

# A Bibliometric Analysis of Nigeria's Research Performance, 1901-2016

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## Abstract

*A bibliometric analysis of Nigerian publications indexed in Scopus database over a 115-year period, 1901 to 2016 was carried out. The study elucidated Nigerian research performance, publication trends, publications patterns and collaboration patterns at national and international levels. A total of 95,304 publications were analysed with underlying bibliometric indicators and statistics. Results show a steady increase in Nigerian publications after independence; predominant article publications compared to conference papers and reviews as well as frequent collaboration within the country when compared to outside the country; and that most research publications in Nigeria emanate from universities. It is therefore suggested that there is need for more research activities and collaboration within and especially outside the country to enhance effective research productivity.*

**Keywords:** Nigeria, Bibliometrics, Scholarly Communication, Publication Pattern, Scopus.

## Introduction

Research is key to development and productivity of any nation. In this twenty-first century, developed countries periodically assess their research performance and productivity for sustainable national growth and development of innovation systems and modern knowledge. Research outputs are mostly disseminated through publications (Okiki, 2013). Publication can be in textbooks, book chapters, conference papers, journal articles and technical reports. The journal articles are mostly used to assess and evaluate research performance. In bibliometric analysis, experts count the number of papers written by researchers, universities, countries/regions and disciplines over a specific period to measure productivity (Ani and Onyancha, 2012). A bibliometric analysis has been a common and acceptable research method for the assessment of research performance and productivity (Ho, 2014). The bibliometric analysis basically involves the quantitative statistical analysis of documents with an underlying principal assumption that scholars' published papers reflect their scholarly activities when their publications are subjected to quantitative analysis (Moed, 2002). It is used to measure scientific output, impact and collaboration based on the number of publications, usually interpreted as proxies of the indicators (Waltman and Noyons, 2018). Bibliometric studies are sometimes interpreted with other metrics to make a good research policy (Moed, 2005).

## Problem Statement

Studies have shown that limited studies were carried out on the evaluation of Nigerian publications output. These studies include Nigerian publications indexed in Web of Science (WoS) in the fields of arts and humanities and social science between 2002 and 2007 (Nwagwu and Egbon, 2011); publications from Nigerian universities indexed in WoS, 2000 - 2010

(Ani and Onyancha, 2012); WoS indexed library and information science research publications in Nigerian universities (Ani and Okwueze, 2016); and cancer research publications in Nigeria from PubMed database during the period of 2008 to 2012 (Salisu and Ojoye, 2015). These studies tend to address publications output in specific disciplines or national institutions or a specific research interest/field. However, this study seeks to conduct an in-depth analysis of Nigerian research performance using publications output indexed in the Scopus database from 1901 to 2016.

Scopus is the largest curated abstract and citation database of peer-reviewed literature. The use of Scopus as data source has proven suitable and is preferred over other citation databases because of its wider coverage (Chinchilla-Rodríguez, López-Illescas, and de Moya-Anegón, 2012; Mongeon and Paul-Hus, 2015, and Majid, Chang, Hnin, Ma and San, 2015).

### Objectives of the Study

The broad objective of this study is to evaluate Nigeria's research performance over a 115-year period (1901 to 2016) via indexed articles in Scopus database with underlying bibliometric indicators and statistics. The specific objectives are to:

(i) examine the trend and pattern of growth of Nigerian publications output;

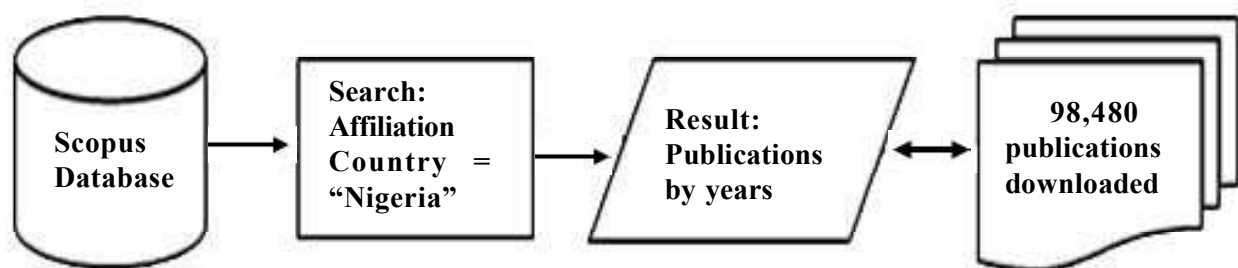
(ii) analyse the publication patterns, and collaboration patterns among Nigerian universities;

(iii) identify national leading universities in terms of publications output and collaboration rate; and

(iv) analyse the collaboration patterns at international level.

### Methodology

The study adopted bibliometric techniques and indicators to explore the research activities in Nigeria from 1901 to 2016. Publications data were extracted from Scopus. Even though Scopus was launched by Elsevier in 2004 as an alternative to Web of Science owned by Thomson Reuters, all predated publications were collated and indexed in the Scopus database. The search involved using the Document Search Tab with the Option Affiliation (Affiliation Country) and the keyword 'Nigeria'. A publication was attributed to Nigeria if there was an author address that reflected the country name. The first evidence of publication from Nigeria was an article paper published in British Medical Journal in 1901, titled: *Preliminary note on an unclassified type of West African fever*.



**Figure 1:** Schematic diagram showing searching of Scopus for publications by Nigerian authors

Each publication record was saved under the following column headings: authors, title, year, source title, volume, issue, article no., page start, page end, page count, cited by, DOI, link, affiliations, authors with affiliations, references, publisher, document type and source. Publication output and citation count are indicators among the performance indicators generally considered to be objective and quantitative when measuring research output and impact (Pienta, 2004 in Ani and Onyancha, (2012)). Basically, this study deployed these two indicators and their derivatives in measuring research outputs and impact. A total of 98,480 records were downloaded.

Data cleaning and standardisation was carried out such as institution's name disambiguation (i.e. harmonising old and new names of institutions), correction of misspelled institution's name, eliminating of duplicate entries, correction of wrong attribution of publication (e.g. article with Nigerian

institution name assigned Niger), reclassification of publications from research centres/institutions/teaching hospitals to their parents' institutions (e.g. papers from University College Hospital was assigned to University of Ibadan) and so on. These processes pruned the total publications to 95,304 publications. Afterwards, a script was written using R-statistical programming language to present the data in a suitable form for data analysis.

## Results

Nigeria's total publications output over the years cumulated to 95,304 publications in 115 years (1901 - 2016); they were delineated into a 10- year period, starting from 1901 to 1910. The total number of universities established over the periods was 127 universities.

**Table 1: Number of Publications in Nigerian Universities from 1901 to 2016**

Publication period	Total publications (%)	Number of established universities	Cumulative number of established universities
1901-1910	13 (0.01)	–	–
1911-1920	18 (0.02)	–	–
1921-1930	63 (0.07)	–	–
1931-1940	70 (0.07)	–	–
1941-1950	108 (0.11)	1	1
1951-1960	557 (0.58)	1	2
1961-1970	1,401 (1.47)	5	7
1971-1980	6,026 (6.32)	11	18
1981-1990	12,563 (13.18)	12	30
1991-2000	11,332 (11.89)	14	44
2001-2010	29,329 (30.77)	58	102
2011-2016	33,824 (35.49)	24	126
<b>Total</b>	<b>95,304</b>	<b>126</b>	

As expected, Table 1 shows an increasing trend from less than 1% in the period 1901 to 1910, to 35.49% during the period 2011-2016 except during the period 1991-2000, when there was a decline. A few publications were recorded before the period the first university, University of Ibadan (formerly

known as University College, Ibadan) was established in 1948. Those publications were from authors whose affiliations were research centres/institutions/hospitals/foreign institutions. Thereafter, the establishment of the first and successive universities over time brought significant increase in publications

output. During the period 1991 – 2000, despite an additional 14 universities that were established and cumulatively 44 universities, there was a drop in publications output. This could be attributed to a 27% shrink in higher institutions budgetary allocation during this period (Saint, Harnett and Strassner, 2003).

There has been an exponential growth in number of publications in the 21st century. Publications within these periods (2001 – 2016) cumulatively constituted 66.3% of the total publications. The table below presents the proportion of publications based on the predefined document types by the Scopus. The document types include abstract report, article, article in press, book, book

chapter, conference, editorial, erratum, letter, note, report, review, short survey, and other publications. Publications classified as other publications are those that are not specified by Scopus.

Table 2 shows significant variation in publication of the document types ranging from predominance of article papers with 85.4%, then conference papers of 4.9% and review papers of 3.3% down to minuscule values for editorial, short survey, erratum, book, abstract report and report while unspecified papers constituted 1.6%. The dominance of journal articles is in conformity with the study by Fiala and Ho (2015) in which article papers accounted for 62.6%.

**Table 2: Number of Publications by Document Type in Nigerian Universities**

Document type	Number of publications (%)
Abstract Report	18 (0.0)
Article	81,407 (85.4)
Article in Press	689 (0.7)
Book	83 (0.1)
Book Chapter	1,334 (1.4)
Conference Paper	4,659 (4.9)
Editorial	222 (0.2)
Erratum	90 (0.1)
Letter	1,545 (1.6)
Note	466 (0.5)
Report	3 (0.0)
Review	3,112 (3.3)
Short Survey	159 (0.2)
Other publications	1,517 (1.6)
<b>Total</b>	<b>95,304</b>

### Universities Publications Output

This section analysed output from Nigerian universities. There are a total of 126 universities which were established between 1948 and 2016, where 74 are public universities – 37 universities each were owned and funded by federal government and state governments respectively, while the other 52 universities were privately owned by missionaries or private individuals. The Nigerian universities' total publications output comprises 83,484 papers in 68 years which is equivalent to 87.6% of the entire

Nigerian publications output as at 2016. Table 3 presents the statistics of bibliometric indicators used: University Total Publication (Univ.TP): total publications from each university; First Author (FA): total number of publications that members of the university were posited as first author; Single author (SA): total number of publications that the member of the university solely authored; Average Citation per Publication (ACT/P) and Average Publication per Year (AP/Y) were also deployed to normalise the variation across the board.

Table 3: Top 25 Prolific Nigerian Universities

Rank	Year founded	University	Univ.TP (%)	FA (%)	SA (%)	Total citation	ACt/P	AP/Y
1	1948	University of Ibadan (UI)	17,092 (20.5)	9,488 (55.5)	3,992 (23.4)	143,227	8.4	251.4
2	1962	Obafemi Awolowo University (OAU)	8,286 (9.9)	4,754 (57.4)	1,957 (23.6)	55,307	6.7	153.4
3	1960	University of Nigeria Nsukka (UNN)	7,544 (9.0)	4,320 (57.3)	1,979 (26.2)	41,963	-5.6	134.7
4	1962	Ahmadu Bello University (ABU)	6,386 (7.6)	3,780 (59.2)	1,359 (21.3)	39,347	6.2	118.3
5	1962	University of Lagos (UNILAG)	6,287 (7.5)	3,575 (56.9)	1,372 (21.8)	37,401	-5.9	116.4
6	1970	University of Benin (UNIBEN)	5,108 (6.1)	3,038 (59.5)	1,165 (22.8)	26,479	-5.2	111.0
7	1975	University of Ilorin (UNILORIN)	3,859 (4.6)	2,092 (54.2)	841 (21.8)	20,975	-5.4	94.1
8	1975	University of Port Harcourt (UNIPORT)	2,746 (3.3)	1,634 (59.5)	498 (18.1)	21,513	7.8	67.0
9	1975	University of Calabar (UNICAL)	2,493 (3.0)	1,415 (56.8)	473 (19.0)	16,259	6.5	60.8
10	1981	Federal University of Technology, Akure (FUTA)	2,341 (2.8)	1,397 (59.7)	439 (18.8)	11,907	-5.1	66.9
11	1988	Federal University of Agriculture, Abeokuta (FUNAAB)	2,109 (2.5)	1,291 (61.2)	240 (11.4)	9,720	-4.6	75.3
12	1975	University of Jos (UNIJOS)	1,924 (2.3)	1,042 (54.2)	351 (18.2)	13,003	6.8	46.9
13	1990	Ladoke Akintola University of Technology (LAUTECH)	1,892 (2.3)	1,232 (65.1)	134 (7.1)	10,726	-5.7	72.8
14	1975	University of Maiduguri (UNIMAID)	1,798 (2.2)	1,108 (61.6)	227 (12.6)	12,240	6.8	43.9
15	1983	Lagos State University (LASU)	1,542 (1.8)	852 (55.3)	209 (13.6)	9,379	6.1	46.7
16	1992	Nnamdi Azikiwe University (UNIZIK)	1,532 (1.8)	862 (56.3)	174 (11.4)	8,167	-5.3	63.8

17	1982	Olabisi Onabanjo University (OOU)	1,496 (1.8)	865 (57.8)	238 (15.9)	10,195	6.8	44.0
18	1991	University of Uyo (UNIUYO)	1,434 (1.7)	866 (60.4)	233 (16.2)	10,337	7.2	57.4
19	1975	Bayero University Kano (BUK)	1,410 (1.7)	691 (49.0)	294 (20.9)	6,920	-4.9	34.4
20	2002	Covenant University (CU)	1,394 (1.7)	943 (67.6)	217 (15.6)	3,680	-2.6	99.6
21	1980	Federal University of Technology, Owerri (FUTO)	1,286 (1.5)	736 (57.2)	324 (25.2)	7,843	6.1	35.7
22	1992	Delta State University (DELSU)	1,131 (1.4)	561 (49.6)	381 (33.7)	3,369	-3.0	47.1
23	1979	Rivers State University of Science and Technology (RSUST)	1,106 (1.3)	584 (52.8)	253 (22.9)	5,226	-4.7	29.9
24	1982	Ekiti State University (EKSU)	913 (1.1)	476 (52.1)	219 (24.0)	2,873	-3.1	26.9
25	1982	Federal University of Technology, Minna (FUTMINNA)	898 (1.1)	508 (56.6)	153 (17.0)	3,370	-3.8	26.4

Univ. TP%: share in 83,484 publications; %FA, %SA: share in each university.

The total Nigerian publications were 95,304 with the total citations of 583,237. Therefore, the average number of citations to Nigerian publications amount to 6.1. Adopting Moed's (2002) study approach in measuring citation impact, the column ACt/P in the table gives the relative citation impact of the publications from Nigeria compared to the average citation rate of the Nigerian universities publications. Thus, the threshold value for relative comparison is 6.1. The negative ACt/P value indicates that the particular university's citation is below the average citation rate of Nigerian publications. This measure showed that only 16 (12.5%) of the universities were above the benchmarked average citation rate of Nigerian publications, and 11 universities (i.e. 8.6% of the 12.5%) were among the 25 top universities, namely UI, UNIPORT, UNIUYO, OOU, UNIMAID,

UNIJOS, OAU, UNICAL, ABU, FUTO and LASU in descending order. The ranking reflect the position of each of Nigerian universities' research performance and productivity in terms of publication output.

It is an undisputable fact that most of the federal universities were at the forefront due to the numerous privileges they enjoyed from the federal government and others.

### Nigeria's Publications Collaboration

Table 4 shows the overall proportion of collaborated publications in Nigerian Universities over the 115-year period (1901-2016). The Table shows the trends of number and percentage share of publications in various collaborations over the 115 year- period (1901- 2016).

**Table 4: Number and Percentage Share of Collaborated Publications in Nigeria, 1901 – 2016**

Publication period	Total papers	No collaboration		Collaborated publications					
				Total		Domestic		International	
		Number	% Share	Number	% Share	Number	% Share	Number	% Share
1941 - 1950	108	106	98.1	2	1.9	2	1.9	0	0.0
1951 - 1960	557	482	86.5	75	13.5	58	10.4	17	3.1
1961 - 1970	1,401	985	70.3	416	29.7	304	21.7	112	8.0
1971 - 1980	6,026	3,488	57.9	2,538	42.1	2,086	34.6	452	7.5
1981 - 1990	12,563	6,695	53.3	5,868	46.7	4,846	38.6	1,022	8.1
1991 - 2000	11,332	4,477	39.5	6,855	60.5	5,364	47.3	1,491	13.2
2001 - 2010	29,329	7,725	26.3	21,604	73.7	17,510	59.7	4,094	14.0
2011 - 2016	33,824	7,506	22.2	26,318	77.8	18,138	53.6	8,180	24.2

Publications with multiple authors tend to increase over the periods at the expense of single-authored publications. Domestic and international collaborations were on increase over the periods. Notably, in the period 2011-2016, significant increases in international collaboration were observed while domestic collaboration fell short.

### Collaborating Countries

A total of 203 countries collaborated with the Nigerian authors till 2016. The top 20 collaborating countries from 1901 -2016 is shown in Table 5. The outstanding two countries with topmost collaboration were the United States and the United Kingdom.

They contributed 5,397(5.7%) and 4,848 (5.1%) publications of the 95,304 total publications respectively. These publications accounted for 66.6% of the publications that were co-authored with international communities. Following the top two countries were South Africa, Germany, Malaysia, China and India that contributed at least a thousand papers. The least number of publications was recorded in Sweden with 412 papers (0.4%).

The total collaborated publications from Africa were 8,123 publications which is approximately half of the 15,368 total international collaboration publications as shown in Table 6. Collaboration among the neighbouring West African countries was very low as it was not as frequent as in the case of the USA and Canada (Aumuller and Rahm, 2011). Generally collaboration with African countries was quite low except for South Africa.

**Table 5: Top 20 International Collaborating Countries with Nigerian Authors (1901 to 2016)**

Country	Collaborated papers	*% of total international collaboration (15,368)	*% of total publications (95,304)
United States	5,398	35.1	5.7
United Kingdom	4,848	31.5	5.1
South Africa	2,653	17.3	2.8
Germany	1,523	9.9	1.6
Malaysia	1,398	9.1	1.5
China	1,210	7.9	1.3
India	1,206	7.8	1.3
Canada	902	5.9	0.9
Italy	885	5.8	0.9
Australia	734	4.8	0.8
Japan	716	4.7	0.8
France	705	4.6	0.7
Ghana	619	4.0	0.6
Netherlands	600	3.9	0.6
Brazil	591	3.8	0.6
Kenya	583	3.8	0.6
Thailand	510	3.3	0.5
Switzerland	508	3.3	0.5
Cameroon	485	3.2	0.5
Sweden	412	2.7	0.4

**Note:** \* A paper may be counted in various countries, thus the sum is not 100%.



**Table 6: Top 10 International Collaborating Countries with Nigerian Authors in Africa**

Country	Collaborated Papers	*% of Total International Collaboration (15,368)
South Africa	2,653	17.3
Ghana	619	4.0
Kenya	586	3.8
Cameroon	485	3.2
Uganda	394	2.6
Tanzania	304	2.0
Benin Republic	262	1.7
Egypt	247	1.6
Ethiopia	210	1.4
Botswana	174	1.1

**Note:** \*A paper may be counted in various countries, thus the sum is not 100%.

There were 5,213 (6%) single-authored publications, and 78,271 (94%) multiple-authored publications out of the 83,484 total collaborated publications. This study also observed collaborated publications within the same universities (37%), between national universities (33%), and between national universities and international universities (24%). Table 7 shows the number and ratio of

collaborated publications by Nigerian universities. All the most productive universities for total publications were also top ranked in collaborating publications. University of Ibadan the foremost of all, followed by Obafemi Awolowo University then University of Nigeria and so on. The intra-university publications from these productive universities range from 40% to 60% of their respective total collaborated publications.

**Table 7: Number and Ratio of Collaborated Publications by Nigerian Universities**

Universities	Univ.TP	*Univ. CP (%)	Collaboration publications		
			Nigerian universities collaboration		International (Ratio)
			Intra-Univ. (Ratio)	Inter-Univ. (Ratio)	
University of Ibadan	17,092	13,094 (15.7)	6,471 (0.5)	3,166 (0.2)	3,457 (0.3)
Obafemi Awolowo University	8,286	6,329 (7.6)	3,145 (0.5)	1,436 (0.2)	1,748 (0.3)
University of Nigeria	7,544	5,593 (6.7)	2,929 (0.5)	1,456 (0.3)	1,208 (0.2)
Ahmadu Bello University	6,386	5,027 (6.0)	2,461 (0.5)	1,397 (0.3)	1,169 (0.2)
University of Lagos	6,287	4,922 (5.9)	2,292 (0.5)	1,377 (0.3)	1,253 (0.3)
University of Benin	5,108	3,944 (4.7)	2,253 (0.6)	1,015 (0.3)	676 (0.2)
University of Ilorin	3,859	3,040 (3.6)	1,206 (0.4)	1,016 (0.3)	818 (0.3)
University of Port Harcourt	2,746	2,261 (2.7)	1,136 (0.5)	719 (0.3)	406 (0.2)
University of Calabar	2,493	2,020 (2.4)	894 (0.4)	598 (0.3)	528 (0.3)
Federal University of Technology, Akure	2,341	1,899 (2.3)	823 (0.4)	539 (0.3)	537 (0.3)
Federal University of Agriculture, Abeokuta	2,109	1,869 (2.2)	105 (0.1)	1,271 (0.7)	493 (0.3)
Ladoke Akintola University of Technology	1,892	1,758 (2.1)	416 (0.2)	961 (0.5)	381 (0.2)
University of Maiduguri	1,798	1,583 (1.9)	643 (0.4)	563 (0.4)	377 (0.2)
University of Jos	1,924	1,580 (1.9)	665 (0.4)	422 (0.3)	493 (0.3)
Nnamdi Azikiwe University	1,532	1,358 (1.6)	359 (0.3)	707 (0.5)	292 (0.2)
Lagos State University	1,542	1,333 (1.6)	343 (0.3)	587 (0.4)	403 (0.3)
Olabisi Onabanjo University	1,496	1,258 (1.5)	433 (0.3)	566 (0.4)	259 (0.2)
University of Uyo	1,434	1,206 (1.4)	405 (0.3)	518 (0.4)	283 (0.2)
Covenant University	1,394	1,177 (1.4)	417 (0.4)	341 (0.3)	419 (0.4)
Bayero University	1,410	1,116 (1.3)	198 (0.2)	444 (0.4)	474 (0.4)

**Note:** \*A paper may be counted in various universities, thus the sum is not 100 %.

Univ. CP: total collaborated publications from each university.

Univ. CP%: share in 83,484 publications.

## Discussion

The findings of this study show that in the earlier periods of the colonial era, the country's publications output was relatively low, while at the country's independence in 1960, the publications output was about 0.58% with only University of Ibadan (formerly, University College Ibadan) present at that time. Immediately after independence, there was a steady rise in publications output over the next three decades with the significant increase in numbers of established universities to 30 universities being a key factor in this increment.

The year 1999 marks a milestone in the country's history, which signified an end to clustered military regimes and the ushering in of a democratic government and governance. The upsurge in publications output that was experienced in the period of 2001 to 2016 which can be attributed to strategic educational policies and reforms that took place, such as reinstatement of university autonomy with increased funding for the university system, establishment of more federal and state universities and licensing of more private universities (Saint, Harnett and Strassner, 2003).

This study's outcome revealed that article publications predominated over the periods, constituting not less than 80% of the publications in each period interval. The article publications output were at the peak value of 5,460 (90.6%) publications and 10,516 (92.8%) publications in both the 1971-1980 and 1991-2000 periods respectively. Even though 1991-2000 saw a downward trend in publications output of 9.8%, article publications output also dropped by 3.6% while some other publications types were slightly affected. Subsequently, there has been a steady increase over the period to 2016.

The study also affirms that most research activities and publications output in Nigeria come from the university system (Okonedo, 2015). The total publications from the Nigerian universities amounted to 87.6% (83,484) of the entire country's publications. The result revealed that the first generation universities (i.e. universities founded between 1948 and 1962) namely UI, OAU, UNN, ABU and UNILAG were the foremost in research publication output. They contributed around 47% of the Nigerian universities' publications. The next ten

include all the second generation universities (i.e. universities founded between 1970 and 1975). Some state-owned universities such LAUTECH and LASU were among the top performers and remarkably, Covenant University which was ranked 20th despite her young age, stands out among other private universities. The leading position of the first generation universities is not surprising, especially UI, being the oldest university, it has larger postgraduate studies enrolments and may also enjoy special benefits of more grants, collaboration from international communities than others (Ani and Onyanche, 2012).

Interestingly, first authorship indicator in Table 3 showed that all the topmost ranked universities (except Bayero University with 49%) had at least 50% of their publications positioned as first author. Single authorship was relatively high among the top tier productive universities ranging from 11% - 34% in which first generation universities were between 22% and 26% single author papers, indicating higher capacity of independent research. Low single authorship (7%) was recorded in LAUTECH which is relatively low compared with other top ranked universities, and around 19 (35%) private universities have no single-handedly authored paper.

Each institution's average annual publication was also evaluated. This average metric was used to normalise the large disparity in volumes of publications among the universities – ratio of years of university's existence till 2016 to total numbers of publications. This gives meaningful comparison of research publications across the board. Data revealed that just 11.8% of Nigerian universities published an average of 50 papers per year in which all the first generation universities ranked at the top, followed by UNIBEN which had more than 100 papers per annum. Next was CU with an average of 99.6 papers, UNILORIN 94.1 while FUNAAB, LAUTECH, UNIPORT, FUTA, UNIZIK, UNICAL and UNIUYO had between 75 to 57 papers annually. Observably, CU which was founded in year 2002 had outgrown older universities and her contemporaries in publication output – despite being a private institution which enjoys little or no benefit of research funds and grants as public universities.

Research collaboration enhances research visibility and outreach (Chinchilla-Rodríguez et al., 2012). Collaboration within the university system

shows that nearly 50% of the Nigerian universities co-authored with their peers from the same universities with ranges between 20% and 30% of their total collaborated publications. It was observed that inter-university collaborations were relatively high, especially for universities with low total publications output. The overall analysis shows that the percentage of collaboration between universities (33%) was much higher than that between countries (24%), which is in line with the study of Li and Ho (2008).

International collaboration indices showed that Nigeria co-authorship ratio is 67% but much lower than co-authorship of Saudi's publications (81.1%) and Egyptian publications (88.0%) (Shehatta and Mahmood, 2016; Shehatta and Mahmood, 2017). The first evidence of international collaboration was 1951 - 1960 period, as low as 3.1% collaborated publications were recorded. The outstanding two countries with topmost collaboration were the United States and the United Kingdom which contributed a little above one-tenth of the total publications. Other top ranked collaborators were Germany, Malaysia, China and India which conforms with previous studies that the United States, the United Kingdom, Germany, France, Italy, China and India are prominent features in bilateral research publications especially the United States and the United Kingdom which are the top collaborators (Chinchilla-Rodríguez, López-Illescas and Moya-Anegón, 2012; Fiala and Ho, 2015; Shehatta and Mahmood, 2016). Further analysis shows that Malaysia, China, India and South Africa are emerging top research partners with Nigeria. Their growth rate in the last six years compared with sixteen years before, as shown in Table 6, has been tremendous especially Malaysia which could overtake the United States and the United Kingdom in the nearest future if the pace continues.

## Conclusion

The publications outputs of Nigeria have shown a steady upward trend over the years, especially with an exponential growth rate of about 96% during 2001 – 2016. That is, almost twice the output as compared to 1901-2000. Evidence from the study showed that 95,300 total publications were predominantly article publications, and accounted for 85.4% of the total

publications. Interestingly, academic institutions have played a significant role in research activities, contributing enormously in publications output especially articles as shown in the study.

Research collaboration has been a key factor that increased Nigerian publications output, including the collaboration among national peers and collaboration with international peers. This key factor is effectively promoting publications output, increasing research visibility and impact.

The findings from this study must be studied alongside other types of indicators to have a full grasp of the context of study and proper interpretation, taking into account the national research system and the structure of the academic system. This will ensure a balanced analytical approach to the study with proper interpretation and facilitate a well-informed discussion about the outcome of the analysis.

Finally, there is an on-going academic campaign for institutional repositories and national publication databases in the country to which this study also adds its voice. Evidently, there is need for national literature databases that fully promote domestic papers and represent the national research interest which would define the national publication activity rather than the Scopus database that much denotes international publication activity.

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