A Scientometric Analysis of Polio Literature during 2011 - 2015

R. Govindarajan
Librarian,
Aravind Eye Hospital & Postgraduate Institute of Ophthalmology, Madurai – 625 020, Tamil Nadu.
Research Scholar, Dept.of Library and Infor.Science
Gandhigram Rural Institute – Deemed University,
Gandhigram – 624 302, DindigulDt, Tamil Nadu.
govindarajanthamba@gmail.com

S. Dhanavandan
Assistant Librarian
Gandhigram Rural Institute – Deemed University
Gandhigram – 624 302, Dindigul Dt, Tamil Nadu.
dhanavandan@gmail.com

Abstract

This study is an attempt to investigate and analyze about the literature output on Polio during the period 2011-2015. The aim of the present study was to identify literature growth over the period, literature distribution by language, journal, and publication type and authorship pattern. The data was obtained from PubMed using the keywords "Polio". The scientific literature published during the period 2011 - 2015 was considered for the study. It was found that a totalof 2,118literature is published during the period 2011-2015 in the field Polio and 7,556 distinct authors contributed the literature in 18 languages in 688 journals in 13 publication types. Single authorship pattern had a higher percentage of literature than multiple authorship patterns and the overall total degree of collaboration is 0.82.

Keywords

Polio;Scientometric; Language Wise; Type of Article

Electronic access

The journal is available at www.jalis.in

Journal of Advances in Library and Information Science
ISSN: 2277-2219 Vol. 5. No.4. 2016. pp.342-347

Introduction

Polio is a highly infectious viral disease. It mainly affects young children. The virus is transmitted by person-to-person spread mainly through the fecal-oral route. It is also transmitted less frequently, by a common vehicle like contaminated water or food. Then it multiplies in the intestine, from where it can invade the nervous system and can cause paralysis.Initial symptoms of polio include fever, fatigue, headache, vomiting, stiffness in the neck, and pain in the limbs. In a small proportion of cases, the disease causes paralysis, which is often permanent. There is no cure for polio and it can only be prevented by immunization. Heat and physical therapy is used to stimulate the muscles and antispasmodic drugs are given to relax the muscles. While this can improve mobility, it cannot reverse permanent polio paralysis. Polio can be prevented through immunization. Polio vaccine, given multiple times, almost always protects a child for life.

Review of Literature

A study by Glover, S. W. (2004) examined the bibliometric profile of Tropical Medicine and International Health journal by using the subjects of the articles published and the geographical distribution of the authors. He found that only 7 articles were published on Polio.A study by Zhang, L. (2009) investigated the polio literature between 1993 and 2007 in china and reported that there is a gradual increase in the literature. Most of the papers were published in chinese journal of vaccines and immunization, chinese journal of public health, chinese journal of epidemiology, etc. Dhanavandan (2014) is discussed about the published research articles and its citation from Universities in South Tamil Nadu. During period from 2009 to 2013, 377 articles were published which include, in the year 2009, 81 (21.49%) articles were published by three universities sand 45 citations were identified from Indian Citation Index. A study by Thimmaiah, B. N. (2016) analysed the Polio literature during the period 1999 to 2014. He described in the article that, to assess the "growth of knowledge", time is an absolute yardstick.He reported that mean relative growth of polio literature during the period 1999 to 2014 has an increasing trend.

OBJECTIVES

1. To identify year wise literature growth of polio literature

2. To elucidate about the different languages of publications in the polio literature
3. To find outjournal wise distribution of the polio literature
4. To examine the different type of publications in the polio literature
5. To identify the authorship pattern in the literature output
6. To find the degree of collaboration in the literature output
7. To identify the popular Mesh/keyword used to index the literature

Materials and Methods

The data was obtained from PubMed using the keyword "Polio". The scientific literature published during the period 2011 - 2015 was considered for the study. A total of 2,118 records were downloaded in XML format from PubMed and converted in to excel using the tool PubMed2Xls. Further analysis was done using Ms-Access and MS-Excel.

Analysis and Interpretation

A total of 2,118published literature in the field of Polio during the period 2011 to 2015were retrieved from PubMed and analyzed. About 7,556distinctauthors were contributed to the literature in 18 languages in 688 journals and in 13 publication types.

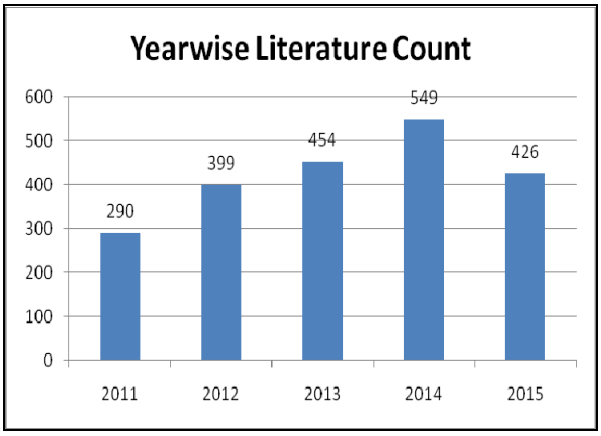


Fig.1. Year Wise Literature Output

Actually time is the strict yardstick to measure the growth of the literature. The no. of literature published in the years 2011, 2012, 2013, 2014, 2015 are 290, 399, 454, 549, 426 respectively. In the year 2014, the literature growth is higher when compared tothe other years. This indicates that the major research workswere happened around that year. Among the total literature 2118, the year 2011 holds 13.7%, 2012 holds 18.8%, 2013 holds 21.4%, 2014 holds 25.9%, 2015 holds 20.1% of the total literature output. The following chart shows up the year wise distribution of the polio literature.

Language wise Distribution

The following table indicates the language wise literature output in the Polio during the period 2011 and 2015. Among the total 2,118 literature, 91.6% of the literature was published in the language English only. The total number of literature published in languages other than English is 177 and it is around 8.4% of the total literature.

To elucidate about the literature contribution in languages other than English, the data is divided into two categories

- Category "A": Literature published in all languages
- Category "B": Literature published in languages other than English

Category "A" holds a total of 2118 literature and Category "B" holds a total of 177 literature. The % of contribution in each category is calculated and tabulated. The formulae used are:

*% of litearture * = Number of literature/ 2118*

*% of Literature in other languages ** = Number of literature / 177*

French is in the second rank which holds 1.9% of literature in the Category "A" and it also holds the first rankin Category "B". It contributed around 22.6% of literature in Category "B".The languages Spanish, Russian, Chinese also hold a good number of literature contributions in Category "B"

Table 1: Language wise Distribution

Language	Number of literature	% of literature *	% of literature in other languages **
English	1941	91.6	
French	40	1.9	22.6
Spanish	37	1.7	20.9
Russian	27	1.3	15.3
Chinese	22	1.0	12.4
German	14	0.7	7.9
Japanese	9	0.4	5.1

Portuguese	5	0.2	2.8
Swedish	4	0.2	2.3
Polish	4	0.2	2.3
Croatian	3	0.1	1.7
Dutch	3	0.1	1.7
Hebrew	2	0.1	1.1
Danish	2	0.1	1.1
Italian	2	0.1	1.1
Bulgarian	1	0.0	0.6
Turkish	1	0.0	0.6
Czech	1	0.0	0.6
Total	2118		

Literature distribution published in the Top 20 Journals

The research which is not published is of no use. The journals are the actual gateways between the researcher and the common human.The Polio literature waspublished in 688 different journals and shows up a smooth even pattern of journal distribution rather than a journal centric pattern.

To find out the literature published in the journals, we ranked each journal with the number of literature it holds and listed the top 20 journals in the following table. The top 20 journals holds a total 786 literature and it is around 37.1% of the total literature. We also calculated the % of literature each journal holds by the following formula.

% = No.of literature / 786

The journal Vaccine holds the first rankby publishing highest number of polio literature. A total of 7.7% literature was published inthe journal Vaccine.

Table 2: Literature distribution published in the Top 20 Journals

S.no	Journal	No. of literature	%
1	Vaccine	164	7.7
2	The Journal of infectious diseases	90	4.2
3	Releve´ e´pide´miologiquehebdomadaire / Section d'hygie`ne du Secre´tariat de la Socie´te´ des Nations = Weekly epidemiological record / Health Section of the Secretariat of the League of Nations	83	3.9
4	PloS one	52	2.5
5	Lancet (London, England)	50	2.4
6	MMWR. Morbidity and mortality weekly report	47	2.2
7	BMJ (Clinical research ed.)	33	1.6
8	Human vaccines &immunotherapeutics	31	1.5
9	Journal of virology	30	1.4
10	The Lancet. Infectious diseases	30	1.4
11	The Pediatric infectious disease journal	22	1.0
12	BMC public health	21	1.0
13	Science (New York, N.Y.)	19	0.9
14	Euro surveillance : bulletin Europe´ensur les maladies transmissibles = European communicable disease bulletin	18	0.8
15	BMC infectious diseases	17	0.8
16	Zhurnalmikrobiologii, epidemiologii, i immunobiologii	17	0.8
17	Expert review of vaccines	16	0.8
18	Journal of medical virology	16	0.8
19	Nature	15	0.7
20	The Pan African medical journal	15	0.7
	Total	786	37.1

Distribution of Publication type

To know about the different types of literature published gives more insights about the research work happened in the field. The publication types can be categorized into

- Primary literature
- Secondary literature

The primary literature refers the original scientific research which is mostly in the forms of journal articles, clinical trials, randomized clinical trials. The secondary literaturewill be mostly in the forms of reviews, letters, comments, etc. The purpose of the secondary literature is to give more insights about the primary literature and compile / organize the primary literature to a better presentable and understandable format.

To find out the original scientific research contribution in the polio literature, the data is further

analyzed by publication type and % of each publication type it holds in the total literature is calculated and tabulated as below. The publication type analysis indicated that a good number of scientific research work was happened around the period 2011 –2015. Among the total literature, 72.4% is in the form ofArticle type, 2.9% is in the form of clinical trials and 1.9% is in the form of randomized clinical trials. This shows up a significant growth in primary literature in the field polio during the period 2011-2015.

Table 3: Distribution of Publication type

S.no	Publication type	Count	%
1	Article	1534	72.4
2	Biography	31	1.5
3	Case Report	98	4.6
4	Clinical Trial	61	2.9
5	Comment	69	3.3
6	Congress	7	0.3
7	Editorial	46	2.2
8	Erratum	2	0.1
9	Interview	7	0.3
10	Letter	41	1.9
11	News	72	3.4
12	Randomized Controlled Trial	41	1.9
13	Review	109	5.1
	Total	2118	

Authorship pattern

Authorship trend and collaborative research are important facets of scientometric studies. Collaboration in research is said to have taken place when two or more researchers work together on a scientific problem and it is the most common necessity of any scientific work.

The polio literature is analyzed to find out the authorship pattern and collaboration. The author data is available for the 1978 literature and author data is not available for the 140 literature. The literature with author data is considered for the analysis. The following table shows up the year wise trend in the authorship pattern and % of each authorship pattern. From the analyses, we found out that most of the literature is produced through the single authorship pattern.

Table 4: Authorship pattern

Sno.	Authorship pattern	2011	2012	2013	2014	2015	Total	%
1	Single Author	45	64	91	82	58	340	17.2
2	Two Authors	37	61	56	62	55	271	13.7
3	Three Authors	28	39	41	55	43	206	10.4
4	Four Authors	24	40	43	51	37	195	9.9
5	Five Authors	23	30	42	48	49	192	9.7
6	Six Authors	30	34	37	38	44	183	9.3
7	Seven Authors	17	26	30	26	23	122	6.2
8	Eight Authors	11	16	17	42	17	103	5.2
9	Nine Authors	11	20	12	28	10	81	4.1
10	Ten and above Authors	33	39	56	86	71	285	14.4
	Total	259	369	425	518	407	1978	

The % of each authorship pattern over the years is shown as a bar chart to visualize the authorship pattern clearly. The chart shows up clearly that ten& above authors pattern and Two authorship pattern are more or less close to the Single authorship pattern.

Degree of Collaboration

It was clear from the authorship pattern analysis that single-authored papers are greater than that of multi-authored papers. To determine it clearly in quantitative terms, the total number of literature

produced by the single authors and multiple authors over the years is tabulated as below and Degree of collaboration is calculated for each year using K.Subramanyam formula.

K.Subramanyam's Degree of Collaboration formula C=Nm/Nm+Ns.

The year wise trend shows up the collaboration patternduring the year 2011 to 2015. The year 2015 holds the highest degree of collaboration and the year 2013 holds the least degree of collaboration.

Table 5: Degree of Collaboration

Year	Single Author (Ns)	Multiple Authors (Nm)	Degree of Collaboration =Nm/(Nm+Ns)
2011	45	214	0.826255
2012	64	305	0.826558
2013	91	334	0.785882
2014	82	436	0.841699
2015	58	349	0.857494
Total	340	1638	0.828109

To find out the overall degree of collaboration during the period 2011-2015, again the K.Subramanyam formula is applied on the single author total (340) and multiple author total (1638)

$$C = \frac{1638}{1638+340} = 0.82$$

The formula reveals that total degree of collaboration is 0.82 in the polio literature during the period 2011-2015.

Popular MeSHterms/Keywords Ranking List in each year

Keywords are used to arrange the literature and aid to retrieve the literature. The right keywords target the right literature. MeSH (Medical Subject Headings) is a distinctive feature of MEDLINE database and it is the National Library of Medicine (NLM) controlled vocabulary which used to arrange the literature in a hierarchical manner for easy retrieval. Actually the MeSH terms / Keywords which is used to index the literature determine how effectively the literature can reach to the common.

We analyzed the polio literature in this perspective how well the literature is arranged / indexed during the period 2011-2015 through a frequency analysis. The more number of MeSH/Keywords used to index the literature meant that more it can be reached.

The distinct MeSH/Keywords found in the literature were 2,695 and they all appeared 35,899 times in the total literature. All the MeSH/keywords were ranked by calculating the total occurrence in the literature for each year and the top 10 MeSH/Keywords were tabulated as below. The table also shows up the occurrence of MeSH/Keywords within brackets.

The year wise trend shows up that in the year 2011, the MeSH/Keyword "Humans" is used to index 269 literature. In the year 2012, "immunology" is used to index 375 literature. In the year 2013, "Humans" is used to index 401 literature. In the year, "epidemiology" is used to index 487 literature. In the year 2015, again "epidemiology" is used to index 310 literature. This analyses also reveals that the MeSH/Keyword "epidemiology" is used to index most of the literature during the period 2014 to 2015.

Table 6: Top 10 Popular MeSHterms/Keywords Ranking List in each year

S.no	2011	2012	2013	2014	2015
1	Humans (269)	immunology (375)	Humans (401)	epidemiology (487)	epidemiology (310)
2	epidemiology (257)	Humans (364)	epidemiology (351)	Humans (477)	Humans (298)
3	immunology (236)	epidemiology (335)	prevention & control (304)	immunology (376)	immunology (278)
4	prevention & control (176)	prevention & control (255)	immunology (259)	prevention & control (334)	prevention & control (202)

5	administration & dosage (166)	administration & dosage (218)	Poliomyelitis (241)	Poliomyelitis (298)	administration & dosage (171)
6	Poliomyelitis (136)	Poliomyelitis (216)	administration & dosage (201)	administration & dosage (238)	Poliomyelitis (164)
7	adverse effects (121)	virology (155)	Female (161)	Female (200)	Female (121)
8	genetics (104)	Male (141)	Male (157)	Male (183)	Male (116)
9	Virology (102)	Female (136)	virology (135)	virology (178)	virology (90)
10	Female (97)	adverse effects (133)	genetics (133)	genetics (165)	Infant (86)

Popular MeSH terms/Keywords Ranking List during the year 2011-2015

To determine the most common MeSH/keywords used throughout the period 2011-2015 in the polio literature, each MeSH/keywords occurrence is find out and ranked. The following table shows ups the Top 10 MeSH/keywords.

Table 7: Top 10 Popular MeSH terms/Keywords Ranking List during the year 2011-2015

S.no	MeSH/keyword	Occurrence	%
1	Humans	1,809	5.0
2	Female	715	2.0
3	Male	689	1.9
4	Infant	493	1.4
5	Child, Preschool	409	1.1
6	Child	381	1.1
7	Adult	290	0.8
8	Adolescent	283	0.8
9	Middle Aged	237	0.7
10	Poliomyelitis/prevention & control	212	0.6
	Total	5,518	15.4

And these top 10 MeSH/keywords are repeated 5,518times throughout the period which is about 15.4% of the totalMeSH/keywords used to index the polio literature during the period 2011-2015. The MeSH/keyword “Humans” holds the first rank and used very frequently in the literature.

Conclusion

The results of the study revealed that total Published papers had a significant growth over the period and particularly in the primary literature. It was found that a total of 2,118literature were published during the period 2011-2015 in the field of Polio. About 7,556 distinct authors were contributed to the literature in 18 languages in 688 journals and in 13 publication types. Single authorship is the popular authorship pattern and 0.82 is the overall degree of collaboration of the polio literature which is considered.“Humans”is the popular MESH/Keyword.In conclusion, these results can give an idea tothe researchers, to understand about the current scientific literature produced and identify the gaps in the field polio for further research opportunities

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