumu OO	Prosthesis	Nigeria	8
30	Ajayi MD	Prosthesis	Nigeria	8
31	Lawal A	Surgical dentistry	Nigeria	8
32	Osunde OD	Surgical dentistry	Nigeria	8

33	El-Mowafy O	Prosthesis	Egypt	7
34	Abdalla Al	Concervative Odontology	Egypt	7
35	Saber SE	Concervative Odontology	Egypt	7
36	Abdallaoui F	Concervative Odontology	Morocco	7
37	Elhaddaoui R	Orthodontics	Morocco	7
38	Gbadebo SO	Concervative Odontology	Nigeria	7
39	Fawzy AS	Concervative Odontology	Egypt	6
40	Kwamin F	Periodontology	Ghana	6
41	Guthua SW	Surgical dentistry	Kenya	6
42	Akaji EA	Concervative Odontology	Nigeria	6
43	Ngom PI	Orthodontics	Senegal	6
44	Dallel I	Orthodontics	Tunisia	6
45	Bhayat A	Concervative Odontology	South Africa	5
46	Dawjee SM	Orthodontics	South Africa	5
47	Hudson AP	Orthodontics	South Africa	5
48	Van der Vyver PJ	Concervative Odontology	South Africa	5

**Table 3:** Participation of African universities.

Rank	University	Country	Number	Percent (%)	Total
1	Cairo University	Egypt	81	6.65%	31.69%
	Mansoura University		56	4.59%	
	Tanta University		28	2.29%	
	Minia University		11	0.90%	
	Ain Shams University		77	6.32%	
	6 October University		5	0.41%	
	Suze Canal University		24	1.97%	
	Misr International University		20	1.64%	
	Alexandria University		49	4.02%	
	Fayoum University		5	0.41%	
	Nahda University		7	0.57%	
	Ahram Canadian University		9	0.73%	
	Future University		1	0.08%	
Al-Azhar University	13	1.06%			
2	University of the Western Cape	South Africa	32	2.62%	21.59%
	University of Pretoria		63	5.17%	
	University of Wits		69	5.66%	
	Sefako Makgatho University		32	2.62%	
	University of Limpopo		67	5.50%	
3	University of Nigeria	Nigeria	22	1.80%	15.10%
	University of Ibadan		90	7.38%	
	University of Lagos		55	4.51%	
	Bayero University Kano		17	1.39%	
4	Casablanca Faculty of Dentistry	Morocco	58	4.76%	12.47%
	Rabat Faculty of Dentistry		94	7.71%	
5	Me University	Kenya	2	0.16%	5.09%
	University of Nairobi		60	4.92%	
6	Khartoum college of medical science	Sudan	44	3.61%	4.51%
	University of medical science and technology		10	0.82%	
	Al Neelain		1	0.08%	
7	University Cheikh Anta Diop	Senegal	45		3.69%
8	University of Monastir	Tunisia	25		2.05%
9	Sebha University	Libya	13		1.06%
10	University of Ghana	Ghana	11		0.90%
11	University of Jimma	Ethiopia	8		0.65%
12	University of Zimbabwe Faculty of Medicine	Zimbabwe	5		0.41%
13	niversity of Mahajanga	Madagascar	4		0.32%
14	Tlemcen University	Algeria	1	0.08%	0.24
	Badji mokhtar University		1	0.08 %%	
	Mouloud Maameri		1	0.08%	
15	University of Kinshasa	Democratic Republic of Congo	2		0.16%



## Distribution of Research Teachers

The teaching staff of all African faculties includes 3,576 research professors. The number of those who published between 2008 and 2018 is 489 which represents 13.67%.

At the top of the ranking, we find the South African Prof. Feller L with 61 published articles followed by the South African Prof. Mickenautsch with 37 published articles. Note also that the Egyptian Prof. Elsyad MA occupies the 3rd place with 21 articles published followed by the Moroccan Prof. Bourzgui with 16 articles published during the period between 2008 and 2018.

## Distribution of Publications

### African universities

#### Distribution according to African universities

Regarding African universities having published in indexed journals, Egypt comes in 1st position with a total of 386 articles (31.69%), followed by South Africa with a total of 263 articles (21.59%), then Nigeria in 3rd position with a total of 184 articles (15.10%).

Morocco being in 4th position with 152 articles (12.47%). Kenya published 62 articles (5.09%), Sudan totaled 55 articles (4.51%).

Senegal with 45 articles (3.69%). Tunisia published 25 articles (2.05%). Libya published 13 articles (1.06%). Ghana published 11 articles (0.9%).

Ethiopia published 8 articles (0.65%). Zimbabwe published 5 articles (0.41%). Madagascar published 4 articles (0.32%) Algeria published 3 articles (0.24%).

The Democratic Republic of Congo published two articles (0.16%).

Only Côte d'Ivoire, Cameroon, Guinea and Mali have no publication; which represents 21.05% of the countries covered by our study between 2008 and 2018.

#### Distribution according to the type of article

African universities have mainly published descriptive cross-sectional studies (461 articles; 37.84%) as well as experimental in vitro studies (338 articles; 27.75%). Literature reviews and systematic with (128 articles; 10.50%). However the box report and clinical trials represent respectively (118 articles; 9.38%); (114 articles; 9.35%). Prospective and retrospective studies and meta-analyzes only represent respectively (24 articles; 1.97%) (18 articles; 1.47%) (17 articles; 1.39%).

#### Distribution according to discipline

African universities are mainly interested in conservative dentistry (278 articles; 22.82%), periodontology (246 articles; 20.19%), surgical dentistry (201 articles; 16.50%), orthodontic therapy (200 articles; 16.42%), prosthesis (187 articles; 15.35%); and pedodontics (106 articles; 8.70%).

**Table 4:** Participation of African universities in the journals indexed between 2008-2018 according to the type of publication.

Publication type	Number	%
Descriptive cross-sectional study	461	37.84%
In vitro experimental study	338	27.75%
Literature and systematic review	128	10.50%
Case report	118	9.38%
Clinical test	114	9.35%
Prospective study	24	1.97%
Retrospective study	18	1.47%
Meta-analysis	17	1.39%

**Table 5:** Distribution according to the author's discipline.

THEMES	NUMBERS	%
Conservative dentistry	278	22.82%
Periodontology	246	20.19%
Surgical dentistry	201	16.50%
Orthodontics	200	16.42%
Prosthesis	187	15.35%
Pedodontics	106	8.70%

## Moroccan universities

### Distribution according to Moroccan universities

The total number of publications by Moroccan authors in the journals indexed between 2008 and 2018 is 152 articles, which represents 12.47% of all articles published in Africa.

Regarding Moroccan universities that have published in indexed journals, the Faculty of Dentistry of Rabat comes in 1st position with a total of 94 articles (61.84%), followed by the Faculty of Dentistry of Casablanca with a total of 58 articles (38.15%).

#### Distribution according to the type of article

Moroccan universities have mainly published descriptive cross-sectional studies (76 articles; 50%) as well as case reports with (27 articles; 17.76%). However, the literature and systematic reviews with (19 articles; 12.5%) experimental in vitro studies (15 articles; 9.86%). Clinical trials (12 articles; 7.89%). Meta-analyzes and prospective studies only represent respectively (2 articles; 1.31%) (1 articles; 0.65%)

**Table 6:** Participation of Moroccan universities in the journals indexed between 2008-2018 according to the type of publication.

Publication type	Number	%
Descriptive cross-sectional study	76	50%
Case report	27	17.76%
Literature and systematic review	19	12.5%
In vitro experimental study	15	9.86%
Clinical test	12	7.89%
Meta-analysis	2	1.31%
Prospective study	1	0.65%

#### Distribution according to discipline

Moroccan universities are mainly interested in conservative odontology (19 articles; 12.50%), orthodontic therapies (66 articles; 43.42%), surgical dentistry (28 articles; 18.42%), Joint prosthesis (2 articles; 1.31%); the adjunct prosthesis (7 articles;

4.60%); Periodontology (23 articles; 15.13%) and Pedodontics (7 articles; 4.60%).

**Table 7:** Distribution according to the author's discipline.

THEMES	NUMBERS	%
Orthodontics	66	43.42%
Surgical dentistry	28	18.42%
Periodontology	23	15.13%
Conservative dentistry	19	12.50%
Assistant prosthesis	7	4.60%
Pedodontics	7	4.60%
Joint prosthesis	2	1.31%

## Discussion

### Introduction

Scientific information is essential for the work of teacher-researchers, more precisely for the construction of their scientific communication. We can thus say that bibliographic work precedes scientific work, as Sola Price asserts in 1963: "Each article rests on the foundation of previous papers, then it in turn serves as a starting point, among other things, for the next article. This learned masonry is illustrated by the citation of references" [13].

Bibliometric data today constitute an essential source in the process of evaluating research in the academic world: "Bibliometrics has acquired an increasing place in the evaluation of researchers... This place is explained by the simplicity of its use and through the access it provides to information factual and relatively synthetic on the career of researchers". [2].

Medical and scientific publications reflect the quality of the health system and medical studies as well as the development within a country [10,23].

Indeed, the geographical distribution is considered as a marker of scientific production.

### Protocol discussion

We carried out our study on the PubMed database. It is the reference database for carrying out research in medicine and health sciences.

PubMed is a free search engine providing access to the MEDLINE bibliographic database, gathering citations and summaries of biomedical research articles.

Our study compares the scientific publications carried out between 2008 and 2018 in 19 African countries namely: Morocco, Algeria, Tunisia, Egypt, Nigeria, South Africa, Cameroon, Ivory Coast, Ethiopia, Ghana, Guinea, Kenya, Libya, Madagascar, Mali, DRC Congo, Senegal, Sudan, Zimbabwe.

Our work was carried out through careful research at the respective sites of the different faculties of these countries, and this resulted in the establishment of a list of research professors from the different departments and which represents the center of our research on Pubmed.

After checking the articles obtained, they were classified according to faculties, authors, disciplines and type of article.

The strong point of our work is the inclusion of all disciplines (Orthodontics, Surgical dentistry, Conservative dentistry, Joint prosthesis, Assistant prosthesis, Periodontology, Pedodontics). All articles published during 2008 and 2018 were reviewed.

This work can be criticized for being limited to PubMed as a database.

The difficulties encountered during the development of this work are:

- The absence of similar studies in the literature on the bibliometrics of African publications in dentistry.

- The lack of information concerning African faculties:

Their number, their geographical distribution, the number of teachers...

- The absence of an African organization bringing together all the African odontological faculties and having general information useful in this kind of work.

To overcome the absence of all this information, we had to go and find it ourselves, which is what makes this work so original.

### Discussion of results

Our study found that scientific and technical skills are concentrated in a limited number of countries. It is, in the first place, Egypt which occupies the first rank in all disciplinary fields. South Africa ranks second. In third position, we find a group of countries in particular, Nigeria and Morocco.

In a study conducted by Mohammed Essadaoui in 2010 [6] which analyzed the scientific production of 6 African countries during the period from 2000 to 2010 namely: Morocco, Algeria, Tunisia, Egypt, Nigeria and South Africa, in the 4 disciplinary fields and their subfields, the results showed more particularly in the field of dentistry the following classification:

- Egypt: with 819 publications
- South Africa: with 471 publications
- Nigeria: with 248 publications
- Morocco: with 170 publications
- Tunisia: with 79 publications
- Algeria: with 5 publications

These results obtained by Essadaoui agree with our study.

It should be noted that during the period from 2008 to 2010, the ranking of African universities in terms of scientific production has not experienced any significant change, because all countries have retained their rank initial [6].

In another study carried out by an Olalekan A Uthman et al in 2015 [20] which analyzed 107,662 articles indexed in PubMed between 2000 and 2014 in the medical field, published by authors from the Africa region (WHO REGIONS) comprising 45 countries.





Three countries are in the lead: South Africa (30%), Nigeria (16%), Kenya (6%). The number of publications increased from 3,623 in 2000 to 12,709 in 2014.

We note that the countries most represented in this analysis are English-speaking, explaining the contrast obtained with our results and the absence of certain countries of North Africa (Morocco, Tunisia, Egypt) which occupy an important place in our study.

Table 1 Top 10 countries in the WHO African Region in terms of health research publications from 2000 to 2014, normalised by the indicated variable

Rank	Absolute number	Normalised by		
		Population	Gross domestic product	Total expenditure on health
1	South Africa	South Africa	Gambia	South Africa
2	Nigeria	Nigeria	Malawi	Nigeria
3	Kenya	Kenya	Guinea-Bissau	Kenya
4	Uganda	Uganda	Niger	Ethiopia
5	Tanzania	Ethiopia	Zimbabwe	Tanzania
6	Ethiopia	Tanzania	Uganda	Uganda
7	Ghana	Eritrea	Cameroon	Cameroon
8	Cameroon	Cameroon	Kenya	Ghana
9	Malawi	Senegal	Tanzania	Malawi
10	Senegal	Malawi	Burkina Faso	Senegal

Table 8: Ranking of the top 10 African countries (WHO AFRICAN REGION) in terms of scientific production between 2000-2014 [20].

Among the university ranking systems that exist; the Shanghai ranking of Jiao-Tong University (common name of Academic Ranking of World Universities in English or ARWU) proposed for the first time in 2003 by 4 professors from this university. It allows institutions to be classified according to a single index calculated from quantitative criteria:

- Number of publications in the 2 scientific journals Nature and Science.
- Number of researchers among those cited more frequently
- Number of scientific Nobel prizes and medals in the different fields awarded to alumni and university staff
- A productivity criterion related to the size of the teaching staff if it is known. [8,11,18]

Critères	Indicateurs	Poids
Qualité de la formation	Nombre de prix Nobel et de médailles Fields parmi les anciens élèves (Quaerflor ma)	10 %
Qualité du capital humain	Nombre de prix Nobel et de médailles Fields parmi les enseignants-chercheurs (PrixNobel)	20 %
	Nombre de chercheurs les plus cités dans leurs disciplines (Citations)	20 %
Production scientifique	Nombre d'articles publiés dans Nature et Science (N&S)	20 %
	Nombre d'articles indexés dans le Science Citation Index, le Social Science Citation Index et le Arts & Humanities citation Index (SCI/SSCI)	20 %
Productivité apparente du capital humain	Performance tenant compte de la taille de l'établissement (Productivité)	10 %

Table 9: Calculation method for the Shanghai ranking.

We note that only South Africa is represented among the top 40 countries in the world occupying the 25th place according to the Shanghai ranking.

In Table XI classifying world universities, we find the University of Cape Town in South Africa at the 239th position.

Note that this ranking is dominated by the United States with 8 American universities among the top 10.

Pays	Rang	Rang 1	Rang 2	Rang 3	Rang 4	Rang 5	Nombre d'universités classées par pays
États-Unis	1	1	1	1	1	1	168
Royaume-Uni	2	2	2	2	2	2	40
Allemagne	3	3	3	3	3	3	40
Japon	4	4	4	4	4	4	34
Canada	5	5	5	6	5	5	23
France	6	6	6	5	6	6	21
Italie	7	7	7	7	7	7	23
Australie	8	8	8	9	8	8	14
Pays-Bas	9	9	9	10	9	9	12
Suède	10	10	10	11	10	10	11
Suisse	11	11	11	8	11	11	8
Israël	12	12	13	13	12	12	7
Belgique	13	13	12	12	13	13	7
Espagne	14	14	15	16	14	14	9
Chine	15	15	14	23	16	15	8
Corée du Sud	16	16	16	18	17	17	8
Danemark	17	17	17	14	15	16	5
Autriche	18	18	18	15	18	18	6
Hongkong	19	19	19	21	21	19	5
Finlande	20	20	20	20	19	20	5
Norvège	21	21	22	17	20	21	4
Taiwan	22	22	21	24	23	22	5
Nouvelle-Zélande	23	24	23	22	22	23	5
Bésil	24	23	24	26	24	24	4
Afrique du Sud	25	25	25	25	25	25	4
Russie	26	26	26	19	26	26	2
Irlande	27	28	28	28	27	28	3
Pologne	28	29	27	29	28	27	3
Singapour	29	27	29	31	30	29	2
Inde	30	30	30	27	29	30	3
Hongrie	31	32	31	30	31	31	2
Grèce	32	31	32	32	32	32	2
Mexique	33	34	33	33	33	33	1
Turquie	34	33	34	36	34	34	2
Argentine	35	36	35	34	35	35	1
Répub. tchèque	36	35	36	35	36	36	1
Chili	37	37	37	37	37	37	1
Portugal	38	38	38	38	38	38	1

Table 10: Ranking of universities by country according to the different indicators.

The 1st French-speaking university is at the 46th position (University Paris VI).

Institution	Pays	Rang'	Institution	Pays	Rang
Harvard Univ	États-Unis	1	Univ Adelaide	Australie	238
Univ Cambridge	Royaume-Uni	2	Univ Cape Town	Afrique du Sud	239
Stanford Univ	États-Unis	3	Univ Laval	Canada	240
Univ California-Berkeley	États-Unis	4	Kobe Univ	Japon	252
MIT	États-Unis	5	École Polytechnique	France	253
California Inst Tech	États-Unis	6	Tech Univ Berlin	Allemagne	254
Columbia Univ	États-Unis	7	Univ Karlsruhe	Allemagne	255
Princeton Univ	États-Unis	8	Univ Lyon I	France	286
Univ Chicago	États-Unis	9	Univ Dundee	Royaume-Uni	287
Univ Oxford	Royaume-Uni	10	Univ Bordeaux I	France	295
Univ Paris VI	France	46	Univ Méditerranée	France	309
Univ Paris XI	France	61	Univ Bath	Royaume-Uni	310
Univ Strasbourg I	France	92	Univ Bielefeld	Allemagne	311
Univ Utah	États-Unis	93	Univ Nancy I	France	312
Stockholm Univ	Suède	94	Univ Fed Rio de Janeiro	Bésil	345
École Normale Paris	France	95	École Super Phys & Chimie	France	346
Univ Leuven	Belgique	150	Univ Bayreuth	Allemagne	347
Coll France	France	151	Eindhoven Univ Tech	Pays-Bas	371
Hokkaido Univ	Japon	152	Univ Paris IX	France	372
Fed Inst Tech Lausanne	Suisse	153	Vienna Tech Univ	Autriche	373
Univ Paris VII	France	154	Nanyang Tech Univ	Singapour	374
Univ Grenoble I	France	187	École des Mines – Paris	France	375
Univ Turin	Italie	201	École Normale Sup Lyon	France	391
Univ Paris V	France	202	Nagasaki Univ	Japon	392
Univ Auckland	N-Zélande	203	Univ Bordeaux	France	411
Univ Montpellier II	France	215	Univ Granada	Espagne	441
Univ Western Ontario	Canada	216	Univ Aix Marseille I	France	442
Delft Univ Tech	Pays-Bas	236	Univ Quebec	Canada	443
Univ Toulouse III	France	237			

Table 11: Ranking of the Shanghai system of.

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However and despite the notoriety that this classification system has known, the fact remains that it has known many criticisms as to the criteria used for a relevant and objective classification, because these criteria used do not assess the quality. Education or the level of graduate students which is opposed to the goals recommended in this classification and which are certainly only the education and vocational training of students. The number of Nobel prizes and Fields medals in a university therefore seems to measure old reputations, and on the contrary does not allow us to know the current quality of research or teaching in this university [3,9,24].

It should be noted that this classification system has imperfections insofar as it favors older large institutions more, or which treats the hard sciences (Medicine and Biology) to the detriment of the social sciences and the law and which does not do not take into account the constraints exerted on these establishments or their resources [3,9].

Given the above, in particular the findings noted, the bibliometric studies prove to be more credible and more reliable or even closer to reality in terms of the evaluation of scientific production compared to the aforementioned classification systems [8].

During recent years, numerous bibliometric studies have been carried out in different countries of the world such as the United States of America [21], Canada [20], China [16], Brazil [14], France [5], Turkey [25], Iran [15], Spain [4], Lithuania, Latvia, Estonia [12], and the countries of South East Asia [17],... etc.

According to a bibliometric study carried out by Gil-Montoya and his colleagues in 2006 [7], and which consisted mainly of a quantitative analysis of scientific publications between 1999 and 2003 in the field of dentistry, in order to allow the creation of a map geographical relief illustrating the various publications in this field throughout the world, the classification shows that:

- USA with a number of publications of 6779 articles
- United Kingdom with 2667 publications
- Japan with 2442 publications

In addition, it should be noted that in this ranking we find South Africa occupying the 29th place with 113 publications and Nigeria occupying the 40th place with 34 publications.

These results agree with those of the Shanghai ranking given the parameters taken into account in the latter, namely the 20% corresponding to the number of articles published in Nature and Science (N&S), but contrast with those reported in our study; this could be explained by the possibility that the data concerning the number of scientific publications in certain countries of North Africa in particular Egypt and Morocco must have evolved during these last decades.

In another bibliometric study carried out by Poskevicius L et al in 2018 [12], they noted that during the period 1996 to 2018, the

Baltic countries published 651 publications.

Lithuania has published 280 scientific publications in dentistry ranking first; Latvia comes second with 210 articles. Estonia occupies the last place with 161 scientific publications.

The results obtained in this study show that the countries of North Africa (Morocco, Egypt, Tunisia) published about 50% more articles than the Baltic countries during the decade (2008-2018).

Note that the number of faculties in the Baltic countries is 6; while the countries of North Africa have 31 faculties which explains this difference.

Times Higher Education recently released its 2020 ranking of universities in emerging economies based on 13 performance indicators, grouped into five areas: learning environment, research (volume, income and reputation), citations (influence of research), international perspectives (for staff, students and research) and knowledge transfer [26].

Thus, Moroccan universities are included but have, however, mostly lost several ranks in this ranking containing about 500 universities in emerging countries:

1. The Mohammed V University of Rabat is registered between the "301 and 350 "th places, while it was ranked among the " 201 and 250 "th places in 2019.
2. The Sidi Mohammed Ben Abdellah University in Fez has maintained its place between the "201st and 250th" in the ranking.
3. The Hassan II University of Casablanca has also kept its rank between "351st and 400th" place.
4. The Cadi Ayyad University of Marrakech dropped from the position of "251st to 300th" in 2019 to enroll between "401st and 500th" in 2020.
5. The Ibn Tofaïl University of Kenitra joined the ranking in 2020 to be in the position of "401st to 500th" [26].

For its part, the QS World University Ranking, an annual ranking of universities published by Quacquarelli Symonds, a British company specializing in education, also shows rank losses for Moroccan universities in its ranking of "Best universities in the Arab world in 2020 " [27].

The six indicators of the QS ranking are academic reputation, employer reputation, citations by faculty, faculty / student ratio, international faculty ratio, and international student ratio.

Thus, out of the 100 Arab universities selected for this ranking, the three Moroccan universities which appear there are placed as follows:

1. Al Akhawayn University is among the "71st-80th" when it was 46th in 2019.
2. The Mohammed V University of Rabat is among the "81st-90th" while it was among the "51st-60th".
3. The Hassan II University of Casablanca is among the last of

the ranking "91st to 100th" while it was among the "71st-80th" in 2019 [27].

Given that dentistry is only taught at the level of Mohammed V University in Rabat and Hassan II University in Casablanca, these results are similar to those obtained in our study.

Despite the efforts made, African universities still remain very far from European and American universities in terms of all measurement indicators.

Finally, in view of the results of our study, it would be wise and essential that African faculties:

- Place more emphasis on research and teacher training.
- Allocate a significant budget to research
- Pool their efforts in the field of research to improve their global ranking.

## Conclusion

Through our study, we evaluated scientific research in dentistry in Africa through the publications of teacher-researchers indexed on PubMed from 2008 to 2018 using a bibliometric approach.

Egypt and South Africa dominate the publication charts. Morocco occupies 4th place, Ivory Coast, Cameroon, Guinea and Mali are absent.

Despite the efforts made by African universities, they still remain very far from European and American universities, which is demonstrated in particular by the number of their publications.

The policy of African ministries must encourage and provide more efforts in the field of scientific research in all its forms.

It would be wise to increase the collaboration between the different establishments on a national and African level and to use the English language to allow more visibility on a global scale.

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