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Bibliometric/scientometric investigation of African Journal of Medicine and medical Sciences between 2001–2010

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Abstract

Background: Bibliometric or Scientometric appraisal of a research publication outfit of this nature serves as a tool to evaluate the direction of research activities of the scholars who published in African Journal of Medicine and Medical Sciences between 2001 and 2010, and to determine the research impacts on the body of knowledge.

Objective: The essence of this research is to determine the quantum volume of research output, patterns of research collaboration by authorship, citations/regional and subjects distributions.

Methods: Information/data was transcribed on the cataloguing cards for the generation of data bank. Subject analysis was carried out using Medical Subject Headings of 2010 edition. Medical Tree Structure was consulted to know the broad spectrum down to the specifics of each concept, and Bradford's Mathematical tool was used to analyze the data.

Results: Six hundred and sixty three research articles were published within the period of study. The highest 85 (12.9%) number of articles was published in 2001, followed by 2003 with 82 articles (12.4%) and the least published year was 2010 with 45. A total of 13,859 references were cited. Three authorship collaboration was the highest and Oyo State recorded maximum number of publications in terms of geographical distribution.

Conclusion: AJMMS has contributed significantly to the body of knowledge with a total of 663 research output, 13,859 citations and high degree of research collaboration recorded over a ten year period. However, there was a gradual decline in research output during the period.

Keywords: *Bibliometric, scientometric, informatics, research productivity, research distributions, Bradford's Statistical Model.*

Résumé

Introduction : L'évaluation Bibliométrique et Scientométrique d'un équipement de publication de recherche de cette nature sert comme un instrument à évaluer la direction des activités de recherche des savants qui publiaient dans le Journal Africain de Médecine et Sciences Médicales (AJMMS) entre 2001 et 2010, et à déterminer les impacts de recherche sur le corps du savoir.

Objective : L'essence de cette recherche est de déterminer la quantité de volume du rendement de recherche, modèles de collaboration de recherche par auteur, citations/régionale et distribution de sujets.

Méthode : L'information/donnée était transcris sur les cartes à catalogue pour la génération de donnée bancaire. L'analyse du sujet était réalisée en utilisant Les Sujets d'Entêtes Médicaux, édition 2010. La Structure d'Arbre Médicale était consultée pour savoir le large spectre descendant aux spécifiques de chaque concept, et l'instrument Mathématique de Bradford était utilisé pour analyser les données.

Résultats : Six cents soixante trois articles de recherche étaient publiés durant la période d'étude. Le plus grand 85 (12,9%) nombre d'articles était publié en 2001, suivit par 2003 avec 82 articles (12,4%) et le plus petit nombre en 2010 avec 45 articles. Un total de 13.859 références était cité. La collaboration entre trois auteurs était le plus grand et l'état d'Oyo recordait nombre maximum de publications en termes de distribution géographique.

Conclusion : AJMMS a contribué significativement au corps du savoir avec663 rendements de recherche, 13.859 citations et haut degré de collaboration de recherche recordé sur une période de dix ans. Toutefois, il y avait un déclin graduel en rendement de recherche durant la période.

Mots Clé : *Bibliométrique, scientométrique, productivité de recherche, distributions de recherche, Modèle Statistique de Bradford.*

Introduction

On daily basis human beings are engaged in intellectual activities and these are packaged in special formats for information consumers. The aggregate number (or volume) of these information resources and sources are enormous and cumbersome to filter out the irrelevant information resources from the globally generated information. In other words, information generated from any geographical area or institution would be relevant for the general population; some are meant for specific consumer segment. Therefore, the efforts of getting the précised

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information resources and sources require filtration, awareness creation about the existing information resources, and having adequate access to them.

Scientometric study of a periodical aims specifically to determine the volume of intellectual activities within a period of time, the structure, interrelationships existing amongst the disciplines and the direction of its growth.

It has become obvious that scientometric or bibliometric study is a very useful tool for ensuring high quality of collection development of any library. This approach assists the information managers to source for relevant and precise information or data for their clients. In this regard, information or data are sieved and relevant materials are obtained or sourced [1].

Scientometric research methodological investigation also delves into citation analysis of scholarly published works. It is believed that a good research work should have a good number of citations as bedrock for the research [2]. Citation study in bibliometric involves examining the patterns of the intellectual works cited. This may include very many sources such as textbooks, journals, monographs, encyclopaedia, technical reports, research reports, patents, manuscripts, dissertations/theses, proceedings, abstracts, and indexes. Others include electronic sources such as databases (PubMed, MEDLINE, HINARI, Jstor, Ebscohost, Bioline-international, e-medicine) as well as internet, e-journals, ebooks and websites of institutions and organizations etc.

According to the term scientometric was introduced by Pritchard, Nalimov and Mulchenko in 1969, and therefore, unfolded the concept of bibliometric and scientometric as the application of mathematical and statistical methods to books and other media of communication [3]. This same author carried out a study on stem cell research from 1999-2008. The major focus of this work is to observe authorship patterns, discover the degree of collaboration; measure the quantum of research productivity in MEDLINE, and study the linguistic distribution. It also revealed the geographical distribution, the growth rate of production of literature and identified the most frequently cited journals.

Thus, attesting to the prowess of the type of study affirmed that the exponential growth of scientific literature, the interdisciplinary nature of research and trend towards specialization have posed many problems both to the scientists and librarians. The extensive investigations and the abundance of literature being published and contributed to immense escalation of cost for the libraries, it is therefore necessary for the librarians to know the characteristics of subject literature used by the users [4].

Similarly, carried out a study on a citation analysis of College and Research Libraries comparing Yahoo, Google, Google Scholar, and Web of knowledge with implications for promotion and tenure between 2000 to 2006. Two hundred and seventeen articles in college and research libraries were searched by title on Yahoo, Google scholar and ISI Web. Yahoo, Google and ISI web of knowledge averaged between 2.8 and 3.5 citations per title and the Google scholar averaged 6.4. The value of citation counts in the promotion and tenure process [5].

Likewise, work on citation pattern of the Nigerian Journal of Horticultural science from 1990-2005. The following parameters were used: Research contributions in Universities, Research Institutes, Colleges of Agriculture, Education, and foreign authors. Other parameters include types of materials cited (1990-2005) [6].

Furthermore, researched on citation analysis of dissertations and theses submitted to the Department of Agricultural Economics and Extension, Federal University of Technology Akure, Nigeria. The study aimed at identifying the types of information materials cited by masters and doctoral students determine the distribution of citations by year; determine the most frequently cited journals; to ascertain the recency of cited materials and to examine the types of authorship cited. Others include identifying the highest and lowest citations by individual dissertations and theses and finally to identify the most cited authors in the dissertations and theses of masters and doctoral students [7].

The view that a Library's collections can be compared to works cited to see if they hold the items used most often by students and can also be analyzed to determine the format, date, and refereed status of the materials cited. Also included in the analysis were types of materials cited, number of citations per paper, publication year, and online availability and refereed status of materials cited. Results showed a positive correlation between the number of citations in the paper and the word count of the paper [8].

Jevin *et al.* used network approach to assess scholarly journals. According to the authors, there was only one adequate approach to evaluating the quality of an individual paper (eigen-factor Metric TM): read it carefully, or talk to others who have done so [9]. To them, limited time and budgets have created a legitimate need for quantitative measures of scholarly work. The well-known journal impact factor is the leading measure. In Eigen factor Metric System, citations from top journals are weighted more heavily than citations from lower-tier publications.

Similarly, the characteristics of la literatura: a reference study of Spanish and Latin American literature over a 30 year period. The study also examined the age of materials referenced in an effort to gain insight into the shelf-life of these materials. Results showed that monographs and literary works predominated, the usage of volumes of collected essays showed significant increase [10].

Joginder and Sheela worked on citation analysis of dissertations of law students submitted to the University of Delhi. A total of 3052 citations analyzed from 33 dissertations submitted by Postgraduate students of University of Delhi in 2006. Results showed that 25.5% citations were from the journal articles [11].

Swain analyzed the growth and development of publication output of library philosophy and practice between 2004-2009. The research work focused on these areas: authorship patterns and degree of authors' collaboration, bibliographical forms of citations, geographical distributions, distribution of authors and the age of citations and publication half-life of books and journals. Results showed that a total of 337 authors contributed 266 articles published during the period. Journals were mostly cited (1697), followed by books (1181) whilst the least cited were theses [12].

Kamal *et al.* studied Annals of Library and Information studies 20002-2010. They analyzed data generated on the following parameters: Year wise distribution of articles, Year Wise distribution of articles and citations, bibliographical forms of document, authorship pattern and Ranking of authors. Others include length of articles, geographical distribution of contributors and chronological distribution of citations. Results show constant increase of articles in Annals of Library & Information studies on yearly basis, average citation per articles was 16; the average number of paper per articles was 8 etc [13].

Mulla researched on identifying and mapping the information science and scientometric analysis studies in India 2005-2009: a bibliometric study. The aim of the study was to sketch the frequency of articles volume and year wise, distribution of articles by the contributors and patterns of the authorship. Others include the length of papers, degree of collaborations, knowing the types of the documents, geographical distribution of the contributors and to discover the core journals for publishing papers. Results showed that a total of 998 articles were published. The highest number of publications was 329 (32.97%) in 2009 [14].

Other scholars who had contributed in this direction were Tukur, & Musa, [15], William, & Anne [16]; Reba [17] and Obajemu [18-20]. Also Thomas (2009) had worked on simulated electronic availability study of serial articles [21], Susan (2010) carried out a research on citation analysis [22] and Rong (2008) researched on citation characteristics and intellectual acceptance of scholarly monographs [23].

This research work investigated bibliometrically African Journal of Medicine and Medical Sciences between 2001-2010 (a period of ten years). This journal is owned and published by the College of Medicine, University of Ibadan, Ibadan and the University College Hospital (UCH) Ibadan, Nigeria. The journal is published quarterly and is featured in Index Medicus thus showing its international outlook.

Theoretical background

Due regards must be given to the early theorists of Bibliometric study. There are laws and models that have come to stay in Bibliometric study. Theory is a contemplation and rational type of abstract or generalized thinking [24]. Therefore, the theory describes ideas and empirical phenomena. It is a well-confirmed type of explanation and consistent with scientific methods empirically supported (Verified) and empirically contradicted i.e., (Falsified) [25].

Bradford's Law of Bibliometric

Bradford Samuel was one of the early theorists of Bibliometric. This theory was similar to George Kingley Zipf's, otherwise called Zipf's law. Samuel Bradford was a renowned bibliometrician. This theory or law explains exponentially diminishing returns when searching for references in a science journals. The work declared that if journals in a field of knowledge can be sorted by number of articles into three groups, each with one-third of articles then the number of Journals in each group will be proportional to $1:n:n^2$.

Bradford's law is also known as law of scattering. This law provided mathematical tables showing the number of articles, the number of subject's determined and cumulative numbers of subjects analyzed. Column 4 indicated multiplication of articles in column one by number of subjects determined. While column five shows cummulation of articles and column six shows the logarithms of column 3.

The importance of Bradford's Bibliometric law are as follows

1.) Literatures are scattered.

2.) There is need to provide scientific investigation to identify the most productive literature.

3.) There is need to rank them in decreasing order of productivity of the literature studied.

4.) There is need to determine the quantity and quality of scientific literature produced.

The aims of this journal are

- To provide a medium for wide dissemination of information resulting from biomedical research in Africa and elsewhere
- To furnish a means whereby appropriate international medical and health organizations may transmit information to medical scientists throughout Africa,
- To serve as a medium for publication of proceedings of international conferences on Medical Sciences in Africa
- To serve as a medium for the exchange of information and opinion among Medical Scientists in Medical Institutions of Africa and elsewhere, and
- To promote inter-regional cooperation amongst medical scientists in Africa.

Objective of the Study

The specific objectives of the study are:

- Determine the aggregate volume of intellectual contributions within the period of study.
- Investigate the pattern of research collaborations by the contributors
- Study the geographical distribution of articles published between the period of study
- Determine the pattern of subject distributions
- Determine the distribution of references cited.

Research questions

The following research questions will be addressed in the study

- What is the aggregate volume of intellectual contributions in AJMMS?
- What are the patterns of research collaborations in AJMMS?
- What are the geographical distributions of the published articles in AJMMS?
- What are the subject distributions of the published articles in AJMMS?
- What are the distributions of references cited per article in the study?

Materials and methods

Data for this study were sourced from the databank generated from the 10 volumes/39 issues of African Journal of Medicine and Medical Sciences between the periods of 2001 to 2010. Information/data concerning this research was transcribed from all the issues of the journal on cataloguing template cards. The following parameters were designed on the template: title of the research articles, number of author(s) indicated in the work, subject, geographical distribution and number of references cited, and the year and month the article was published.

Technical reading of each article was done thoroughly so as to carefully determine the subject matter of each article. Titles, abstracts, introduction, body of the work, conclusion and the references cited were examined.

Medical subject Headings of 2010 edition was used to determine the appropriate and approved concepts. Also, medical tree structure was consulted in MeSH to know the family tree of subject analyzed. Usually, a tree structure arrangement is from the broad spectrum to the specifics.

Also, Bradford's Mathematical tool was used to analyze the data in the study.

Results

Table 1 shows the distribution of articles published in African Journal of Medicine and Medical Science within a period of ten years. The journal publishes quarterly (every 3 months) in March, June, September and December. Thus the Journal had published 663 researched articles on various medical subjects within the period under review. The year 2001 pooled the highest number of articles with 85 (12.85%), followed by 2003 with 82 articles (12.37%), while the least published year was 2010 which recorded only 45 articles (6.79%). However, there was no publication for the month of March, 2001.

Table 2 shows the periodic distribution of references cited in the journal studied. Results show that a total of 13,859 references were cited. The year 2003, recorded the highest no. of references with 1,695 (12.2%), while 2010 recorded the least with only 1,083 (7.8%).

The table 3 shows the degree of collaborations of authors or researchers as published

Table 1: Quarterly distribution of the articles published between 2001 – 2010

Year	No of articles in each issue Mar	June	Sept	Dec	Total	% of Articles	Cumulatiive Total No. of Articles	Cumulative % of Articles
2001		34	18	33	85	12.85	85	12.85%
2002	21	19	21	20	81	12.22	166	25.07%
2003	21	20	20	21	82	12.37	248	37.44%
2004	18	18	17	19	72	10.86	320	48.30%
2005	18	17	19	15	69	10.41	389	58.71%
2006	17	15	15	15	62	9.35	451	68.06%
2007	12	15	16	15	58	8.75	501	76.81%
2008	13	15	15	14	57	8.60	566	85.41%
2009	14	15	14	9	52	7.84	618	93.25%
2010	10	10	12	13	45	6.79	663	100%
Total	144	178	167	174	663	100%		

Table 2: Distribution of re ` ferences cited in African Journal of Medicine and Medical Sciences between 2001 to 2010.

Year	References Cited In Each Issue Mar	June	Sept	Dec	Total	% of ref. cited	Cumulative Total	Cumulative %
2001		582	389	653	1624	11.7	1624	11.7%
2002	367	379	402	347	1495	10.7	3119	22.4%
2003	375	462	401	457	1695	12.2	4814	34.6%
2004	352	402	330	408	1492	10.7	6306	45.3%
2005	393	364	371	280	1408	10.1	7714	55.4%
2006	354	313	254	336	1257	9.06	8971	64.4%
2007	284	337	320	329	1270	9.6	10241	74%
2008	270	320	336	309	1235	8.9	11416	82.9%
2009	353	311	429	207	1300	9.3	12776	92.2%
2010	238	233	330	282	1083	7.8	13859	100%
Total	2986	3703	3562	3608	13859	100%		

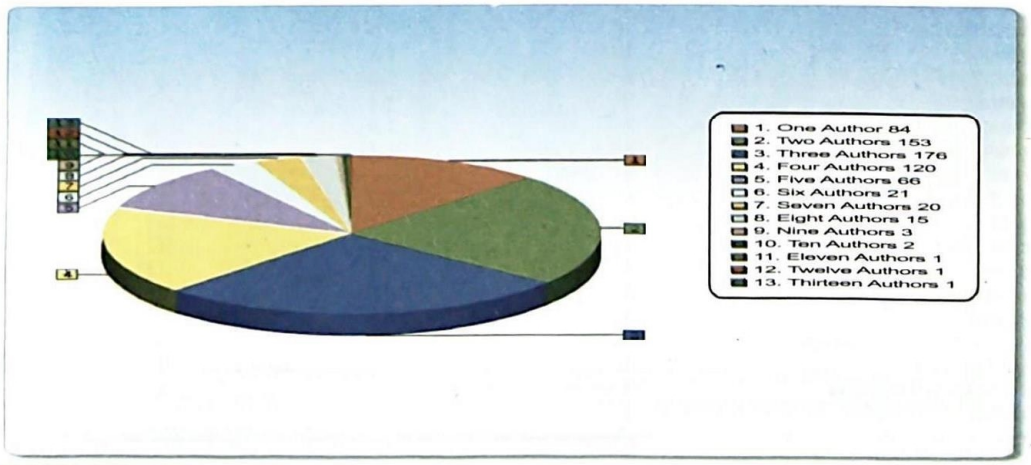

Fig 1: Showed the patterns of Authorship Distribution

Table 3: Authorship patterns of distribution of articles published in African Journal of Medicine and Medical Sciences 2001-2010.

No. of authors	No. of articles	% of articles	Cumulative articles	Cumulative % of articles
One	82	12.37	82	12.37
Two	152	22.93	234	35.30
Three	169	25.49	403	60.79
Four	120	18.10	523	78.89
Five	66	10.0	589	10.89
Six	31	4.68	620	93.59
Seven	20	3.02	640	96.59
Eight	15	2.26	655	98.85
Nine	3	0.45	658	99.3
Ten	2	0.30	660	99.6
Eleven	1	0.15	661	99.75
Twelve	1	0.15	662	99.90
Thirteen	1	0.15	663	100%
Total	663	100%		

Table 4: Productivity of subjects to the minimum of 5 frequencies of Articles

Subjects	No. of Articles	% of Articles	Cumulation of Articles
Dentistry	47	7.1	47
HIV/AIDS	33	5.0	80
Animal Experimentation	31	4.7	111
Malaria	28	4.2	139
Surgery	23	3.5	162
Pharmacy/Pharmacology	22	3.3	184
Diabetes, Mellitus	19	2.9	203
Neoplasms (Cancer)	18	2.7	221
Tuberculosis	16	2.4	237
Radiology/Radiation	15	2.3	252
Eye Diseases	15	2.3	267
Oto-Rhino-laryngology (Ear, Nose, Throat)	15	2.3	282
Microbiology	13	2.0	295
Paediatrics	12	1.8	307
Psychiatry/Psychology	12	1.8	319
Hypertension	12	1.8	331
Orthopaedics	11	1.7	342
Kidney Diseases	11	1.7	353
MateriaMedica	10	1.5	363
Pregnancy	10	1.5	373
Gyneacology	9	1.4	382
Obstetrics	9	1.4	391
Occupational Health	9	1.4	400
Haematology	8	1.2	408
Anaemia Sickle Cell	8	1.2	416
Anaesthesia	8	1.2	424
Hepatitis	7	1.1	431
Contraception	7	1.1	438
Nutrition	7	1.1	445
Thyroid Disease	6	0.9	451
Delivery	6	0.9	457
Sexual Transmitted Diseases	6	0.9	463
Breast Diseases	5	0.8	468
Cardiovascular Disorders	5	0.8	473
Mortality	5	0.8	478

in the journal. The collaborations ranged from the minimum of single authorship to the maximum of thirteen. Three authorship collaborations produced the maximum number of 169 (25.49%) articles whilst eleven, twelve and thirteen authorship collaborations showed the least numbers of articles with only one frequency each.

Table four on the other hand shows the way subjects areas of the articles produced or published by African Journal of Medicine and Medical Sciences. The distribution of subjects areas were ranked in decreasing order of productivity with dentistry recorded the highest 47 (7.1%) and

Table 5: Bradford's Mathematical tool in African Journal of Medicine and Medical sciences between 2001-2010

I No. of Articles	II No. of Subjects	III Cumulation of Subjects	IV I X II	V Cumulation of Articles	VI Logarithmn Column III
47	1	1	47	47	0
33	1	2	33	80	0.30
31	1	3	31	111	0.48
28	1	4	28	139	0.60
23	1	5	23	162	0.70
22	1	6	22	184	0.78
19	1	7	19	203	0.85
18	1	8	18	221	0.90
16	1	9	16	237	0.95
15	3	11	45	282	1.04
13	1	12	13	295	1.08
12	3	15	36	331	1.18
11	3	18	33	364	1.26
10	2	20	20	384	1.30
9	3	23	27	411	1.36
8	3	26	24	435	1.41
7	3	29	21	456	1.46
6	3	32	18	474	1.51
5	4	36	20	494	1.56
4	9	45	36	530	1.65
3	12	57	36	566	1.76
2	23	80	46	612	1.90
1	51	131	51	663	2.12
		SS = 131	AA = 663		

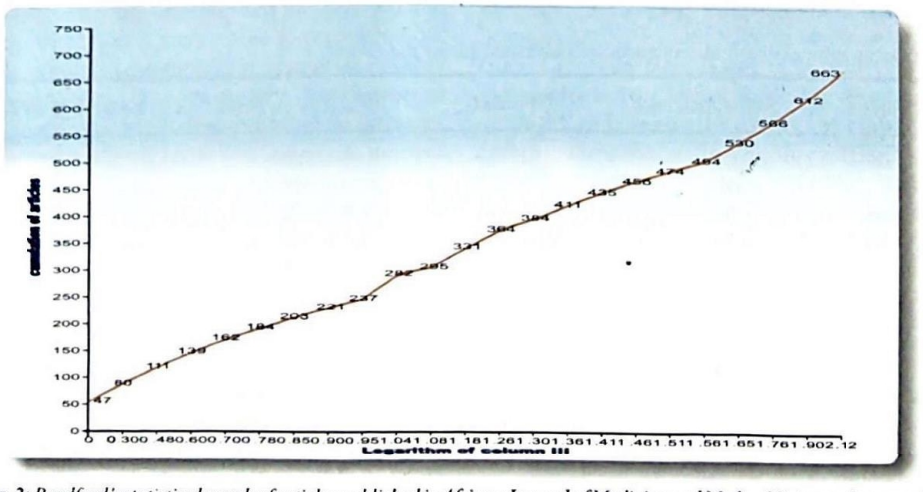

Fig. 2: Bradford's statistical graph of articles published in African Journal of Medicine and Medical Sciences between 2001-2010.

followed by Human immune Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) 33 (5.0%). This table was used to produce Bradford's statistical table 5.

Where SS = total number of subjects analyzed and AA = total number of articles produced Fig. 2 showed the log of cumulation of subjects in columns at horizontal axis and cumulation of articles in vertical axis. Table 5 was used to produce this linear graph

domiciled recorded 337 articles (50.0%), Lagos state pooled 49 articles (7.4%), while Kwara state had 44 articles (6.6%).

Discussion

This study investigated the intellectual activities of researchers published in African Journal of Medicine and Medical Science. The study covered a ten year period (2001-2010) and looked into various facets: growth, direction of growth, subject coverage,

Table 6: Geographical Distribution of Articles Published in the various States in Nigeria

State/Region	No of Articles	% Pooled	Cumulative Articles	Cumulative % of Articles
Oyo State	337	50.8	337	50.8
Lagos State	49	7.4	386	58.2
Kwara State	44	6.6	430	64.8
Osun State	34	5.1	464	69.9
Borno State	17	2.5	481	72.4
Ogun State	15	2.3	496	74.7
Edo State	14	2.1	510	76.8
Plateau State	11	1.7	534	80.5
Rivers State	10	1.5	544	82
South West Nigeria	10	1.5	554	83.5
Kaduna State	9	1.4	563	84.9
Enugu State	7	1.1	570	86
Kano State	7	1.1	577	87.1
Nigeria	6	0.9	583	88
Anambra	5	0.8	605	91.4
Abuja	4	0.6	613	92.6
Cross River	4	0.6	621	93.8
Ondo State	4	0.6	625	94.4
Sokoto	3	0.5	628	94.9
Bayelsa State	3	0.5	631	95.4
North East Nigeria	2	0.3	636	96.2
Delta State	2	0.3	640	96.8
Akwa-Ibom State	2	0.3	644	97.4
Others with one frequency	19	2.6	663	100

Table 7: Geographical distribution of articles published across the Globe.

Country/Region	No of Articles	% Pooled	Cumulative Articles	Cumulative % of Articles
Saudi Arabia	13	2.0	523	78.8
Ghana	6	0.9	589	88.9
United Kingdom	6	0.9	595	89.8
Africa	5	0.8	600	90.6
West Indies	4	0.6	609	92
Sudan	4	0.6	617	93.2
USA	3	0.5	634	95.9
Zimbabwe	2	0.3	638	96.5
Gambia	2	0.3	642	97.1

Table 6 shows the regional distributions of articles published in African journal of Medicine and Medical sciences. Oyo state when the journal is

collaborations of authorship, regional distribution of research activities and references cited for the research works.

African Journal of Medicine and Medical Sciences produced a total number of 663 articles within the period of study (2001 – 2010). The most productive year was 2001 which recorded 85 articles (12.85%) and the least published year was 2010 which accounted (6.79%) of all publications within the study period. Findings showed a gradual decline of medical research activities from 2001 down to 2010. Of the 39 publication months, the month of June 2001 pooled the highest number with 34 articles followed by December 2001 with 33 articles.

AJMMS, has thus made a considerable impact in the field of medicine and its allies in the production of 663 research articles when compared to other medical research outfits such as Journal Farmacis Hospitalaris in Spain had 416 articles as cited in Kevin's work [28], Economic Botany produced 358 articles within ten years, Journal of IEEE Transaction on Engineering Management recorded 526 all cited in Kevin and Nigeria Quarterly Journal of Hospital Medicine 2001-2010 published 374 articles [29]. December issues pooled the highest number of articles with 179, June issues recorded 178 articles, September issues had 167 and March issues was the least productive.

Another area looked into was the citation of each research work published. Researchers are expected to consult adequate number of information sources and resources (be it, primary or secondary) such as journals: textbooks, Monographs, theses/ dissertations, abstracts/indexes, bibliographies, Manuals, and atlases. Others include handbooks, encyclopedia, patent, technical reports, research reports, conference papers and online so as to build solid bedrock for the research. Reference Citation in scholars publishing is critical. It provides bedrock for any research work. Researches have shown that references cited add a great value to research work [27] This work investigated the aggregate number of references cited and its yearly distribution in African Journal of Medicine and Medical Sciences between 2001 to 2010 [10]. The aggregate number of references cited from various sources and formats stood at 13, 859. This figure was relatively higher than Nigerian Quarterly Journal of Hospital Medicine' which had 12,182 (Obajemu, 2012).

The result further showed that 2003 recorded maximum number of references cited with 1695 (12.2%), 1624 (11.7%) in 2001, 1495 (10.7%) in 2002 whilst 2010 was the least productive year in terms of reference citation. The June issues recorded the maximum number of citations with 3703, December 3608, September 3562 and March 2986 in decreased order of productivity.

In sciences and Medicine, research collaboration is highly encouraged. Collaboration is when researchers work on a project and publish the results. It is a concrete form of networking [26]. Research Collaboration in most cases produces the following advantages:

1.) Due to scarce resources, all the researchers involve can pool together financial, materials and intellectual resources to enhance smooth research work.

2.) High quality research outcome is expected in collaborative works. In African Journal of Medicine and Medical Sciences results showed a great deal of research collaborations.

The results showed the following: One authorship 82 articles (12.37%); two 152 (22.93%); three 169 (25.49%); four 120 (18.10%); five 66 (10.0%); Six 31 (4.68%); Seven 20 (3.02%) and eight 15(2.26%). Others include nine authorship with 3 (0.45%0; ten 2 (0.30%) while eleven, twelve and thirteen authorship collaborations had 1 article (0.15%) each. Three authorship collaboration was most productive (169). This finding was similar to the Nigerian postgraduate Medical Journal 1999 to 2008.

Subject analysis and its distribution were made in this study. These subjects which were determined were arranged in decreasing order of productivity. In other words, they were enumerated from the maximum number of articles to the minimum. The distribution showed the top 16 subjects with their percentage distributions: Dentistry/Maxillofacial Surgery 47 (7.1%); Human Immune Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) 33 (5.0%); Animal Experimentation 31 (4.7%); Malaria 28 (4.2%); Surgery 23 (3.5%); Pharmacy/Pharmaceutical Sciences 22 (3.3%) and Diabetes Mellitus 19 (2.9%). Others include Neoplasms (Cancer) 18 (2.7%), Tuberculosis 16 (2.4%); Radiology/Radiation 15 (2.3%); Eye Diseases 15 (2.3%); Microbiology 15 (2.3%); Otor-Rhino-laryngology (Ear, Nose & Throat) 13 (2.0%); Pediatrics 12 (1.8%); Psychiatry/ Psychology 17 (1.8%) and Hypertension 12 (1.8%). The total number of subjects analyzed was 131 (SS) and aggregate number of articles was 663 (AA) as indicated in Bradford's Mathematical Table 5.

Similar studies conducted by Trilla [32] showed gastroenterology to have produced the highest number of articles (338) and neuroradiology (139, 47%) in the research word conducted by Misquel [33]. Reasons for the high concentration of research efforts on some disciplines may be due to local and international demands, proactiveness to

meet societal medical solutions to problems, costs and risks and government funding, a curiosity driven.

Also investigated was the regional distributions of the articles. In other words, its geographical focus of the publications within and outside Nigeria. The results showed the top nine as follows: Oyo State 337 (50.8%), Lagos State 49 (7.4%) Kwara State 44 (6.6%), Osun State 34 (5.1%), Borno State 17 (2.5%), Ogun State 15 (2.3%), Edo State 14 (2.1%), Saudi Arabia 13 (2.0%), and Plateau 11 (1.7%).

Oyo state which appeared the topmost in terms of geographical distribution of articles might be due to the fact that AJMMS is domiciled in the state. Researchers in that geographical axis might have concentrated their medical research activities on that zone, hence the high volume of research works produced.

Conclusion

This work had investigated research productivity of Medical Scientists published in African Journal of Medicine and medical Sciences between 2001 and 2010. The quarterly and yearly distribution of articles published was demonstrated statistically. Also, references cited in the journal were analyzed and discussed. Likewise, the authorship patterns of collaboration, geographical and subjects distributions were ranked in decreased order of frequency. The research has thus unraveled the directions of publication, the areas much concentrated and those areas least concentrated. Lastly, the research finding revealed a gradual decline in research activities over the years. Obviously, the study of this nature helps to know the strengths and weaknesses of a research outfit, promotes quality research and collection developments.

References

1. Obajemu AS, Periodical Productivity Study on Communicable Diseases in Nigeria: January-December 1996. Nigerian Libraries 2001; 32:36-50.
2. Obajemu AS, Ekere FC and Ezeani CN. The Nigeria Postgraduate Medical Journal 1999-2008: a Scientometric approval. Nigerian Quarterly Journal of Hospital Medicine. 2012; 22:249-257.
3. Thirumagal A.Stem cell research: a bibliometric analysis from 1999-2008. Library Philosophy & Practice. Available at http://unilib.unl.edu/LppL.
4. Zafrunisha N. Citation analysis of Ph.d theses in psychology of selected university in Andhra, India. Library Philosphy ane practice. Available at http://unib.unl.edu/LppL.
5. Martel CA. Citation analysis of College & Research Libraries comparing, Google Scholar and ISL web of knowledge with implications for promotion and tenure. College and Research Libraries. 2009;70: 460-472.
6. Fagbola BO and Adejoro MA, citation pattern of the Nigerian Journal of Horticultural Science. Library Philosophy and Practice.2012; Accessed at http://unilib.unl.edu/LppL.
7. Joseph KF, Citation analysis of dissertations and theses submitted to the Department of Agricultural Economics and Extension, Federal University of Technology Akure, Nigeria. Library Philosophy and practice. Available at http.//unilib.unl.Edu/LppL.2012
8. Stacey K and Jan SS. Analysis citations in undergraduate papers. College & Research Libraries 2008; 69:447-458.
9. Jevin DW, Theodore CB and Cart TB. The Eigenfactor Metric TM Network approach to accessing scholarly Journals. College & Research Libraries 2010; 74:237-244.
10. Nollen DS. Characteristics of a literature: a reference study of Spanish and Latin American Literature. College Research Libraries. 2010;71:9-19.
11. Joginder SB and Sheela M. citation analysis of dissertations of Law submitted to university of Delhi, Delhi.Library Philosophy and Practice.2011 Available at http://unilib.unl.Edu/LppL.
12. Swain DS. Library Philosophy and practice. 2004-2009: a scientometric appraisal. Library Philosophy and practice. Available at http:// unilib.unl.ed/LppL.
13. Kamal L J, Dillip KS and School KC. Annals of Library and information study 2002-2010. A bibliometric study. Library Philosophy practice.2012 Available at http://unilib.unl.edu/ LppL.
14. Mulla KR. Identifying and mapping the information Science and Scientometrics analysis studies in India: 2005-2009: Library Philosophy and practice.2012; Available at http:// unilib.unl.edu/LppL.
15. Tukur A and Musa DB. Citation analysis of authorship and articles characterization in technology and development: a Journal of scientific and technological Research. Library Philosophy and practice.2012; Available at http:/ /unilib.unledu/LppL.
16. William HW and Anne CL. Characteristics Open Access Journal in six subject Areas. College &

Research Libraries. 2011; 72:372-392.
17. Reba L. using citation checking of undergraduate honours thesis bibliographies to evaluate library collections. College & Research Libraries 2005;66: 416-429.
18. Obajemu AS. Serial Productivity: a study of Nigerian Librarianship 1910-1985. Nigerian Libraries. 1998,32:36-50.
19. Obajemu AS and Bolarinwa MO. Analysis of students of physiotherapy dissertations: 1980-2000.Nigerian Journal of Health and Biomedical Sciences 2004; 3: 33-36.
20. Obajemu AS, Akinade HOJ, Ogunyade TO and Ekere, FC Malaria Research in Nigeria: A Scientometrics appraisal. Nigerian Quarterly Journal of Hospital medicine 2013;23:165-170
21. Thomas EN. A stimulated electronic availability study of serial articles through a university webpage. College & Research Libraries 2009;70:422-442.
22. Susan V, Robert K and Park MS. Moving beyond citation analysis: how surveys and interviews enhance, enrich and expand research findings: college & Research Libraries 2010; 71:456-466.
23. Rong Tang. Citation characteristic and intellectual acceptance of scholarly monographs. College & Research Libraries 2008; 69:356-369.
24. Wikipedia. Theory; 2013. Available at http:// en. Wikipedia. Org/wiki/theory.
25. Michelle M. What is the meaning of theoretical framework 2013? Available at http:// WWW.ehoq.com/about 63382450
26. Lewis JN. Research Collaborations and research policy- disciplinary differences are important. Higher Education Development Association. 2012. Available at http://uv-net/www/hedda.
27. Carol Anne Meyer. Reference accuracy best practices for making the links. The journals of electronic publishing. 2008.
28. Kevin Wan, Utap Anyi, Zainab A and Anuar NB. Bibliometric studies on single journals: a review. Malaysian Journal of Library & information Science Apr 2009; 14: 1-11
29. Obajemu AS. A Comparative Bibliometric study of two renowned scholarly medical journals in Nigeria: 2001-2010. 2014 unpublished