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BIBLIOMETIRC ANALYSIS OF SICKLE CELL ANAEMIA LITERATURE ON NIGERIA LISTED IN PUBMED BETWEEN 2006 AND 2016

Omolayo A. Adesina Ms.

Africa Regional Centre for Information Science, University of Ibadan, Nigeria, adesinaomolayo1@gmail.com

Adeola O. Opesade Dr

Africa Regional Centre for Information Science, University of Ibadan, Nigeria, morecrown@gmail.com

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BIBLIOMETRIC ANALYSIS OF SICKLE CELL ANAEMIA LITERATURE ON NIGERIA LISTED IN PUBMED BETWEEN 2006 AND 2016

Abstract

This paper analysed Sickle cell anaemia literature on Nigeria listed in PubMed to understand the research performance of medical researchers on sickle cell anaemia literature on Nigeria. Data covering the period of 2006-2016 were collected from the PubMed, a citation database developed by the National Centre for Biotechnology Information (NCBI). The search strategy used was ((sickle cell anaemia) OR (sickle cell anemia)) AND Nigeria AND (("2006/01/01"[PDat] : "2016/12/31"[PDat])), bearing in mind variance in spelling (anaemia and anemia), which retrieved 326 sickle cell literature on Nigeria between 2006 and 2016. Article productivity increased between 2006 and 2010. However, there was a drastic drop in article publication between 2010 and 2011 as well as between 2013 and 2015. The degree of collaboration ranged between 0.85 and 1. University of Nigeria Teaching Hospital, Enugu, Nigeria, had the highest number of contributing authors. Authors published more in journals located in Nigeria, with Nigeria Journal of Clinical Practice being the most prolific publication outlet for authors publishing sickle cell anaemia literature on Nigeria.

Keywords Bibliometric Analysis, Sickle Cell Anaemia, Nigeria, PubMed

Introduction

Sickle cell anaemia, recognized as a major public health problem by the World Health Organization (WHO) (WHO, 2006) is a genetic blood disorder characterized by abnormal red blood cells that assume a rigid, sickle shape (Chaudhary & Chaudhary, 2011). It is a genetically determined haematological disorder which was first observed in 1904 by Dr. J.B. Herrick in the blood of an anaemia West Indian medical student (Emechebe, Oyire, & Achigbu, 2017). It is a disease which decreases the flexibility of many red cells resulting in their destruction and blocking blood flow which may cause many complications. According to Grosse et al (2011) sickle cell anaemia is wide spread affecting many people in Africa and some other part of the world. According to Akinyanju (1989) Nigeria has the largest burden of sickle cell disorder in the world; Nigeria's large population has ensured that over 40 million Nigerians are healthy carriers of the S gene. This number of carriers far exceeds the total population of every other affected African country and indeed, of several of them put together. Consequently, about 150, 000 Nigerian children are born each year with sickle cell anaemia (HbSS), the prevailing type of sickle cell disorder (SCD) in this region (Akinyanju, 1989). Combatting the menace of sickle cell anaemia in the country requires not only financial support but also sickle cell anaemia research to discover the potential treatment and possible cure for the disease. In line with the National effort to kick against the sickle cell anaemia, this study was carried out to give the bibliometric analysis of sickle cell anaemia literature on Nigeria listed in PubMed in order to determine the productivity of medical researchers on sickle cell anaemia on Nigeria.

Bibliometrics is an approach used in measuring scientific publications and science in general (Meyer, 2009). Bibliometrics is the application of quantitative analysis and statistics to publications such as journal articles and their accompanying citation counts (Thomson Reuters, 2008). According to Oxford LibGuides (2018), Durieux & Gevenois (2010) and Kolle (2017), Bibliometrics is the statistical method engaged to analyse and measure the

quantity and quality of books, articles, or other publications which can be done using a set of statistical and mathematical indices called bibliometric indicators. There are three major categories of these indicators and these are the quantitative indicators that measure the research productivity of a researcher, performance indicators that evaluate the quality of publications and structural indicators that help to establish a link between publication, authors and research fields (Josh, 2014; Kolle, 2017; Durieux and Gevenois, 2010). Bibliometrics is used in research performance evaluation, especially in university and government laboratories, and also by policy makers, research directors and administrators, information specialists and librarians, and researchers themselves (Thomson Reuters, 2008). Therefore, bibliometric analysis is a discipline in which research work described in scientific literature is evaluated by measuring certain indicators (Carrizo-Sainero, 2000; Thom, 2008).

Innumerable studies have been carried out on citation analysis as well as bibliometric analysis of different medical literature. Vioque et al. (2009) conducted a bibliometric study of scientific literature on obesity research in PubMed (1988–2007) in order to give an overview of obesity research and to explore to what extent scientific production parallels the so-called obesity epidemic. Akinola (2016) conducted citation analysis of paediatrics literature on Nigeria listed in Medline during 2002-2012, to understand the information need, use, sources and trends in the citation window. Ugolini et al. (2013) conducted bibliometric analysis of literature in cerebrovascular and cardiovascular diseases rehabilitation in order to explore temporal trends, geographic distribution, and socioeconomic determinants of scientific production in the field of cerebrovascular and cardiovascular disease (CCD) rehabilitation. Huang et al. (2015) conducted a retrospective bibliometric analysis of articles about traditional Chinese medicine (TCM) research in PubMed in order to learn about the development and perspective of TCM. Olayiwola (2015) conducted Bibliometric analysis of Ebola research in Africa, studying the characteristics of Ebola literature on Africa and utilized some evaluative bibliometric design to figure out citations of the publication. Glynn et al (2010) conducted bibliometric analysis on representation of cancer in the medical literature, which was used to measure the proportion, quality and relevance of articles for the most common cancer types. Yang, Pan and Chen (2009), conducted citation analysis of five journals in Andrology, which was used to find out the features in literature demand by researchers in the field of Andrology.

Despite the remarkable bibliometric research activities in medical sciences, no known study has been carried out on sickle cell anaemia literature listed in PubMed, particularly on Nigeria. Therefore, the present study aims at carrying out bibliometric analysis of sickle cell anaemia literature on Nigeria listed in PubMed between 2006 and 2016 in order to investigate the research productivity output of medical researchers in Nigeria on sickle cell anaemia in the published articles included in the electronic database, PubMed.

Literature Review

Bibliometric methods have been applied to several studies to determine research productivity of journals, institutions and scientists as well as to discover productivity trends of articles.

As it was said by Levi et al (2009) and Sanni (2011), one of the most tangible production units of science in any country is research publications, and indeed the number of publications and the amount of citations these papers received. Adeniyi (2012) applied a series of bibliometric indicators to study biomedical literature in selected West African

Countries between 2002 and 2011; it was revealed that Nigeria was the most productive country with 51.6% articles which made her the country with the highest number of publications among the selected West Africa countries. In a study which explored the literature of diabetes in Nigeria, Harande (2011) reported that the production of diabetes literature in Nigeria in the year 1986-2009 revealed that from the year 1986 the growth of literature became exponential. Uthman (2008) had similar observation that Nigeria has achieved a significant increase in the number of publications while Harade(2011) said that the possible explanation for the growth of the literature clearly showed that medical research is gaining attention and interest from Nigeria scientists, medical practitioners, researchers and scholars, which maybe as a result of the general population increase, as well as prevalence of specific diseases

The number of citations an article receives is an important indicator of impact and contribution to clinical world (Shuaib et al, 2015). In a study conducted by Shuaib et al (2015), it was revealed that there was a paucity of literature concerning top article citations in cardiology. It was also revealed that the most highly cited articles were published in variety of journals in which half of the articles were published in *Circulation* and *European Heart Journal*. Contrary to this, the study of bibliometric analysis of citation classics of acute appendicitis revealed that *Radiology*, *Annals of Surgery* and *British Journal of Surgery* were the top three journals with 15, 13, 11 respectively (Varzgalis, 2017). Shuaib et al (2015) also found out that general medical journals such as the *lancet* and the *New England Journal of Medicine* contributed only 5 articles to the list despite their extremely high impact factor.

Huang et al. (2015) conducted a retrospective bibliometric analysis of articles about traditional Chinese medicine (TCM) research in PubMed in order to learn about the development and perspective of TCM. It was observed that the articles originated from 102 countries and territories. China had the highest number of publications with 20,121 articles, followed by United States with 2207 articles and 57.74 % of the articles were published in English. It was also established that the publication activity of TCM literature increased rapidly in the past 20 years, indicating enhanced attention attracted to TCM and more research input.

Vioque et al (2009) analysed publications on obesity research in PubMed from 1988 to 2007. The result showed that there was an exponential increase in the number of publications on obesity. The references were published in 3613 different journals, with 20 journals contributing 25% of obesity literature. *International Journal of Obesity* (5.1%) and *Obesity-Obesity Research* (2.9%) were the two journals contributing most articles. North America and Europe were the most productive world areas with 44.1% and 37.9% of the literature, respectively. The US was the predominant country in number of publications, followed by the United Kingdom, Japan and Italy.

Ugolini et al. (2013) attempted to explore temporal trends, geographic distribution, and socioeconomic determinants of scientific production in the field of cerebrovascular and cardiovascular disease (CCD) rehabilitation. The study revealed that there was steep growth for cerebrovascular diseases in the last 15 years and that the articles' quality (IF) decreased in

the last decade. European Union has the highest citations followed by United States with 44.4% and 30.3% citations retrieved respectively. The highest mean IF was reported for France (4.127). The result also revealed that three journals (Archives of Physical Medicine and Rehabilitation, Clinical Rehabilitation, and Stroke) published one quarter of the articles.

In addition, a study on bibliometric analysis of worldwide scientific literature in mobile-health: 2006-2016, whose purpose was to analyse and assess literature publication in the field of M-Health by investigating the most productive journals in the field of m-Health discovered that Journal of Medical Internet Research was the most preferred journal for publishing articles on m-Health and it was also the journal with the largest circle size indicative of having the highest number of citations in m-Health (Sweileh et al, 2017).

The 20th century saw an explosion in research output across all medical and scientific fields (Varzgalis et al, 2017). They observed that surgical practice as it pertained to appendicitis had been no exception and a consistent yearly increase in frequency of publications had been seen throughout the decades. On the other hand, a study of bibliometric analysis of literature on Toxic Epidermal Necrolysis (TEN) and Stevens-Johnson Syndrome (SJS)(1940-2015) revealed that the number of publication on SJS and TEN increased slowly and gradually over the past half century. This increase might be due to natural growth of medical publications in the past half century or due to increased reported cases of drug-induced SJS and TEN in the past half century (Sweileh et al., 2017).

Sanni (2011), adopted bibliometric methods to examine article productivity and citation analysis of the oldest medical journal in Malaysia, Medical Journal of Malaysia (MJM) from years 2004 to 2008 using data extracted from the Malaysian Abstracting and Indexing System (MyAis) database. The findings showed that MJM sustained consistent publication productivity with at least 100 to an average of 116 papers per year, with scholarly journal being the most cited form of sources (87.67%). Authors' productivity pattern conformed slightly to Lotka's law of author productivity, most productive authors were senior medical researchers affiliated to higher institutions and foreign contributions were very few (6.20%). Most of the papers were joint-authored with three-authorship being the highest pattern of collaborative work. The average number of reference used per year was 1,391, while average citation per article was twelve. The age of citation used were mainly about 1 to 11 years old (63.87%) with publication of over 20 years, still being referenced suggesting the longevity of the usefulness of works published in the medical field.

The main aim of the study by Wen et al. (2015) was to investigate the distribution, development tendency, and research hotspots of cataract publications listed in the PubMed (2001-2013). They discovered that the Journal of Cataract and Refractive Surgery ranked first, followed by British Journal of Ophthalmology. Also, it was discovered that the developing world produced fewer cataract research publications which might be associated with a relatively indigent economy in developing countries, thus resulting in lack of adequate funding to support cataract research. They suggested that governments in the developing world should pay more attention to cataract research and provide more manpower and material to support it.

Research on literature involving zirconia based on PubMed database, conducted by Huiyan, Zhuangzhi, Chunxia, and Huazhe (2017) in which the purpose of the study was to study the trends of zirconia as dental materials revealed that authors are mainly from developed countries and regions (America and Germany), and a developing country such as China is playing an increasing role in this field. Further, the number of high impact articles including international co-authorship articles was relatively small with a low overall research level. They suggested that international cooperation should be strengthened to improve the quality of research.

Objective of the Study

The objective of this present study is to carry out a bibliometric analysis of medical literature on sickle cell anaemia on Nigeria. Specifically, the degree of collaboration of authors, the most prolific authors, the institutional affiliation of authors and scientific journals involved in publishing such articles were determined. The impact factor of journals involved in publishing articles and the country of affiliation of those journals were also investigated.

Methodology

Literature used in this study was derived from PubMed database (<https://www.ncbi.nlm.nih.gov/pubmed/>), the National Library of Medicine (NLM) search interface to the MEDLINE database which was developed by National Centre for Biotechnology Information (NCBI) in 1996 and which provides access and links to the

integrated molecular databases maintained by NCBI (National Network of Libraries of Medicine, 2004). A search was carried out in PubMed database using custom setting tools of the database with search queries which was entered into the search box: ((sickle cell anaemia) OR (sickle cell anemia)) AND Nigeria AND ("2006/01/01"[PDat] : "2016/12/31"[PDat])), bearing in mind variation in the spellings (anaemia and anemia). Using the above search strategy, a total of 326 sickle cell anaemia literature on Nigeria published between 2006 and 2016 were retrieved from PubMed. Thirty six of these articles were outliers, that is, were not relevant due to the fact that they were either not on the subject of sickle cell anaemia or the studies were not carried out on Nigeria. Thirty three articles were not accessible. A total of 257 articles were eventually used for the citation analysis. Data used for this study were extracted from each sickle cell anaemia literature on Nigeria listed in PubMed to Microsoft excel worksheet. All results were analysed using Statistical Package for the Social Science (SPSS) version 20. The h-index, g-index and number of citations received were retrieved from Harzing Publish or Perish (PoP) software designed to help scholars determine their own h-index. The impact factors of journals were taken from the Journal Citation Reports (JCR) published in 2017 gotten from ResearchGate (https://www.researchgate.net/publication/317604703_2017_Journal_Impact_Factor_JCR). For each literature retrieved, data of interest captured include: the names of author(s), the number of authors, year of article publication, the institutional affiliation(s) of authors and the names of journal, location of journals.

Results

Types of sources cited

The 257 journal articles used in this study generated 7226 citations. As shown in Table 1, twenty six (26) different types of sources were observed to have been cited in the journal articles excluding the unknown (unidentified) sources. These types of sources are bulletins,

census, charts, computer programs, conference proceedings, databases, discussion papers, dissertations/theses, guidelines, handbooks, journals, magazines, manuals, monographs, newspapers, newsletters, patents, personal communications, posters, reports, software, storybooks, textbooks, trials registers, websites, and year books.

Table I Distribution of types of sources cited in sickle cell anaemia literature

S/N	Form of Sources	Total Number of Citations	Percentage (%)
1	Journal	6308	87.30
2	Textbook	488	6.75
3	Website	141	1.95
4	Report	126	1.74
5	Dissertation/Theses	23	0.32
6	Guideline	16	0.24
7	Conference Proceedings	17	0.22
8	Bulletin	14	1.9
9	Trials Register	7	0.10
10	Magazine	3	0.04
11	Database	2	0.03
12	Manual	2	0.03
13	Software	2	0.03
14	Year Book	2	0.03
15	Census	1	0.01
16	Chart	1	0.01
17	Computer Program	1	0.01
18	Discussion Paper	1	0.01
19	Handbook	1	0.01
20	Monographs	1	0.01
21	News Paper	1	0.01
22	Newsletter	1	0.01
23	Patent	1	0.01
24	Personal Communication	1	0.01
25	Poster	1	0.01
26	Storybook	1	0.01
27	Unknown	63	0.87
	Total	7226	100.0

The table shows that journal articles were the most common type of sources cited with 87.3% (6308) of all the cited materials, this is followed by textbooks accounting for 6.8% (488), websites have 2.0% (141), and reports have 1.7% (126).

Scientific productivity trend

Figure 1 shows the trend of scientific productivity of sickle cell anaemia literature on Nigeria listed in PubMed between 2006 and 2016. It could be observed that article publications have been consistently on the increase during the year 2006 to 2010. Thereafter, there was a drastic drop in article publication between 2010 and 2011. There was also a slight drop in scientific productivity in the Year 2014 till 2015. The highest number of articles publication was recorded in 2013 followed by 2014, 2010 and 2016 with 32, 31, 30 and 30 articles respectively.

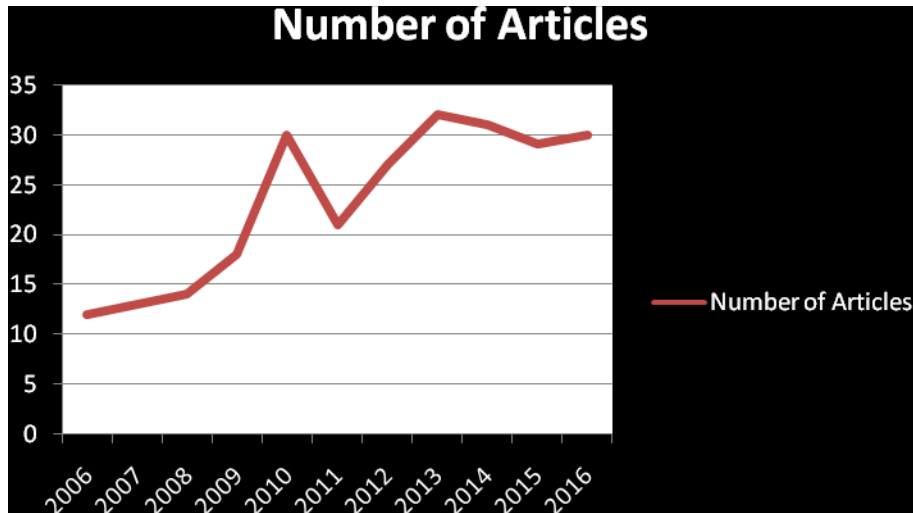


Fig. 1 Trend of scientific productivity

Degree of collaboration

Using the Subramanyan (1983) formula for calculating degree of collaboration among authors as stated in Eq. 1, Table 2 presents the degree of collaboration among researchers in the present study.

$$C = \frac{Nm}{(Nm + Ns)} \dots\dots\dots (Eq. 1)$$

Where,

C=Degree of Collaboration,

Nm=Number of Multi-Authored Contribution and

Ns=Number of Single-Authored Contribution.

Table 2 Degree of collaboration

S/N	Year	Single Authored Paper(Ns)	Multi Authored Papers(Nm)	Total (Nm+Ns)	Degree of Collaboration
1	2006	1	11	12	0.92
2	2007	2	11	13	0.85
3	2008	2	12	14	0.9
4	2009	3	15	18	0.85
5	2010	0	30	30	1
6	2011	2	19	21	0.90
7	2012	1	26	27	0.96
8	2013	3	29	32	0.91
9	2014	1	30	31	0.96
10	2015	1	28	29	0.96
11	2016	1	29	30	0.96
	Total Average	17	240	257	0.93

The result shows that the degree of collaboration among authors of sickle cell anaemia literature on Nigeria listed in PubMed during the period (2006 and 2016) ranges from 0.85 to 1 and the average degree of collaboration is 0.93. The highest degree of collaboration was in 2010 while the least were in the Year 2007 and 2009. From the table, it is evident that more

number of authors' produces research articles in collaboration. Therefore, it is concluded that collaborative research is more preferred to single authorship among researchers that published sickle cell anaemia literature on Nigeria.

Authors' productivity

The study reveals that among 1253 authors whose articles were published in sickle cell anaemia literature on Nigeria listed in PubMed during the period, the most prolific author was Emodi, I.J. with 21 (1.7%) published articles followed by Ikefuna, A.N. with 19 (1.5%) published articles, Ibegbulam, O.G. with 14 (1.1%) published articles, Njokanma, O.F. with 12 (1.0%) published articles, and Diaku-Akinwumi, I.N. with 11 (0.9%) published articles. Some other authors include Brown, B.J., Ocheni, S., Akinbami, A.A., Chukwu, B., Adediran, A., Adegoke, S.A., Akodu, S.O., Ejim, E.C., Kotila, T.R., and Oguanobi, N.I. having 10(0.8%), 10(0.8%), 9(0.7%), 9(0.7%), 8(0.6%), 8(0.6%), 8(0.6%), 8(0.6%), 8(0.6%), and 8(0.6%) published articles respectively.

Institutions' productivity

Majority of the authors are affiliated to Nigerian institutions while other sizeable numbers of authors are affiliated to institutions in the United Kingdom and United States of America. The summary of the distribution of authors' affiliation is as shown in Table 3. The table shows that 90% of contributors to the retrieved sickle cell anaemia literature are from Nigerian institutions, followed by institutions in the USA with 4.8%, Italian and UK institutions with 1.5% and 1% respectively. Barbados institutions had the least contributors with 0.3% sickle cell anaemia literature.

Table 3: Authors' countries of affiliation

Country of affiliation	No. of contributors	Percentage distribution of authors
Barbados	3	0.3
Brazil	5	0.5
Canada	6	0.6
Gambia	7	0.7
Italy	15	1.5
Kuwait	5	0.5
Nigeria	897	90.1
UK	10	1
USA	48	4.8
Total	996	100

Analysis of the eight hundred and ninety seven (897) authors from Nigeria revealed that majority of the contributing authors are from the University of Nigeria Teaching Hospital, Enugu (10%), followed by College of Medicine, University of Lagos, Lagos(6.1%) contributing authors, Lagos State University College of Medicine, Lagos, is the third institution with 4.9% contributing authors.

Geographical location of journals

The data regarding the research articles were analysed according to the geographical location of journals in which authors of Sickle cell anaemia literature on Nigeria listed in PubMed

during the period (2006 and 2016) published their articles. Table 4 shows the distribution of articles into their countries of journal publication.

Table 4 Distribution of geographical location of journals

S/N	Geographical Location of Journals	Number of Articles	Percentage (%)	Rank
1	Nigeria	56	21.8	1
2	United Kingdom	52	20.2	2
3	United States	37	14.4	3
4	India	11	4.3	4
5	Netherlands	11	4.3	4
6	Egypt	10	3.9	5
7	Switzerland	8	3.1	6
8	Uganda	8	3.1	6
9	Italy	6	2.3	7
10	Kenya	6	2.3	7
11	South Africa	5	1.9	8
12	Saudi Arabia	5	1.9	8
13	Iran	4	1.6	9
14	Germany	3	1.2	10
15	Belgium	2	0.8	11
16	Ethiopia	2	0.8	11
17	Japan	2	0.8	11
18	New Zealand	2	0.8	11
19	Hungary	1	0.4	12
20	Oman	1	0.4	12
21	Pakistan	1	0.4	12
22	Singapore	1	0.4	12
23	Taiwan	1	0.4	12
24	Turkey	1	0.4	12
25	Unavailable	21	8.2	
	Total	257	100.0	

Table 4 observed that Nigeria ranks first with 56 articles forming 21.8% of the total of 257 articles. It is followed by United Kingdom (UK) publishing 52 articles (20.2%), United State (US) ranks next to United Kingdom with 37 articles (14.4%). This is followed by India and Netherlands having 11 articles (4.3%) each, Egypt, Switzerland, Uganda, Italy and Kenya ranking 5th, 6th, 6th, 7th, 7th respectively with their article contribution of 10(3.9%), 8(3.1%), 8(3.1%), 6(2.3%) and 6(2.3%) articles respectively.

Journal productivity

Table 5 shows the journals with prolific publication outlets for authors publishing sickle cell anaemia literature on Nigeria listed in PubMed during the period (2006 and 2016).

The journal with the most prolific publication outlets is the Nigerian Journal of Clinical Practice with 15(5.8%) articles. Cochrane Database of Systematic Review is the second journal with 12 (4.7%) articles, followed by West African Journal of Medicine with 11 (4.3%) articles published in it. Nigeria Medical Journal with 9 (3.5%) articles, African health Sciences with 8 (3.1%), Paediatric Blood and Cancer with 7 (2.7%) articles while Anaemia Journal, Nigeria Journal of Medicine, and Paediatric Haematology & Oncology has 6 articles each published in them.

Table 5 Distribution of Journals with Prolific Publication Outlets

S/N	Journal Title	Geographical	Number of	Percentage
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		Location	Articles	(%)
1	Nigerian Journal of Clinical Practice	Nigeria	15	5.8
2	Cochrane Database of Systematic Reviews	United Kingdom	12	4.7
3	West African Journal of Medicine	Nigeria	11	4.3
4	Nigerian Medical Journal	Nigeria	9	3.5
5	African Health Sciences	Uganda	8	3.1
6	Paediatric Blood and Cancer	United State	7	2.7
7	Anaemia	Egypt	6	2.3
8	Nigerian Journal of Medicine	Nigeria	6	2.3
9	Paediatric Haematology and Oncology	United Kingdom	6	2.3
10	American Journal of Haematology	United State	5	1.9
11	Pan African Medical Journal	Kenya	5	1.9
12	Annals of Ibadan Postgraduate Medicine	Nigeria	4	1.6
13	Cardiovascular Journal of Africa	South Africa	4	1.6
14	Mediterranean Journal of Haematology and Infectious Diseases	Italy	4	1.6
15	Nigerian Postgraduate Medical Journal	Nigeria	4	1.6
16	Annals of African Medicine	India	3	1.2
17	Annals of Medical and Health Sciences Research	Unknown	3	1.2
18	BMC Complementary and Alternative Medicine	United Kingdom	3	1.2
19	International Health	Netherlands	3	1.2
20	Journal of Obstetrics and Gynaecology	United Kingdom	3	1.2
21	Journal of the National Medical Association	United States	3	1.2
22	Medical Principles and Practice	Switzerland	3	1.2
23	Nigerian Journal of Physiological Sciences	Nigeria	3	1.2
24	Pathophysiology	Netherlands	3	1.2
25	Saudi Journal of Kidney Diseases and Transplantation	Saudi Arabia	3	1.2
26	Actacardiologica	Belgium	2	0.8
27	BMC Research Notes	United Kingdom	2	0.8
28	British Medical Journal	United Kingdom	2	0.8
29	East African Medical Journal	Kenya	2	0.8
30	Ethiopian Journal of Health Sciences	Ethiopia	2	0.8
31	Haematology	United Kingdom	2	0.8
32	Haemoglobin	United States	2	0.8
33	International Quarterly of Community Health Education	Unknown	2	0.8
34	Italian Journal of Paediatrics	United Kingdom	2	0.8
35	Journal of Paediatric Haematology/Oncology	United States	2	0.8
36	Journal of Tropical Paediatrics	United Kingdom	2	0.8
37	Journal of Vector Borne Diseases	India	2	0.8
38	Nigerian Quarterly Journal of Hospital Medicine	Nigeria	2	0.8

Journal impact factor of the most prolific journals

Table 6 presents the impact factors of journals in which authors of sickle cell anaemia literature on Nigeria listed in PubMed Published their articles. British Medical Journal (BMJ) has the highest Journal Impact Factor (JIF) of 20.785, this is followed by Cochrane Database of Systematic Reviews with JIF of 6.124, followed by Paediatric Blood and Cancer with JIF of 2.513, BMC Complementary and Alternative Medicine with JIF of 2.288, International Health, Italian Journal of Paediatrics, Medical Principles & Practice, and Haematology having JIF of 1.784, 1.668, 1.469, and 1.244 respectively.

Table 6 Impact Factor of Journals with Prolific Journals in which Authors of Sickle Cell Anaemia Literature on Nigeria Listed In PubMed Published their Articles

S/N	Name of Journal	Geographical location	JIF
1	British Medical Journal	United Kingdom	20.785
2	Cochrane Database of Systematic Reviews	United Kingdom	6.124
3	Paediatric Blood and Cancer	United State	2.513
4	BMC Complementary and Alternative Medicines	United Kingdom	2.288
5	International Health	Netherlands	1.784
6	Italian Journal of Paediatrics	United Kingdom	1.668
7	Medical Principles and Practice	Switzerland	1.469
8	Haematology	United Kingdom	1.244
9	Journal of Vector Borne Diseases	India	1.190
10	PaediatricHaematology and Oncology	United Kingdom	1.120
11	Journal of Tropical Paediatrics	United Kingdom	1.093
12	Journal of Obstetrics and Gynaecology	United Kingdom	1.086
13	Journal of PaediatricHaematology/Oncology	United States	1.076
14	Cardiovascular Journal of Africa	South Africa	0.967
15	ActaCardiologica	Belgium	0.808
16	Haemoglobin	United States	0.770
17	African Health Sciences	Uganda	0.635
18	Nigerian Journal of Clinical Practice	Nigeria	0.615
19	Journal of the National Medical Association	United States	0.182
20	West African Journal of Medicine	Nigeria	0
21	Nigerian Medical Journal	Nigeria	0
22	Anaemia	Egypt	0
23	Nigerian Journal of Medicine	Nigeria	0
24	American Journal of Haematology	United State	0
25	Pan African Medical Journal	Kenya	0
26	Annals of Ibadan Postgraduate Medicine	Nigeria	0
27	Mediterranean Journal of Haematology and Infectious Diseases	Italy	0
28	Nigerian Postgraduate Medical Journal	Nigeria	0
29	Annals of African Medicine	India	0
30	Annals of Medical and Health Sciences Research	Unknown	0
31	Nigerian Journal of Physiological Sciences	Nigeria	0
32	Pathophysiology	Netherlands	0
33	Saudi Journal of Kidney Diseases and Transplantation	Saudi Arabia	0
34	BMC Research Notes	United Kingdom	0
35	East African Medical Journal	Kenya	0
36	Ethiopian Journal of Health Sciences	Ethiopia	0
37	International Quarterly of Community Health Education	Unknown	0
38	Nigerian Quarterly Journal of Hospital Medicine	Nigeria	0

Article H-index, G-index and total citations received

An analysis of H-Index, G-Index and total citations received by sickle cell anaemia literature on Nigeriathat 237 articles out of a total of 257 in the present studyhave H-Index and G-Index of 1 while the remaining 20 articles have H-Index and G-Index of 0. Furthermore, it is observed that “Global Burden of Sickle Cell Anaemia in Children under Five, 2010–2050: Modelling Based on Demographics, Excess Mortality, and Interventions” has the highest number of citation received (227), followed by “Use of complementary and alternative medicines for children with chronic health conditions in Lagos, Nigeria”(82), “Sickle cell disease and pulmonary hypertension in Africa: A global perspective and review of epidemiology, pathophysiology, and management” ranked 3rd(76). “Prevalence and risk factors for pulmonary artery systolic hypertension among sickle cell disease patients in

Nigeria” and “New-born screening for sickle cell disease in a Nigerian hospital” ranked 4th and 5th with 75 and 55 total number of citation respectively.

Discussion

The first specific objective of this study is to find the type of sources cited in the Sickle cell anaemia literature on Nigeria. It can be inferred that medical researchers cite more of journal articles than any other type of sources. The possible explanation for the high rate of journal citation could be that articles found in journals go through a peer-review process and the information is therefore considered more reliable (CQ University, 2018). Another possible reason given by Liverpool Hope University (2017) could be that academic journals are seen as the ‘gold standard’ for academic research, ensuring a high level of quality and academic rigor in the articles that are published.

As regards to the scientific productivity trend of publications on sickle cell anaemia literature on Nigeria listed in PubMed during the period. The highest productivity was observed in 2013 with a total of 32(12.5%) articles and the lowest productivity was in 2006 with a total productivity of 12(4.7%). This increase of research productivity could be attributed to the need to uncover the causes of some crisis that occur and to discover the possible cure for the disease. Concerning the degree of collaboration among authors, out of the 257 articles analysed, 6.6% articles were written by single author while 93.4% articles were written by 2 or more authors, this indicated a high degree of collaborative research in sickle cell anaemia literature on Nigeria listed in PubMed during the period. The possible reason for the high degree of collaboration is that there could be a need for scientists who are specialists in different areas to work together to address the problems using different scientific techniques, approaches, and ideas. Another reason as stated by Hackett (1990) and Morrison (2017) could be the need to access resources and research funding from Governmental and non-Governmental organizations.

The analysis of the geographical locations of journals revealed that authors published more in journal located in Nigeria than journals located in all other countries, the possible explanation for the increase in number of biomedical journals in Nigeria is because of the patronage by some authors who allege that their papers are not published by internationally reputed journals because of some sort of discrimination (Ajao&Ugwu, 2011).

British Medical Journal ranked first in terms of impact factor having impact factor of 20.785, followed by Cochrane Database of Systematic Review while Paediatric Blood and Cancer ranked third position. The possible reason could be that the editorial policies of these journals are firm and precise. Menon (2018) believed that BMJ has high impact factor due to the fact that BMJ uses a comprehensive peer review process giving priority to articles that improve clinical decision-making in general medicine. Few of the publications were published in highly prestigious and influential journals and majority of the publications were published in low or no impact journals. It is quite disturbing to note that none of the Nigeria journals is among impactful ones (with impact factors ranging 0.615 and 0).

Conclusion

Bibliometric analysis of sickle cell anaemia literature on Nigeria listed in PubMed between 2006 and 2016 is presented in this study. Journal article is the most common type of sources cited. A consistent growth was observed between 2006 and 2016. Thereafter, there was a drastic drop in article publication in 2011 and it picks up in 2012. In 2014 the scientific

productivity of sickle cell anaemia literature on Nigeria listed in PubMed between 2006 and 2016 slightly drop again. The peak period was observed in 2013 (32 articles). The degree of collaboration ranges from 0.85 to 1 and the average degree of collaboration is 0.93. Perfect degree of collaboration was observed in 2010. Emodi, I.J. affiliated to College of Medicine, University of Nigeria, Enugu, Nigeria and University of Nigeria Teaching Hospital, Enugu, Nigeria was the most productive author with 21 (1.7%) published articles. University of Nigeria Teaching Hospital, Enugu, Nigeria has the highest number of contributing authors with 10% (132) of the contributions. It was observed that authors published more in journals located Nigeria than other countries with 56 articles. Nigerian Journal of Clinical Practice is the journal with the most prolific publication outlets with 15(5.8%) articles. British Medical Journal (BMJ) has the highest Journal Impact Factor (JIF) of 20.785. Out of the total of 257 articles used for this study 237 articles ranked 1st with H-Index of 1 and G-Index of 1 and 20 articles rank 2nd with H-Index of 0 and G-Index of 0. (Global Burden of Sickle Cell Anaemia in Children under Five, 2010–2050: Modelling Based on Demographics, Excess Mortality, and Interventions) has the highest number of citation received with 227 total number of citations.

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