Infometrics Growth Analysis of Medical Science Researchers in Nigeria during 2007 to 2016

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ABSTRACT

This article accounts for the trend and pattern of medical research in Nigerian Universities within the span of ten years. The study aims to evaluate the research productivity of Nigerian Medical Science Researchers, appraise the preferred research communication outlets, analysing the growth rate of Nigerian medical science research publications, productivity, and visibility of both author and institution. Also, the trends of collaboration with colleagues within the continent and intercontinental were reviewed. The documents included in this research were retrieved from Scopus database; the results revealed incremental research output in medical science between 2007 and 2016 with 2016 having the highest number. It also showed that the *Nigerian Journal of Clinical Practice* is the most widely patronised by Nigeria Medical researchers and that the growth rate of research productivity is 9.5 per cent as indicated by the T value of 0.094768. Moreover, the researcher with the highest output was credited with 103 publication, while the trend of inter-continental research collaboration of Nigerian medical sciences researchers with scholars from another part of the world was more with the United States researchers.

Keyword: Medical research; Research output; Research trend; Scientometrics; Nigeria; Medical schools

1. INTRODUCTION

Medical research productivity reflects the level of medical education and practice in the country[1]. Data from such research are handy to support the training and education of students of medical sciences and related disciplines. Similarly, medical research data are necessary for effective planning and allocation of resources to the various health facilities in a country for the effective and efficient health services delivery.

The productivity of researchers is a measure of their publication counts in their areas of specialisations. Publication count is a bibliometric method used to evaluate scholarly publication outputs of authors by their institutional affiliations and countries of origin over a time[2]. It measures the total number of published items such as books, journal articles, conference papers and others within a period.

Visibility, on the other hand, is a measure of the number of times his/her peers cite a researcher's works in the field, often referred to as a citation index. Citation index is the number of citations to a published work typically using a citation database[3]. The more the citation index, the more visible the researcher in his discipline's information communication space.

Informetrics "involves exploring online databases not only to access documents or find facts but also to trace trends and developments in society, scientific disciplines, production, and consumption areas"[4]. It is a subfield of bibliometrics which has become a scientific discipline which includes statistical and mathematical modelling connected with library documentation and information problems with strong links to the theoretical aspects of information retrieval. Like the traditional bibliometrics, informetrics consists of all quantitative elements and models of communication, storage, dissemination, and informetric retrieval of scientific information. The present study employs these principles to gauge the scholarly performance and visibility of medical science researchers in Nigeria between 2007 and 2016.

This can be attributed to the significance attached to research and publication in all sectors of the various institutions; academic librarians in public universities are also expected to conduct research. It was posited that it might be surprising to most to hear of librarians engaging in research because people generally believe that librarians confine themselves to shelving, checking books in and out, and classifying and cataloguing books in the library[6].

2. AIMS

This study aimed to measure, specify and calculate the research trend in medical sciences by examining the research productivity during a period of ten years (2007 to 2016) using Scientometrics method.

3. RESEARCH OBJECTIVES

- To identify the most productive research year among medical scientist in Nigeria Universities and their publication output per year

- To examine the preferred research communication outlets among medical scientists in Nigerian Universities
- To measure the growth rate of research productivity of medical researchers in Nigeria
- To determine the visibility of Nigerian medical scientists in the global research space
- To investigate the trend of collaborations of Nigerian medical science researchers with colleagues from other countries
- To examine the type of publications among medical researchers in Nigeria.

4. METHODOLOGY

This research is grounded on Scientometrics methodology, in which relevant scientific information from the records indexed in Scopus was selected to know the effect of medical research in Nigeria. Scientometrics approach to quantitatively scrutinise activities relating to the research growth, outputs and visibility of Nigerian medical science researchers for ten years between 2007 to 2016. The effort aimed at bringing out new knowledge in measuring growth rate, research productivity, preferred sources of publications, level of research visibility, the trend of collaborations among researchers, type of papers and different areas of research communication of medical researchers in Nigeria. As reflected in the Table 1, Thirteen thousand, five hundred and seventy-three (13,573) research publications in medical sciences were carefully harvested from Scopus, which is one of the largest databases that index medical publications.

This research is conducted using logical positivism, which is the form of study guided by verificationism also know as verifiability criterion of meaning or the verification principle which is a theory of knowledge promoting the view that cognitively meaningful statement should be valid through empirical observation[7]. Therefore information for this research was gathered from a valid existing body of knowledge indexed in Scopus databases and carefully evaluated, analyse in harmony with the objectives of the research to bring a new experience which can be verified by any researcher.
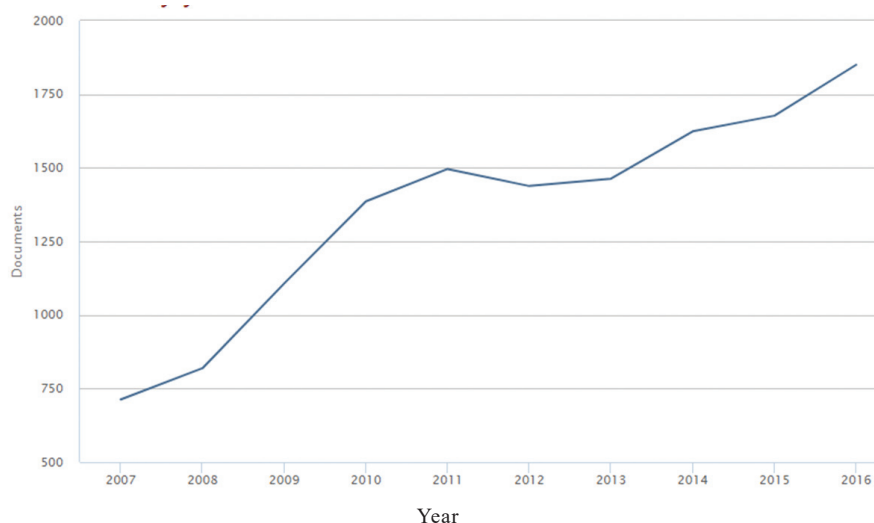
5. DISCUSSION OF FINDINGS

This section provides the findings of the study under the following subheadings: most productive research year; preferred source of publication among; research visibility; the trend of collaborations; type of papers; research communication by subjects' areas and level of productivities among medical researchers in Nigeria.

5.1 Productivity of Nigerian Medical Science Researchers

Academic productivity is reflected in the number of publications in high impact refereed journals, and this has become a significant benchmark of scholarly accomplishment in the competitive environment of worldwide higher education. Figure 1 shows a progressive research document outputs from medical science researchers b between 2007 and 2016 with 2016 having the highest number. Out of a total of 13573 and a mean of 1467 (10.8 %) publications per year produced by the scientists during the period, 2016 has the highest number of papers (13.63 %); implying that 2016 was the most productive year for the researchers.

Figure 1 illustrates the research outputs productivity of Nigerian Medical Science in both y and x-axis of the graph shown. The Y-axis of the chart shows the research output from 500 to 2000, while the x-axis shows the periodical year from 2007-2016. Each has a meeting point of their productions as indicated from 2007-2016, while the year 2007 has the least research output of 500, the year 2016 having the highest of 13,573 research outputs. Statistically, the year 2007 has an average of 27.15 per cent; the low research productivity shows 8 per cent between the year 2011 and 2012. While the highest outputs of 2016 have the most productive year, with 13.63 per cent.

5.2 Preferred Research Communication Outlets

The importance of research communication can not be over-emphasised; the essence of communication and disseminating the result of any research is to expand the frontiers of knowledge. Research communication is the activities that surround how scholars convey the result of their research exercise to the general public or among their colleagues, a research that is not widely circulated will not transform society.

Figure 2 is a graphical representation of the various outlets exploited by Nigerian medical science researchers to communicate and disseminate their research findings per year. The chart reveals that the *Nigerian Journal of Clinical Practice* is the most used publication by the researchers while *African Journal of Biomedical Research* is the least used.

Furthermore, Fig. 3 shows the forms of documents produced by medical science researchers in Nigeria. As presented by the figure, over 12000 (88.91 %) documents appeared as peer-reviewed journal articles. Other forms of materials include reviews,
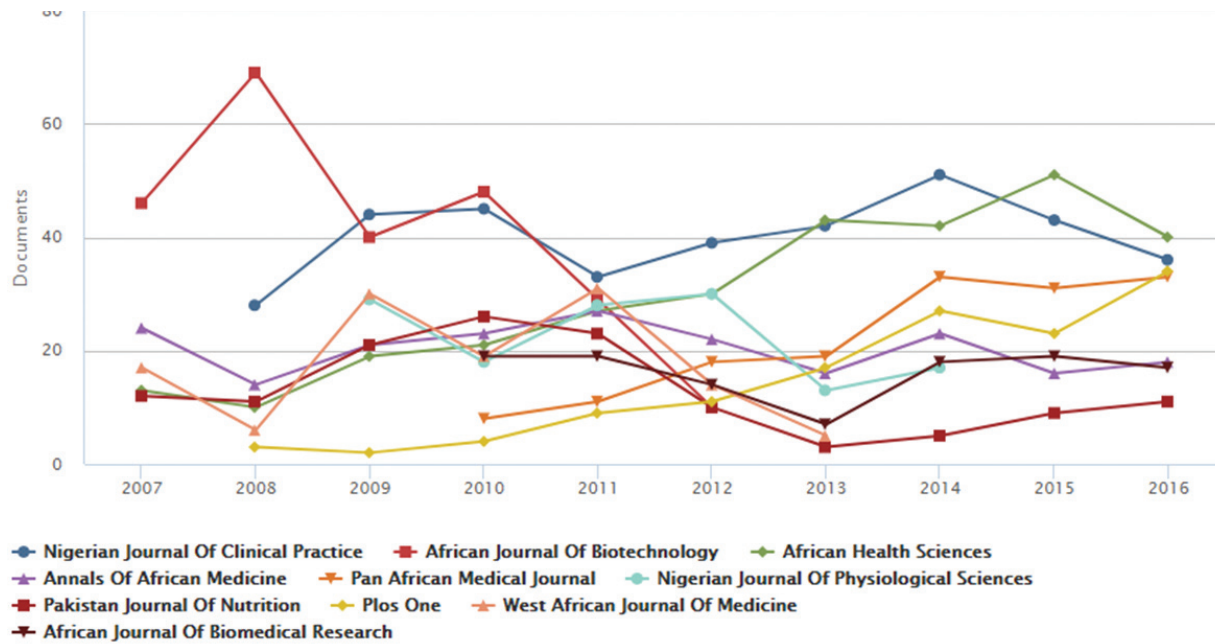

Figure 1. Productivity of Nigerian medical science by year.

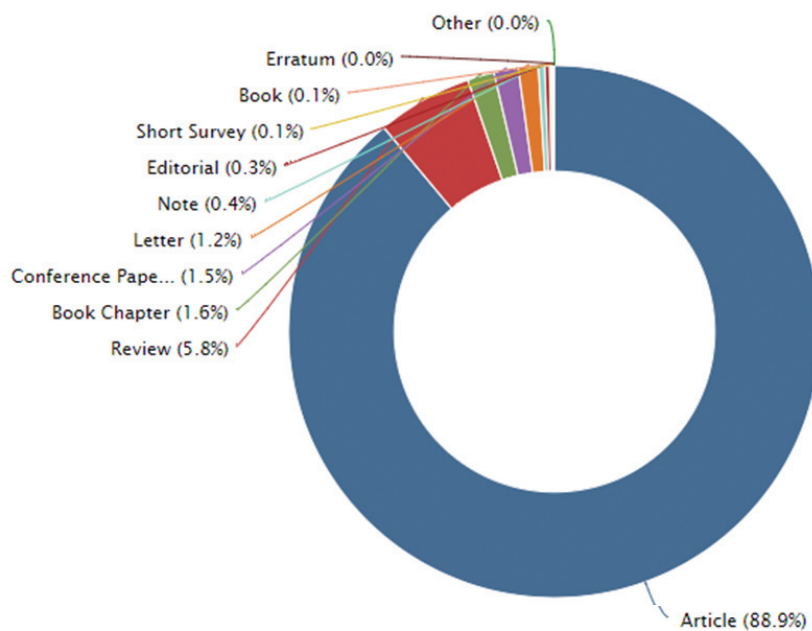**Figure 2. Researchers' Preferred communication outlets.**

Figure 3. Document by type of publications.

book chapters, conference papers, letters, and editorials.

5.3 Growth Rate of Nigerian Medical Science Research Publications

Table 1 presents a semi-log growth rate model of research productivity of medical researchers in Nigeria the period 2007 to 2016. The result shows that the growth rate of research productivity is 9.5 per cent as indicated by the T value of 0.094768. The probability value of 0.015 showed that research productivity of medical researchers in Nigeria has significantly increased within the space of ten years. The growth rate was found to be statistically significant at 5 per cent level of significance.

Likewise, the F-Statistic (F=40.64098, p=0.000215) shows that the model obtained is adequate to predict the future growth of research productivity of medical researchers. This result indicates that medical researchers in Nigeria are highly prolific in the research environment over the period under consideration. However, factors such as several citation received in the past, current and future journals and impact criteria occupy higher precedence than research copiousness.

Similarly, the result of Breusch-Pagan-Godfrey test (3.343224; p=0.068) indicates that this model is devoid of heteroskedasticity. Moreover, Jarque-Bera statistics (0.618017; p=0.734) suggests that the residual of this model is a normal distribution, which implies that the result obtained in the growth rate analysis is dependable.

5.4 Visibility of Nigerian Medical Science Researchers

Maximising the visibility of research necessitates the advertising and dissemination of research output, by giving research the conspicuousness and exposure to make the research available to highest possible members of the community.

Figure 4 presents the bibliographic search results of publications of Nigerian medical researchers. Gureje, O. has the highest number of papers (103) credited to him while Owolabi, M.O. has the least (48). Moreover, considering the institutional affiliations of the papers and their authors, the analysis as presented in Fig. 5, reveals that the University of Ibadan has the highest number of documents affiliated to it (2251; 25.81 %) and the University of Calabar has the least (563; 6.45 %).

Table 1. The growth rate of research productivity of medical researchers in Nigeria

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	6.651906	0.092238	72.11668	0.0000
T	0.094768	0.014866	6.375027	0.0002
R-squared	0.835530	Mean dependent var		7.173130
Adjusted R-squared	0.814971	S.D. dependent var		0.313897
S.E. of regression	0.135023	Akaike info criterion		-0.989890
Sum squared resid	0.145849	Schwarz criterion		-0.929373
Log-likelihood	6.949452	Hannan-Quinn criteria.		-1.056277
F-statistic	40.64098	Durbin-Watson stat		0.616431
Prob(F-statistic)	0.000215			

5.5 Trends of collaborations of Nigerian Medical Researchers with Colleagues in other Countries

Figure 6 shows the trend of inter-continental research collaboration of Nigerian medical sciences researchers with scholars from different part of the world. The chart reveals that out of the 18,643 documents generated by Nigerian medical scientists, 13,573 (72.8 %) was wholly authored by Nigerian scholars. The remaining 27.2 per cent was created and produced in collaboration with other researchers from other countries, including the USA, United Kingdom, South Africa, and India. Others are China, Germany, Australia, Malaysia, and Brazil. However, the result shows that Nigerian scientists have more collaborators from the USA (1429; 7.66 %) than any other country.

6. DISCUSSION ON FINDINGS

The findings of the study showed a progressive and logical increase in medical sciences research among the ten Universities in Nigeria. The growth may be attributed to the nature of the subject, which attracts attention more than any other disciplines; this may command necessary funds or grants for research to improve the rate of epidemic and mortality[8]. This finding is also in agreement with the position that federal universities benefits more from government funds? Channelled through the National Universities Commission (NUC). Federal universities received two types of grants from the NUC, i.e., capital and recurrent grants, and research funds are included within the recurrent grants[10].

It can also be emphasised that one of the ways through which the NUC is supporting the universities in the establishment of entrepreneurial centres in the universities to enable them to develop capacities for generating additional revenues that can help university programmes[11]. Additionally, the Nigerian government initiated the University Hostel Development and Management Initiative policies to enable universities to channel more resources towards teaching, learning and research as well as policy initiatives on funding that would separate the cost of academic activities from the regular overhead costs through the creation of a separate budget for direct teaching and laboratory cost. Since research is critical to the image and ranking of universities, it is essential to find alternative sources of funding beyond annual budgeting.

In evaluating the preferred sources of publications among the ten leading journals in Nigeria within the period under consideration, the study showed that Nigeria Journal of Clinical Practice is the most preferred while the African Journal of Biomedical Research is the least when one compares
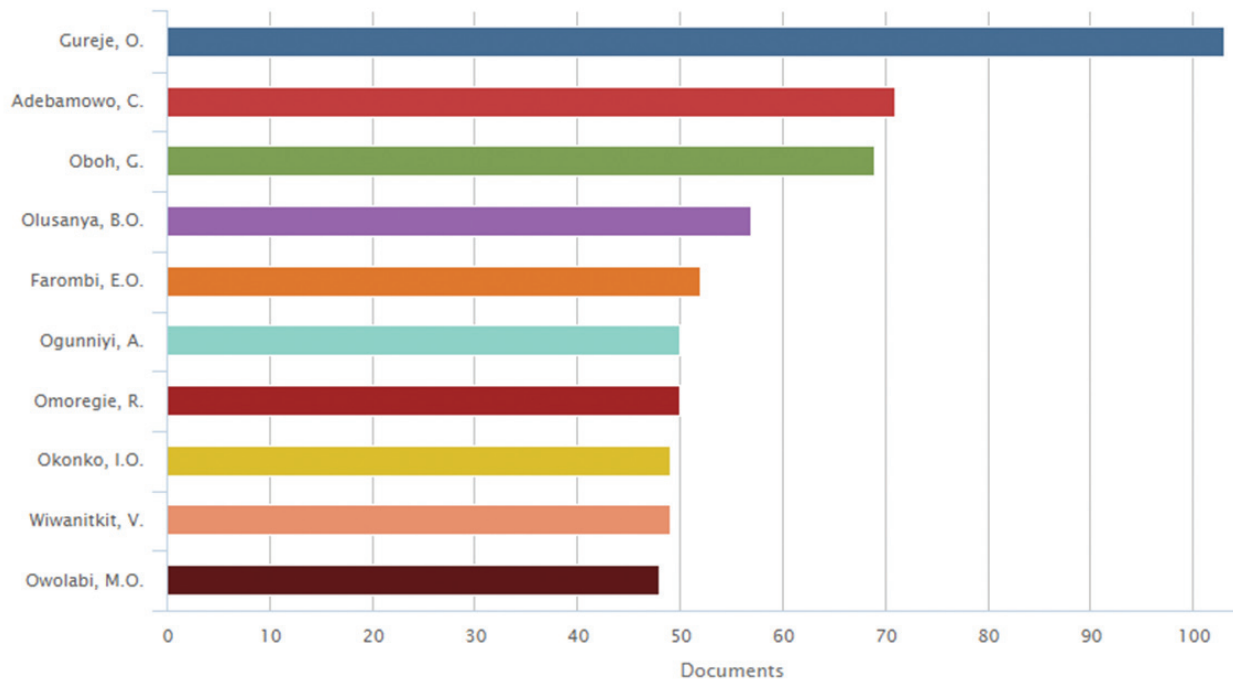
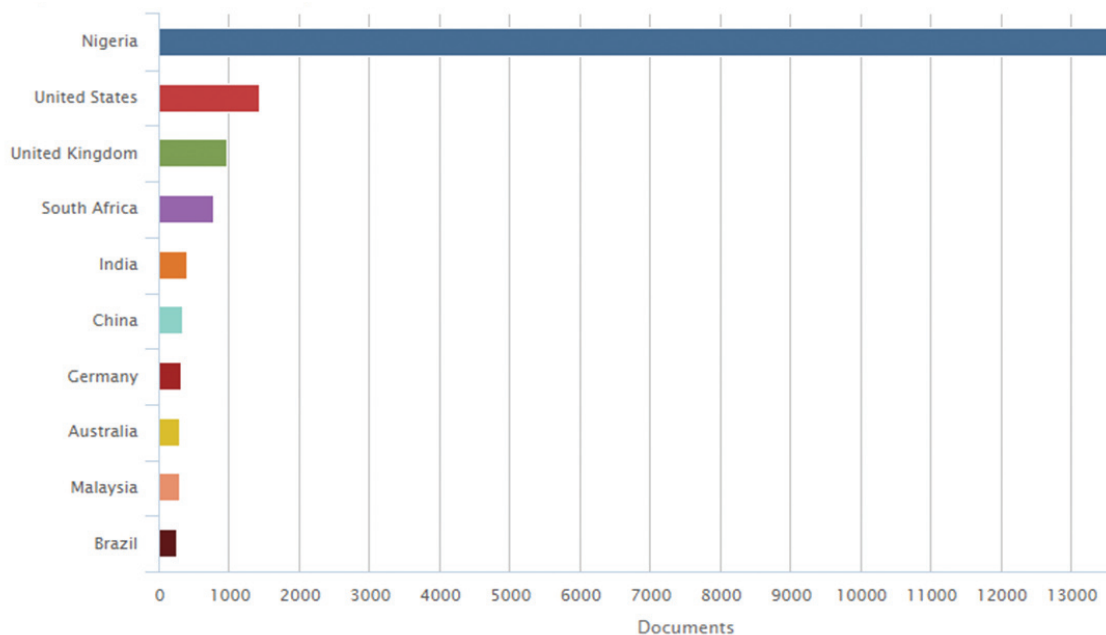**Figure 4. Visibility of medical science researchers by publications.**

Figure 5. Trends of collaboration with colleagues from other countries.

this with other disciplines like engineering within the same period[11]. Medical sciences have the highest research *visibility* because of the nature of the subject and access to funds and grants and the rate at which medical publications are found in scholarly books and reputable journals. This finding observes that there are as "many reasons for evaluating journals as there are different groups of people interested in information production, storage, dissemination, and? use." Interested parties *included* researchers, librarians, documentarists, electronic database publishers, funding agencies, and journal editors and publishers[11]. However, the findings also revealed that most scholars in Nigerian universities *published* in non-indexed local journals, which limits the visibility of their research outputs internationally and also its impact[12].

In terms of the visibility of medical researchers in Nigeria, the study shows that researchers from the University of Ibadan are the most prolific and visible in the high impact factor journal space? The finding is in agreement with scholars who posited that the number of research outputs is increasing in each of the universities where these authors are working as well as the number of authors involved in that output[13]. The increasing number of publications as well as authors might be attributable to an increased awareness of the need to publish in reputable indexed journals. The findings show the most productive scholars in their respective university in terms of their ID, name, institutional affiliation, and department, number of publications, citations, and h-index. The performance index of the researchers depends on the number of papers, citations, and h-index in each of the universities, the scholar with the highest number of documents based on the Scopus rankings was selected for inclusion[14].

Affiliation and collaboration in research encourage more visibility of journals, books, and conference papers. The study shows that collaboration has its recompenses most notably in

the area of visibility, exchange of ideas, context, methodology, facilities, common objectives or goals, between individual researchers or research teams from different institutions and countries` or regions of the world as an exposure on the Scopus. It has shown the highest percentage of papers with international research collaborations, possibly a result of their limited research resources; a practice similarly engaged by Korean researchers. These findings support an earlier study conducted [14]which posited that international research collaborations are measured based on international co-authorship. International collaborations in research are essential for some types of research as they may be necessary for funding purposes and to increase research productivity[16].

Moreover, the findings support[17], who asserted that international collaborative papers, which is a widespread practice in medical sciences research, have more impact than single-authored ones. Another possible reason for the high percentage of international collaborations in Nigeria is the increase in the number of scholars in these universities who have gone overseas for their postgraduate training. These universities like the University of Ibadan, University of Nigeria, Obafemi Awolowo University, and University of Benin amongst the ten universities used by Scopus Analyser might have possibly motivated their scholars to collaborate with researchers in foreign Universities. Therefore, it was necessary to analyse the international research collaborations between the Nigeria Federal Universities (NFU's) and other universities outside Nigeria.

The findings of the study further revealed that the highest number of published documents in medical sciences in the African region are from Nigeria and the country is leading in international collaborations in the field. This result negates another researcher who found that it is not always easy for scholars in developing countries to get articles published in

foreign journals because many of their papers address local issues and medical challenges, and these may not interest international audiences[17].

The trend of research communication among the scholars of the medical science in Nigeria within the space of the ten year (2007-2016) which are visible in Scopus Analyser electronic database, this research communication shows where medical sciences scholars disseminate their research findings by making their result and scientific reports accessible to a broader audience. The above result shows that most of the researchers in medical sciences communicate their findings by publishing in peer-review scientific articles, 12,068 article which represent 80.9 per cent of the research output in medical sciences amongst the various channels of communication and disseminating their publications. It is an indication that our medical sciences have come a long way in publishing their work, most notably in both local and foreign publishing houses.

These findings are in agreement with an earlier study, that subject content and trends in the medical informatics literature have shed light on the past, current, and future directions of diverse education and research activities. That core medical informatics journals were compiled through expert consensus articles from the U.S. National Library of Medicine's MEDLINE database that those journals published word for a particular period. These involve descriptive analyses were conducted to reveal the historical productivity of the journals, publications trends, and the subject content based on the Medical Subject Headings (MeSH) term frequencies and debut years[19].

7. CONCLUSIONS AND RECOMMENDATIONS

The importance of medical research is not only to expand frontiers of knowledge but to use the acquired experience in the diagnosis, management, control and prevention of diseases among human being[20]. The research shows that a few Nigerian Universities participated in medical research despite the high number of them with medical institutions. The implication of this could be that many of the research papers were featured in less visible research platforms other than the Scopus database.

This research set out to evaluate the research output of Nigerian Medical Science Researchers by reviewing the favourite research communication platform of scholars, the implication of productive research output can be attributed to access to information resources from the library, having internet access or authentic educational databases. On the alternative, an obstacle to research productivity has been attributed to low internet bandwidth, lack of recent access to journals, non-renewal of a licence to electronic resources are some of the factors that can weaken research productivity. The research also reflects significant growth in research output, this may be used as a yardstick to measure the proliferation of knowledge, which may be driven by the 'publish or perish' (swim or sink) syndrome adopted by many academic institutions to put pressure on the academia to publish in order to sustain themselves in the career. The research further shows that the active medical researchers exhaust the possibilities of placing their intellectual ouput in a platform that will help them disseminate or expose their research to the highest

constituency with other researchers. The implication of this is that the investigation would be available to a broad category of audience, and giving it impact by making available the benefit of the research in solving human problems.

Likewise, the study established trends of collaboration with contemporaries within the continent and intercontinental; collaborative research offers great advantages that implies teaching and clinical practices. Collaborative research may have a higher impact, which may attract grant from public spirit institution. Collaboration in research may bring better ingenuity, when colleagues assemble to debate ideas that may bring our creativity and better quality of output with less work, without compromising the integrity.

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