

# A Bibliometric Analysis on Lassa fever Research Trend in Nigeria

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## Abstract:-

### ➤ Background and Objective:

Lassa fever is a viral haemorrhagic malady resulting from the *Lassa virus* which is becoming a global health concern emerging as one of the top eight pathogens expected to cause severe outbreaks in the near future. The virus was named after the town of its first incident, Lassa town in Borno State, Nigeria. The virus gained a lot of attraction due to its capacity to be transmitted from person to person and potential to cause hospital outbreaks with attendant morbidity and mortality among health workers. The purpose of this paper is to measure the contribution of Nigeria affiliated researchers in terms of quantity and impact to Lassa fever research efforts.

### ➤ Methods:

Bibliometric analysis was performed on ninety-one (91) papers retrieved from the SCOPUS database based on defined Lassa fever search terms. The affiliation of the papers was limited to the country of its incidence, Nigeria.

### ➤ Result:

A total of ninety-one (91) documents met the search criteria with a generally increasing trend of Lassa fever publication and the highest quantity of the papers published so far in 2018. Irrua Specialist Teaching Hospital, Irrua, Nigeria was observed to be the most productive institution with the highest number of affiliations. United States appeared as the country observed to have the highest number of collaborations with Nigeria. The result also shows a fluctuating but decreasing citation trend over the years.

### ➤ Conclusion:

Although Nigeria has been reported to be amongst the first five affiliated country with Lassa fever research, there is more growth in the research area in the publishing pattern in the nearest future.

**Keywords:-** Bibliometrics, Lassa Fever, Lassa Virus, Research Productivity, Citation Analysis, Nigeria.

## I. INTRODUCTION

Lassa fever is a viral haemorrhagic malady resulting from the *Lassa virus* which is becoming a global health concern emerging as one of the top eight pathogens expected to cause severe outbreaks in the near future (WHO, 2005). The Lassa virus is a single-stranded RNA virus belonging to the virus family of *Arenaviridae* (Peters, 2010). Due to its tendency to cause bleeding from body orifices, the virus is often called haemorrhagic fever virus. Its shape when viewed is either oval, round, or pleomorphic, with a diameter size of 110 to 130 nm and enveloped (Ogbu et. al., 2007; Peters, 2010; Ehichioya et. al., 2011). Multimammate rat called *Mastomys natalensis* is the natural reservoir for Lassa virus (Richmond and Baglole, 2003; Lacompte and Fischet-Calvet, 2006). *Mastomys natalensis* is omnipresent in equatorial Africa, found in eastern, western, central, northern and southern Africa (Monath, 1975; Richmond and Baglole, 2003; Lacompte and Fischet-Calvet, 2006; Fischet-Calvet and Rogers, 2009). In Nigeria, *Mastomys natalensis* has been identified by her top three major ethnic groups in their local languages as “EekuAsin” by the Yoruba group, “Jagba” by the Hausa group and “Nkapia or Nkakwu” by the Igbo group. Rodent infection may occur more frequently in the rainy season, when the humidity is lower, the stability of viral aerosol, as seen in the dry season (Fischet-Calvet and Rogers, 2009). Among other factors, the increased aerosol transmission of Lassa virus may account for the emergence of recurrent Lassa fever in some regions during the dry season (Troup et. al., 1970; McCormick et. al., 1987).

Lassa fever disease is endemic in the western part of Africa and is responsible for recurrent epidemics of acute haemorrhagic fever in the western parts of Africa as well as sporadic diseases in Europe, Asia and America (Monath, 1975; Macher and Wolfe, 2006). The virus was named in

recognition of Lassa town, Borno State, Nigeria, where the index case was first documented in 1969 (Frame et. al., 1970). Although it was thought that the earliest cases of Lassa fever occurred between 1920 and 1950 in Nigeria and perhaps in some parts of West Africa, Sierra Leone and the Central African Republic (Monath, 1975). However, the disease became recognised and named in 1960 after two missionary nurses died and a third suffered a grave apparently communicable febrile systemic illness while working in Nigeria (Frame et. al., 1970). Recently, Lassa virus can be considered an agent of bioterrorism due to its ability to transmit from person to person and its potential to cause hospital outbreaks involving morbidity and mortality among health workers.

In 2005, World Health Organization (WHO) estimated the yearly average death estimate due to Lassa fever to be 5000 with 200 000 to 500 000 cases in West Africa, particularly in Nigeria, Sierra Leone, Liberia and Republic of Guinea. The prevalence of antibodies to the virus in Nigeria is 21% (McCormick et. al., 1987b; Bausch et. al., 2001; Ehichioya et. al., 2012) relative to 4-55% in Guinea and 8-22% in Sierra Leone. Based on the report presented by the Federal Ministry of Health, Nigeria, (Monath, 1975; Troup et. al., 1970; Frame et. al., 1970; Fisher-Hoch et. al., 1995; Grundy et. al., 1980; Bowen et. al., 1975; Biya and Coker, 2007) presented the outbreaks of Lassa fever in Nigeria from 1969 to 2006. (Ehichioya et. al., 2010; WHO, 2011; Ehichioya et. al., 2012; Inegbenebor et. al., 2012; ) also presented the outbreaks experienced in various states in Nigeria between the year 2008 and 2011. As for the states in Nigeria that have yet reported a case or an outbreak of Lassa fever since its inception, it is possible that the cases were either not reported or recognized.

According to clinical presentations described by various authors, only about 20% of persons infected by the Lassa virus develop symptoms, with the remaining 80% demonstrating serological evidence of infection without symptoms (Frame et. al., 1970; McCormick et. al., 1987a&b; Fisher-Hoch et. al., 1995; Bausch et. al., 2001; Richmond and Baglole, 2003; Macher and Wolfe, 2006; Ogbu et. al., 2007. In 1998, WHO recommended that once Lassa fever is suspected, the patient should ideally be admitted into an isolation room or ward and barrier-nursed. The antiviral drug called ribavirin is the only specific effective treatment for Lassa fever. Although Ribavirin's mechanism of action is known to have broad-spectrum antiviral properties against both RNA and DNA viruses as well as immunomodulatory effects, they are however not completely understood (Snell, 2001).

## II. RELATED WORK

Bibliometric method is a very good guide towards prioritizing efforts and directing research funds to help control emerging diseases (Cox et. al., 2014). To properly situate this study, a summary of previous related work is presented in this section. (Almaida-Guerrero et. al., 2018) presented a document on the mitigation of the global impact of Lassa fever by performing a bibliometric measure on countries with the highest Lassa fever research from the SCOPUS and SCI database. In the same manner, (Okoroiwu et. al., 2018) did a global research impact on the subject matter and reported a slow research growth.

Following the World Health Organization publication on the top eight pathogens expected to cause severe outbreaks in the near future, (Sweileh, 2017) retrieved documents from SCOPUS on the eight pathogens including Lassa virus and did a research trend measure. He drew a conclusion that although United States is leading the research on the diseases, the share of African, Asian and Middle Eastern countries was observed to be apparent.

Additional uniqueness of this study is the measure of Lassa fever research in the country where it was first reported and named – Nigeria.

## III. STUDY OBJECTIVES

In other to achieve the purpose of this study is to quantify the contribution to Lassa fever research in Nigeria, the following set of objectives were outlined:

- **Objective 1:** to identify the distribution of Lassa fever research's publication by year and document type,
- **Objective 2:** to identify the most active Lassa fever research authors and institutions in Nigeria,
- **Objective 3:** to highlight top countries that are active in collaborating with Nigeria on Lassa fever research endeavours,
- **Objective 4:** to show the widely adopted source title, subject area and keywords for Lassa fever research outputs from Nigeria and
- **Objective 5:** to perform a citation analyses of Lassa fever research output from Nigeria.

## IV. METHODS

The data analyzed in this study was collected from SCOPUS through a cautiously created search query; SCOPUS is one of the biggest indexed scholastic databases (ELSEVIER, 2016). Extracted facts were used to respond to the study objectives proposed in this in this study; search sequences containing "Lassa fever" was used to retrieve related documents and the affiliated country was restricted to Nigeria. According to (Fischer and Zigmond, 2004), the contents of the title, abstract and keyword was reported to

adequately reflect a paper’s main content. Thus, a total of ninety-one (91) research documents was extracted with the predetermined search string contained in the document title, its abstract or its keyword. The extracted data contained details such as authors’ name, affiliations (institution and country), source title, year of publication, abstract, document type, citation count, access type, keywords (index and authors’) and language (Fischer and Zigmond, 2004).

To verify the fact that only the pertinent papers were used for the bibliometric evaluation in line with the purpose of the study, a preliminary check was carried out on the extracted data. To attain this, the title, abstract and keywords of the papers were examined for main keywords such as “Lassa fever” and “Lassa virus”. In situations in which there are uncertainties, the entire documents were reassessed to verify its relevance to the purpose of the study. Fortunately, all the documents retrieved from SCOPUS were relevant and all the documents were written in English. Parts of the data considered in the study included Author, year, Document Type, Source Title, Affiliations, Countries, Subject area, Keywords and Citation.

In this study, we employed a bibliometric method of answering the research questions. The analysis was carried out in line with the stated objectives which includes the annual research outputs, academic publishers, source titles, the citation impact and so on.

**V. RESULTS**

This study's purpose is to measure the volume of Lassa fever research outputs in Nigeria. In the following subsections, the answers to the research goal posed in this study are presented.

❖ *Distribution of Total Research Output*

This section shows the results of the distribution of “Lassa fever” documents published by Year, Document Type, and Language in Nigeria.

*A. Publication Distribution by Year*

All the published Lassa fever documents from 1972 till date were written in English. Though there seems to be an increase till 2015 and a decrease within 2015 – 2017, the shoot out in 2018 was very high. It can generally be observed from Figure 1, that the publications on Lassa fever documents have been progressive from 1972 to 2018. From a total of 91 documents, the largest amount of publication is 20.88% (n=19) in 2018, followed by 9.89% (n=9) in 2015, 7.69% (n=7) in both 2014 and 2016. In 2019, 5.49% (n=5) has been published as at the point of this analysis; where n denotes number of documents published.

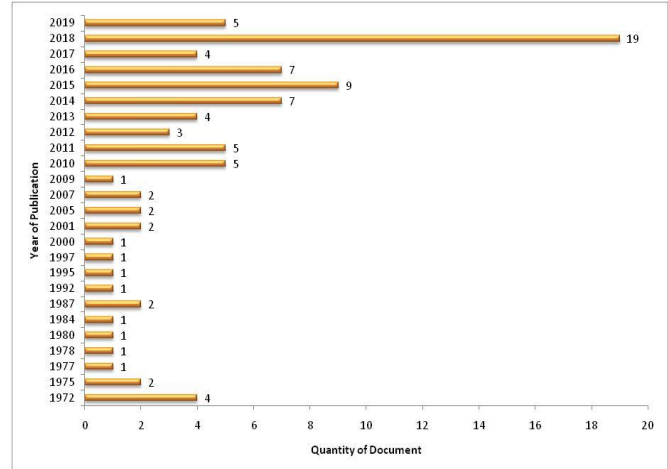


Fig 1:- Publication Distribution by Year

*B. Publication Distribution by Document Type*

Most of the Lassa fever documents published till date were articles (75.82%, n = 69) followed by 9 letters, 6 reviews, 3 book chapters, 2 editorial, 1 paper and note each – Figure 2.

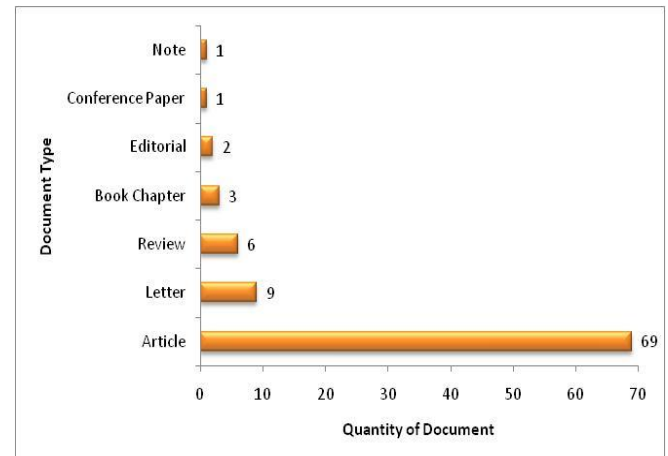


Fig 2:- Publication Distribution by Document Type

❖ *Most Productive Lassa Fever Research Authors and Institutions in Nigeria*

*A. Most Productive Lassa Fever Research Authors*

The most productive authors with the highest number of affiliation with Lassa fever publication till date are shown in Table 2 – Nine (9) of them in all. Asogun, D. A. and Okokhere, P. O. are the two most productive authors with a Nigeria institution affiliation, they have twelve (12) documents each. Happi, C.T. have 11 documents while Akpede, G.O. have 10 documents. It can be noticed that most of the top productive Lassa fever research authors from Nigeria are affiliated with Irrua Specialist Teaching Hospital, Irrua, Nigeria. Every other author not in Table 1 had documents less than 8.

| Author           | Institutions  | Affiliation     |       |
|------------------|---|-----------------|-------|
|                  |   | As First Author | Total |
| Gunther, S.      | Bernhard-Nocht-Institute for Tropical Medicine, Hamburg.  | 2               | 20    |
| Asogun, D.A.     | Ambrose Alli University, Ekpoma, Nigeria.Irrua Specialist Teaching Hospital, Irrua, Nigeria   | 1               | 12    |
| Okokhere, P.O.   | Irrua Specialist Teaching Hospital, Irrua, Nigeria. Ambrose Alli University, Ekpoma, Nigeria.   | 3               | 12    |
| Happi, C.T.      | Harvard University, Boston, MA, United States. Irrua Specialist Teaching Hospital, Irrua, Nigeria. African Center of Excellence for Genomics of Infectious Disease (ACEGID).Redeemer’s University, Ede, Nigeria.                    | 0               | 11    |
| Akpede, G.O.     | Ambrose Alli University, Ekpoma, Nigeria.Irrua Specialist Teaching Hospital, Irrua, Nigeria.  | 1               | 10    |
| Becker-Ziaja, B. | Bernhard Nocht Institute for Tropical Medicine, Hamburg, Germany, German Centre for Infection Research, Partner site, Hamburg, Germany  | 0               | 10    |
| Odia, I.         | Institute of Lassa Fever Research and Control, Irrua Specialist Teaching Hospital, Irrua, Nigeria   | 0               | 9     |
| Grant, D.S.      | Viral Hemorrhagic Fever Program, Kenema. Government Hospital Sierra, Kenema, Sierra Leone. Ministry of Health and Sanitation, Freetown, Sierra Leone.   | 0               | 8     |
| Sabeti, P.C.     | Broad Institute of MIT and Harvard, Cambridge, MA, United States. Harvard University, Cambridge, MA, United States. Harvard University, Boston, MA, United States. Howard Hughes Medical Institute, Chevy Chase, MD, United States. | 0               | 8     |

Table 1:- Most Productive LassaFever Research Authors

**B. Most Productive Lassa Fever Research Institutions in Nigeria**

Part of the second objective seeks to determine the most productive research institutions of Lassa fever documents. The refined data extracted for this study shows that 160 institutions have contributed to Lassa fever research. The Top nine (9) Nigerian institution are been shown in Figure 3; the institution with the highest number of affiliations with Lassa fever publication is Irrua Specialist Teaching Hospital, Irrua, with 22 documents, followed by University of Ibadan with 20 documents, Redeemer’s University with 11 document and so on.

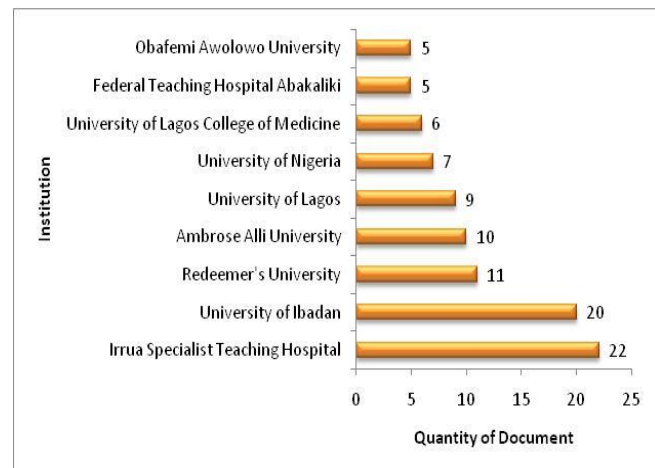


Fig 3:- Most Productive Lassa Fever Research Institutions in Nigeria

**❖ International Collaborations**

According to the purpose of the third objective which is to evaluate collaboration between Nigeria and other countries on Lassa fever research; out of the 26 countries that had collaborated with Nigeria, top 8 countries that are affiliated the most with Lassa fever research documents are shown in Figure 4. United states worked the most with Nigeria on Lassa fever (25 affiliations), followed by Germany, Sierra Leone, Japan, United Kingdom, Belgium, France and Liberia. Argentina, Brazil, Cameroon, Canada, Congo, Ghana, Guinea, Honduras, Italy, Malaysia, Nicaragua, Portugal, Singapore, South Africa, Spain, Switzerland, Thailand and Uganda all have a single affiliation with Nigeria on Lassa fever research.

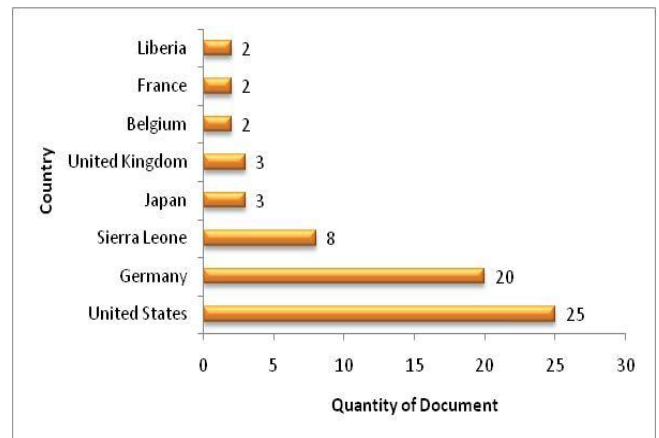


Fig 4:- Active International Collaborations

❖ *Leading Source Title and Source Type*

This section discusses the result of leading source title, subject area and the most used keywords in Lassa fever publication.

A. *Leading Source Title*

The top three source titles where Lassa fever research documents have been published in Nigeria are Emerging Infectious Diseases, Plos Neglected Tropical Diseases and Transactions of the Royal Society of Tropical Medicine and Hygiene with 3, 6 and 9 documents respectively. Every other source title (61 of them) have either 1 or 2 documents indexed in them (Table 2).

| Source Title   | Quantity of Document |
|--|----------------------|
| Transactions Of The Royal Society Of Tropical Medicine And Hygiene | 9                    |
| Plos Neglected Tropical Diseases                                   | 6                    |
| Emerging Infectious Diseases                                       | 3                    |

Table 2:- Leading Source Title

B. *Most Used Keywords in Lassa Fever Research*

The most published research on Lassa fever in Nigeria was done under Medicine (Figure 5). The most used keyword. The top four (4) most used keywords in the Lassa fever research in Nigeria are Lassa fever, human, Nigeria and Lassa virus (Figure 6).

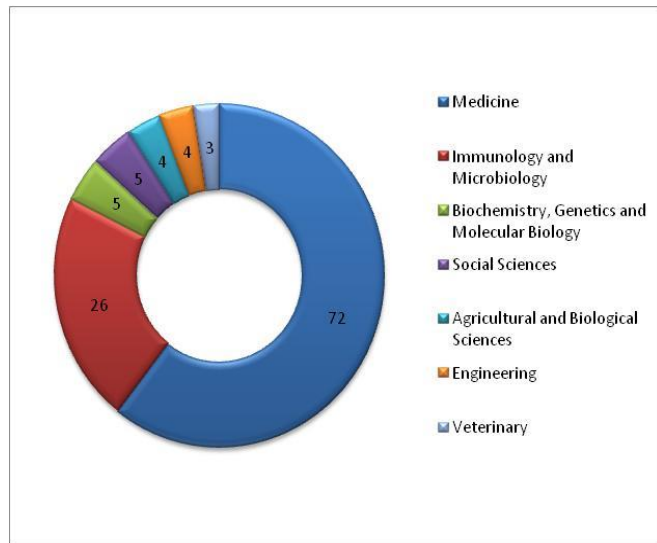


Fig 5:- Common Subject area for Publishing Lassa Fever Documents

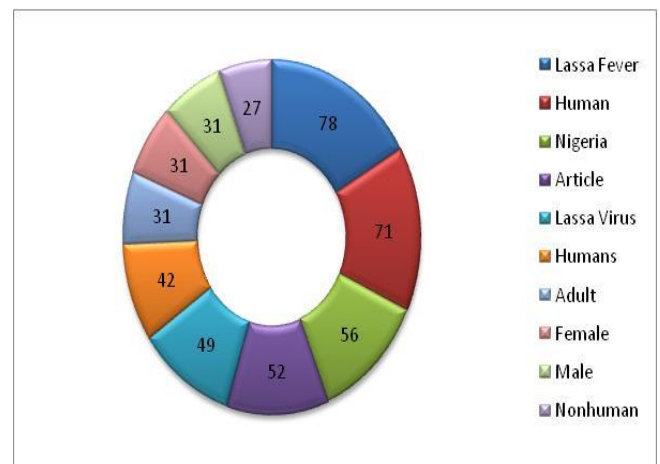


Fig 6:- Most Used keywords in Lassa Fever Research

❖ *Citation Analysis*

This section discusses the result of top twelve most cited Lassa fever documents and the citation spread by year and by document type affiliated with Nigeria.

A. *Top Ten Most Cited Lassa Fever Research Documents*

The result of the analysis on the top twelve most cited documents is shown in Table 4 and it can be observed that the top two (2) most cited documents are the articles titled “Review of cases of nosocomial Lassa fever in Nigeria: The high price of poor medical practice” by (Fisher-Hoch et. al., 1995) which had a total of 184 citations and “Lassa fever Epidemiological aspects of the 1970 epidemic, Jos, Nigeria” by (Carey et. al., 1972) which had a total of 107 citation. The third is a review by (Ogbu et. al.,2007)titled “Lassa fever in West African sub-region: An overview” with 98citations,the other documents in Table (4)are articles.

| Authors                     | Title   | Cited by |
|-----------------------------|---|----------|
| (Fisher-Hoch et. al., 1995) | Review of cases of nosocomial Lassa fever in Nigeria: The high price of poor medical practice     | wen184   |
| (Carey et. al., 1972)       | Lassa fever Epidemiological aspects of the 1970 epidemic, Jos, Nigeria                            | 107      |
| (Ogbu et. al.,2007)         | Lassa fever in West African sub-region: An overview   | 98       |
| (Andersen et. al., 2015)    | Clinical Sequencing Uncovers Origins and Evolution of Lassa Virus                                 | 70       |
| (Vieth et. al., 2007)       | RT-PCR assay for detection of Lassa virus and related Old World arenaviruses targeting the L gene | 66       |
| (Shaffer et. al., 2014)     | Lassa Fever in Post-Conflict Sierra Leone   | 59       |
| (Andersen et. al., 2012)    | Genome-wide scans provide evidence for positive selection of genes implicated in Lassa fever      | 55       |
| (Gunther et. al., 2001)     | Lassa fever encephalopathy: Lassa virus in cerebrospinal fluid but not in serum                   | 48       |
| (Edington and White, 1972)  | The pathology of Lassa fever. A tribute to the late Dr. J.M. Troup                                | 48       |
| (White et. al., 1972)       | Lassa fever A study of 23 hospital cases  | 47       |

Table 4:- Top Ten Most Cited Lassa Fever Research Documents

**B. Citation Spread by Year and Document Type from 2011-2018**

The citation of Lassa fever document can be said to have been fluctuating and decreasing till date(Figure 6) with a total of 1351 citations over the years and 6 citations as at the point of this research for year 2019. The highest citation was recorded in 1972 and the most cited Lassa fever document-type is article with 1161of the 1351 total citations, followed by review with 122 citations.Letter, note and editorial were cited 55, 11 and 2 times respectively. Book chapter and conference papers have never been cited so far(Figure 7).

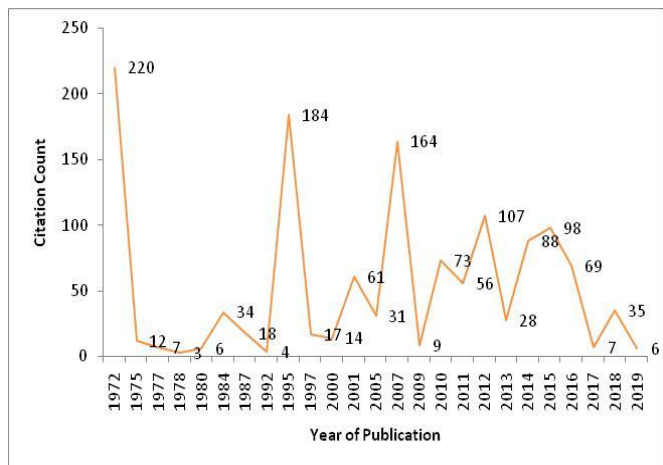


Fig 6:- Citation Spread from 2015-2018

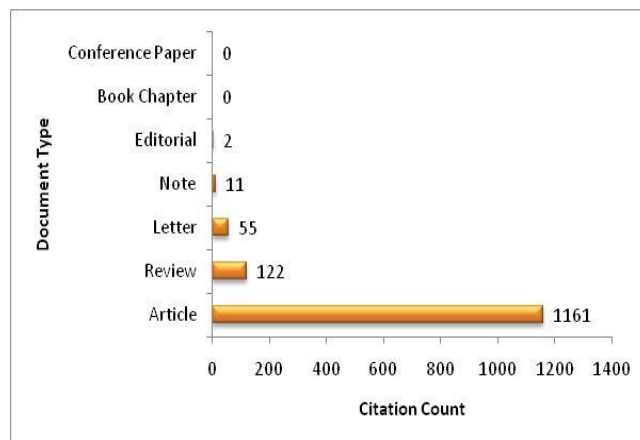


Fig 7:- Citation Spread by Document Type

**VI. CONCLUSION**

The data used for bibliometric studies in this paper was retrieved from SCOPUS, given appropriate search terms on the titles, keywords and abstract of the documents as corresponding to the aim of this study. The study shows publication distribution, authors, countries, sources and institutions affiliated with research activities on Lassa fever in Nigeria from its inception to the present point of this study, 2019. The fact that the results obtained in this study are limited to the SCOPUS, it should be noted that, there is likelihood that different set of results is obtainable if the corpus used in this study includes data retrieved from other electronic databases. However, based on the analysis performed in this study, research on Lassa fever is gaining more attention over the years till date, 2019. Although, the number of publication as at the point of this study, 2019, is less than 2018, there is a greater prospect for an increase in research outputs in the nearest future.

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