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A Bibliometric Analysis on Polio Research Productivity

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Abstract - **Presents a bibliometric analysis of the literature in the discipline of Polio as listed the MEDLINE data which covered in the PubMed for the length 1990-2019.It is found that a total of 18956 records are within the MEDLINE database which covered by PubMed on 'Polio '. Maximum number of 1683 records was published during the year 2019, followed by 1672 records in the year 2017 and 1587 records in the year 2018. It became discovered that 76.54% of records are journal articles, followed by Review 12.49%, Editorial 2.60%, Letter 2.44%, Case Report 2.38%, News 2.22%,Comment 1.21%, Published Erratum 0.11%, and Published Retraction 0.01% are included in this look at. Relative Growth Rate (RGR) has been reducing from the year 1991 to 2019 but in a fluctuation trend. On the other hand, the Doubling Time (Dt) has shown an increasing trend, but it is also in a fluctuation of records throughout the examine period. A total of 240 journals were identified as core journals in the subject of Polio literature. The ratio of single and multiple authors publications is 1:6 found within the discipline of Polio literature. The meager percent i.e. 2.02% of records represent nameless authorship. The average Degree of Collaboration arrived at 0.86. It shows that multi-authored papers dominated within the field of Polio literature.**
Keywords: **Polio, Relative Growth Rate (RGR), Doubling time (Dt), Bradford Law and Degree of Collaboration**

I. INTRODUCTION

Bibliometrics is a branch of study in Library and Information Science and lots of studies is being carried out for a statistical study of the numerous aspects of literature of a given subject. The aim of this paper is to take a look at the growth of literature, to identify the core journals and to study the authorship pattern in the field of Polio literature.
Poliomyelitis commonly shortened to polio is an infectious disease caused by the poliovirus. In about 0.5 percent of cases it moves from the gut to affect the central nervous system and there is muscle weakness resulting in a flaccid paralysis [1].

There are some of records that are being published within the field of Polio. In those situations, it is required to take a look at quantitatively the output of literature via making use of bibliometric strategies i.e. Relative Growth Rate (RGR), Doubling time (Dt), Bradford Law and Degree of Collaboration. It helps to take a look at the growth rate, to identify the essential journals and authorship pattern of literature in the discipline of Polio.

II. REVIEW OF LITERATURE

The obvious feature of science in current years has been its rate of growth. Growth studies in different areas studied by Baker [2] in chemistry, Conard [3] in biology, May [4] and Lamb [5] in mathematics, Sengupta in microbiology [6], physiology [7], biochemistry [8] and Ramesh Babu and Ramakrishnan in Hepatitis [9].

There are number of research on mapping and Bradford law in health sciences. Schloman [10] studied mapping the literature of allied health. Kundra [11] studied the behaviour of Bradford's Law towards citation data on Indian Medical Journal. Ramesh Babu and Ramakrishnan [12] studied on Indian Contributions to the field of Hepatitis. Lewin [13] studied on Diabetes mellitus publication patterns from 1984-2005. Krishnamoorthy, Ramakrishnan and Devi [14] studied the bibliometric Analysis of literature on diabetes (1995-2004); the aim of the study was to identify the core journals and the growth rate in the field of diabetes.

Huge numbers of research also are carried out to investigate the author collaboration output of contributions. Macias-Chapula analyzed the patterns of the growth in AIDS literature [15]. Hartinah *et al.*, [16] studied on nutrition problems in Indonesia, and discussed the authorship pattern. Divya Srivastava [17] studied the concept of collaboration and the technique accompanied in studying research collaboration in the field of Biomedical Sciences in India.

III. OBJECTIVES OF THE STUDY

The objectives of this study are
1. To study the growth of literature on Polio.
2. To become aware of the core journals in the area of Polio literature.
3. To observe the level of authorship pattern in Polio literature.

IV. METHODOLOGY

The records published during the year 1990 to 2019within the discipline of Polio literature in the MEDLINE data which can be covered in the PubMed was searched and bibliographic details like author, title, publication type, language, year, address, country, source etc. have been accumulated. The saved records had been loaded in SPSS

for the reason of this take a look at. The records became analyzed in terms of growth rate, core journals and also to study the authorship pattern in the subject of Polio literature.

In order to determine the growth rate, the bibliometric strategies like Relative Growth Rate (RGR) [18-19] and Doubling time (Dt) [20] were used. Bradford [21] Law used to study the core journals in field of Polio. Degree of Collaboration (DC) [22] used to study the single and multi-authored papers of literature in the subject of Polio. The keyword 'Polio' has been used for extracting the number of records available within the above said database.

V. QUANTUM OF POLIO RESEARCH PRODUCTIVITY

The research productivity on 'Polio' covered in the database is shown in Table I. It is found that overall of 18956 records are included in the field of Polio literature. The year-wise distribution of literature on 'Polio' according to source database MEDLINE, it is found that the maximum number of records (1683) was published during the year 2019, followed by 1672 records in the year 2017 and 1587 records in the year 2018. On the whole, it is noticed that there are fluctuation of records of Polio research productivity.

TABLE I QUANTUM OF LITERATURE PUBLISHED ON POLIO

Sl. No.	Years	Records on Polio	Percentage	Cumulative Percent
1	1990	166	0.88	0.88
2	1991	180	0.95	1.83
3	1992	225	1.19	3.01
4	1993	209	1.10	4.11
5	1994	193	1.02	5.13
6	1995	223	1.18	6.31
7	1996	218	1.15	7.46
8	1997	295	1.56	9.02
9	1998	236	1.24	10.26
10	1999	275	1.45	11.71
11	2000	327	1.73	13.44
12	2001	264	1.39	14.83
13	2002	261	1.38	16.21
14	2003	300	1.58	17.79
15	2004	376	1.98	19.77
16	2005	330	1.74	21.51
17	2006	334	1.76	23.27
18	2007	443	2.34	25.61
19	2008	540	2.85	28.46
20	2009	600	3.17	31.63
21	2010	711	3.75	35.38
22	2011	837	4.42	39.79
23	2012	979	5.16	44.96
24	2013	1221	6.44	51.40
25	2014	1363	7.19	58.59
26	2015	1380	7.28	65.87
27	2016	1528	8.06	73.93
28	2017	1672	8.82	82.75
29	2018	1587	8.37	91.12
30	2019	1683	8.88	100.00
Total		18956	100.00	

VI. PUBLICATION TYPES OF DISTRIBUTION ON POLIO RESEARCH

Table II reveals the distribution of the 'Polio' studies output according to various publication types of MEDLINE. It was found that 76.54% are journal articles, Review 12.49%, Editorial 2.60%, Letter 2.44%, Case Report 2.38%, News 2.22%, Comment 1.21%, Published Erratum 0.11%, and Published Retraction 0.01% are protected in this take a look at.

TABLE II PUBLICATION TYPES OF DISTRIBUTION ON POLIO RESEARCH

Publication Type	Total	%	Cumulative %
Journal Article	14509	76.54	76.54
Review	2367	12.49	89.03
Editorial	493	2.60	91.63
Letter	462	2.44	94.07
Case Report	452	2.38	96.45
News	421	2.22	98.67
Comment	230	1.21	99.88
Published Erratum	20	0.11	99.99
Published Retraction	2	0.01	100.00
Total	18956	100.00	

VII. GROWTH RATE OF THE LITERARY OUTPUT ON POLIO

The analysis of data on the literary output on Polio has been executed with parameters such as Relative Growth Rate (RGR) and Doubling Time (Dt). It is seen from Table III and Fig. 1 that RGR has been reducing from 1991 (0.74) to 2019 (0.09) however fluctuation trend in the course of the study period. On the other hand, the Doubling Time (Dt) has proven an growing, but it also in fluctuation trend throughout the study period. The data in Table III reveals that Doubling time has increased from 0.94 in the year 1991 to 7.71 in the year 2019 but in the fluctuation trend (Fig. 2).

TABLE III RGR AND DT FOR POLIO RESEARCH OUTPUT BY YEAR-WISE

Sl. No.	Year	No. of Output	Cumulative No. of Output	W_1	W_2	$1 - 2^{\overline{R}(aa^{-1}\ year^{-1})}$ RGR	Dt(a)
1	1990	166	166		5.11		
2	1991	180	346	5.11	5.85	0.74	0.94
3	1992	225	571	5.85	6.35	0.50	1.39
4	1993	209	780	6.35	6.66	0.31	2.24
5	1994	193	973	6.66	6.88	0.22	3.14
6	1995	223	1196	6.88	7.09	0.21	3.35
7	1996	218	1414	7.09	7.25	0.16	4.22
8	1997	295	1709	7.25	7.44	0.19	3.58
9	1998	236	1945	7.44	7.57	0.13	5.21
10	1999	275	2220	7.57	7.71	0.14	5.12
11	2000	327	2547	7.71	7.84	0.13	5.22
12	2001	264	2811	7.84	7.94	0.10	6.84
13	2002	261	3072	7.94	8.03	0.09	7.69
14	2003	300	3372	8.03	8.12	0.09	7.43
15	2004	376	3748	8.12	8.23	0.11	6.36
16	2005	330	4078	8.23	8.31	0.08	8.31
17	2006	334	4412	8.31	8.39	0.08	8.44
18	2007	443	4855	8.39	8.49	0.10	7.09
19	2008	540	5395	8.49	8.59	0.10	6.71
20	2009	600	5995	8.59	8.70	0.11	6.38

21	2010	711	6706	8.7	8.81	0.11	6.26
22	2011	837	7543	8.81	8.93	0.12	5.85
23	2012	979	8522	8.93	9.05	0.12	5.76
24	2013	1221	9743	9.05	9.18	0.13	5.16
25	2014	1363	11106	9.18	9.32	0.14	5.12
26	2015	1380	12486	9.32	9.43	0.11	6.17
27	2016	1528	14014	9.43	9.55	0.12	5.88
28	2017	1672	15686	9.55	9.66	0.11	6.27
29	2018	1587	17273	9.66	9.76	0.10	7.15
30	2019	1683	18956	9.76	9.85	0.09	7.71

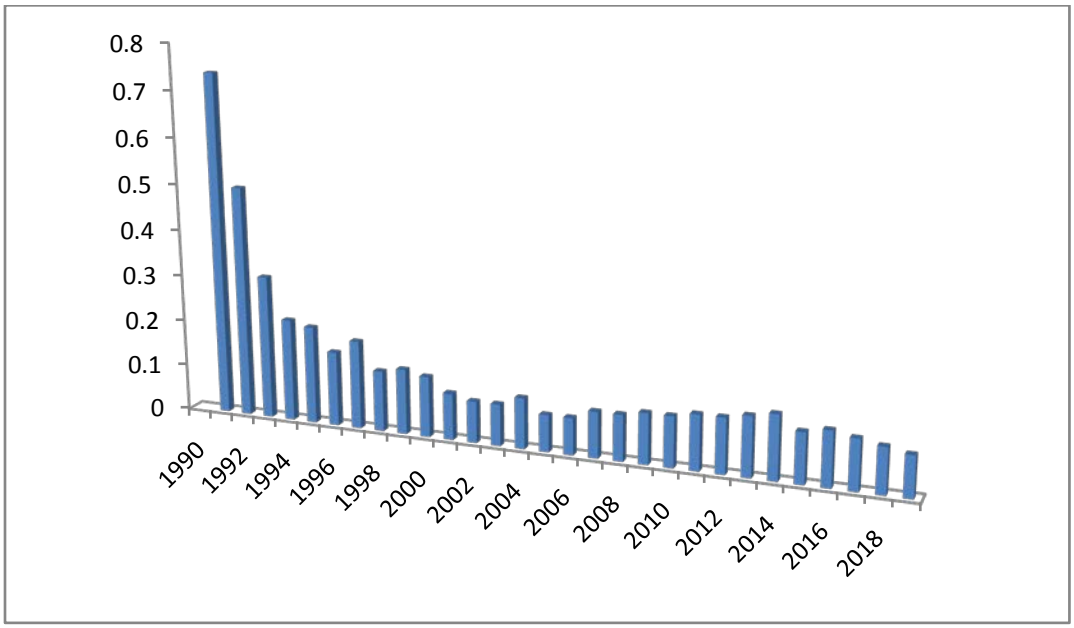

Fig. 1 Relative Growth Rate for Research Output in Polio

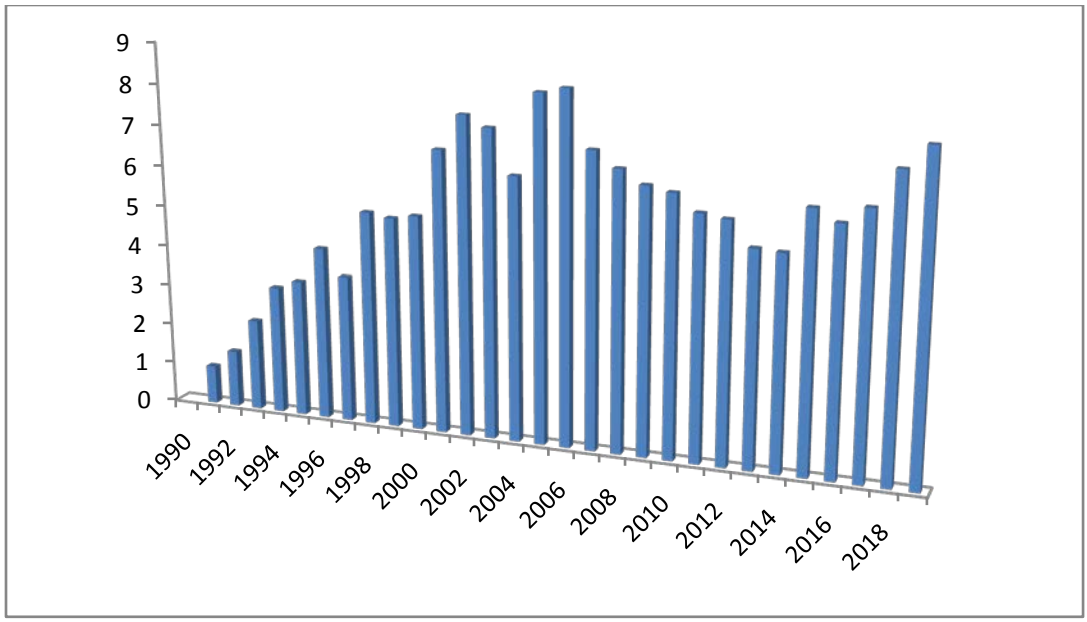

Fig. 2 Doubling time for Research output in Polio

VIII. DISTRIBUTION OF JOURNALS ON POLIO BASED ON BRADFORD LAW

As per the Bradford Law, the journals are grouped into three zones producing similar number of records. The journals by zone-wise is presented in the Table IV. It is seen from Table IV that 22 journals grouped in zone-1 published 4874 journal articles accounting for one third of the overall output. In addition the second one quarter contains of 218 journals published 4973 journal articles and 2404 journals published 4662 journal articles grouped in third zone. A total of 240 Journals have been covered in the Zone-1 and Zone-2 turned into identified as core journals within the area of Polio literature.

TABLE IV DISTRIBUTION BY ZONE OF CITED JOURNALS AND REFERENCES IN POLIO

Zone	No. of Journals		No. of Journal Articles		Cumulative No. of Journal Articles
	No.	%	No.	%	
Zone-1	22	0.83	4874	33.59	4874
Zone-2	218	8.25	4973	34.28	9847
Zone-3	2404	90.92	4662	32.13	14509
Total	2644	100.00	14509	100.00	

IX. RANKING OF JOURNALS ON POLIO RESEARCH

Ranking of the journals based on the studies output on 'Polio' for the year 1990-2019 is given in Table V. The highly useful journals which present in the Zone-1 and Zone-2 of Bradford Law of Scattering are presented below.

TABLE V RANKING OF JOURNALS IN POLIO RESEARCH

Sl. No.	Name of the Journal	No. of Records	%
1	PLoS ONE	810	5.58
2	Journal of Virology	777	5.36
3	BMC Public Health	297	2.05
4	Human Vaccines & Immunotherapeutics	277	1.91
5	Vaccine	274	1.89
6	Bulletin of the World Health Organization	251	1.73
7	BMJ : British Medical Journal	210	1.45
8	Proceedings of the National Academy of Sciences of the United States of America	189	1.30
9	Scientific Reports	179	1.23
10	Emerging Infectious Diseases	172	1.19
11	Journal of Clinical Microbiology	154	1.06
12	American Journal of Public Health	145	1.00
13	BMC Infectious Diseases	144	0.99
14	The Journal of Infectious Diseases	135	0.93
15	The Pan African Medical Journal	112	0.77
16	Archives of Disease in Childhood	110	0.76
17	Journal of Neurology, Neurosurgery, and Psychiatry	110	0.76
18	PLoS Neglected Tropical Diseases	110	0.76
19	PLoS Pathogens	107	0.74
20	The American Journal of Tropical Medicine and Hygiene	106	0.73
21	Virology Journal	104	0.72
22	BMJ Open	101	0.70
23	Public Health Reports	99	0.68
24	Epidemiology and Infection	91	0.63
25	Applied and Environmental Microbiology	81	0.56

26	BMC Health Services Research	76	0.52
27	Clinical Infectious Diseases	74	0.51
28	Paediatrics& Child Health	71	0.49
29	Malaria Journal	67	0.46
30	Infection and Immunity	66	0.45
31	Clinical and Vaccine Immunology : CVI	63	0.43
32	International Journal of Environmental Research and Public Health	62	0.43
33	Virology	62	0.43
34	Viruses	62	0.43
35	Clinical Orthopaedics and Related Research	60	0.41
36	MMWR. Morbidity and Mortality Weekly Report	59	0.41
37	Nucleic Acids Research	59	0.41
38	The Cochrane Database of Systematic Reviews	57	0.39
39	Frontiers in Immunology	56	0.39
40	PLoS Medicine	54	0.37
41	Clinical and Experimental Immunology	52	0.36
42	Western Journal of Medicine	51	0.35
43	Clinical Microbiology Reviews	50	0.34
44	Eurosurveillance	50	0.34
45	CMAJ: Canadian Medical Association Journal	48	0.33
46	Journal of the Royal Society of Medicine	47	0.32
47	BMC Research Notes	44	0.30
48	The Journal of Biological Chemistry	43	0.30
49	BMC Pediatrics	42	0.29
50	British Journal of Cancer	41	0.28
51	Journal of Epidemiology and Community Health	41	0.28
52	Lancet (London, England)	41	0.28
53	Medical History	40	0.28
54	Antimicrobial Agents and Chemotherapy	39	0.27
55	Environmental Health Perspectives	38	0.26
56	Canada Communicable Disease Report	36	0.25
57	BMJ Global Health	35	0.24
58	BioMed Research International	34	0.23
59	BMC International Health and Human Rights	34	0.23
60	Canadian Family Physician	34	0.23
61	The British Journal of General Practice	33	0.23
62	BMC Medicine	31	0.21
63	Indian Journal of Community Medicine	31	0.21
64	mBio	31	0.21
65	Global Health Action	30	0.21
66	CMAJ : Canadian Medical Association Journal	29	0.20
67	Nature Communications	29	0.20
68	EMBO Reports	28	0.19
69	International Orthopaedics	28	0.19
70	Journal of Health, Population, and Nutrition	28	0.19

71	Thorax	28	0.19
72	BMC Pregnancy and Childbirth	27	0.19
73	Clinical Medicine	27	0.19
74	Expert review of vaccines	27	0.19
75	Indian Journal of Orthopaedics	27	0.19
76	Morbidity and Mortality Weekly Report	27	0.19
77	RNA	27	0.19
78	European Spine Journal	26	0.18
79	Gut	26	0.18
80	Immunology	26	0.18
81	Medicine	26	0.18
82	PLoS Computational Biology	26	0.18
83	African Health Sciences	25	0.17
84	Clinical and Diagnostic Laboratory Immunology	25	0.17
85	Journal of Family Medicine and Primary Care	25	0.17
86	The BMJ	25	0.17
87	The EMBO Journal	24	0.17
88	Conflict and Health	23	0.16
89	Emerging Microbes & Infections	23	0.16
90	International Journal for Equity in Health	23	0.16
91	Philosophical Transactions of the Royal Society B: Biological Sciences	23	0.16
92	Proceedings (Baylor University. Medical Center)	23	0.16
93	The Journal of Experimental Medicine	23	0.16
94	Frontiers in Microbiology	22	0.15
95	Frontiers in Public Health	22	0.15
96	Globalization and Health	22	0.15
97	Journal of Clinical Investigation	22	0.15
98	The American Journal of Pathology	22	0.15
99	Transactions of the American Clinical and Climatological Association	22	0.15
100	Vaccines	22	0.15
101	Journal of the National Medical Association	21	0.14
102	Journal of the Royal Society Interface	21	0.14
103	Molecular and Cellular Biology	21	0.14
104	The Journal of Spinal Cord Medicine	21	0.14
105	Cytotechnology	20	0.14
106	Health Policy and Planning	20	0.14
107	Journal of immunology (Baltimore, Md.: 1950)	20	0.14
108	Journal of Urban Health : Bulletin of the New York Academy of Medicine	20	0.14
109	PLoS Biology	20	0.14
110	The Lancet. Infectious Diseases	20	0.14
111	Cell host & microbe	19	0.13
112	Journal of Medical Ethics	19	0.13
113	The Journal of infectious diseases	19	0.13
114	African Journal of Disability	18	0.12

115	Annals of the Rheumatic Diseases	18	0.12
116	Antiviral research	18	0.12
117	Health Services Research	18	0.12
118	Heliyon	18	0.12
119	Influenza and Other Respiratory Viruses	18	0.12
120	International Journal of Epidemiology	18	0.12
121	Journal of Clinical and Diagnostic Research: JCDR	18	0.12
122	Oncotarget	18	0.12
123	Postgraduate Medical Journal	18	0.12
124	The Canadian Journal of Infectious Diseases	18	0.12
125	Blood	17	0.12
126	Current opinion in virology	17	0.12
127	Health Research Policy and Systems	17	0.12
128	Human Resources for Health	17	0.12
129	Journal of Children's Orthopaedics	17	0.12
130	Medical Journal, Armed Forces India	17	0.12
131	Open Forum Infectious Diseases	17	0.12
132	Science (New York, N.Y.)	17	0.12
133	The Iowa Orthopaedic Journal	17	0.12
134	The Journal of General Virology	17	0.12
135	The Journal of Physiology	17	0.12
136	Trials	17	0.12
137	American Journal of Epidemiology	16	0.11
138	BMC Neurology	16	0.11
139	EBio Medicine	16	0.11
140	JMIR Public Health and Surveillance	16	0.11
141	The Canadian Journal of Infectious Diseases & Medical Microbiology	16	0.11
142	The Indian Journal of Medical Research	16	0.11
143	The Journal of Neuroscience	16	0.11
144	The Pediatric infectious disease journal	16	0.11
145	The Yale Journal of Biology and Medicine	16	0.11
146	Genome Announcements	15	0.10
147	International Journal of Health Geographics	15	0.10
148	Pediatrics	15	0.10
149	Protein Science : A Publication of the Protein Society	15	0.10
150	Revista Panamericana de Salud P+¦blica	15	0.10
151	Virus Evolution	15	0.10
152	Antiviral Research	14	0.10
153	eLife	14	0.10
154	Online Journal of Public Health Informatics	14	0.10
155	Proceedings of the Royal Society B: Biological Sciences	14	0.10
156	The Journal of Cell Biology	14	0.10
157	The Milbank Quarterly	14	0.10
158	The Ulster Medical Journal	14	0.10
159	Archives of Public Health	13	0.09

160	Biochemical Journal	13	0.09
161	Biochemistry	13	0.09
162	BMC Microbiology	13	0.09
163	Future virology	13	0.09
164	Health and Quality of Life Outcomes	13	0.09
165	Israel Journal of Health Policy Research	13	0.09
166	Journal of Acquired Immune Deficiency Syndromes (1999)	13	0.09
167	Journal of Medical Internet Research	13	0.09
168	Journal of Virological Methods	13	0.09
169	Lancet	13	0.09
170	PeerJ	13	0.09
171	The Journal of Clinical Investigation	13	0.09
172	The Lancet. Global Health	13	0.09
173	AIDS (London, England)	12	0.08
174	Evidence-based Complementary and Alternative Medicine: eCAM	12	0.08
175	Experimental and Therapeutic Medicine	12	0.08
176	Global Health: Science and Practice	12	0.08
177	International Journal of Molecular Sciences	12	0.08
178	Journal of Clinical Pathology	12	0.08
179	Journal of General Internal Medicine	12	0.08
180	Journal of Korean Medical Science	12	0.08
181	Maternal & Child Nutrition	12	0.08
182	Neurology	12	0.08
183	Occupational and Environmental Medicine	12	0.08
184	Pakistan Journal of Medical Sciences	12	0.08
185	Philosophical Transactions of the Royal Society of London. Series B	12	0.08
186	World Journal of Gastroenterology : WJG	12	0.08
187	BMC Musculoskeletal Disorders	11	0.08
188	Cell	11	0.08
189	F1000 Research	11	0.08
190	Immunity	11	0.08
191	International Journal of Health Policy and Management	11	0.08
192	International Journal of Preventive Medicine	11	0.08
193	Journal of Clinical Immunology	11	0.08
194	Journal of Immunological Sciences	11	0.08
195	Journal of Medical Genetics	11	0.08
196	Journal of molecular biology	11	0.08
197	Nature	11	0.08
198	Neuro-Oncology	11	0.08
199	Springer Plus	11	0.08
200	Strategies in Trauma and Limb Reconstruction	11	0.08
201	Western Pacific Surveillance and Response Journal: WPSAR	11	0.08
202	Advanced drug delivery reviews	10	0.07

203	AIDS Research and Human Retroviruses	10	0.07
204	American Journal of Human Genetics	10	0.07
205	Annals of Indian Academy of Neurology	10	0.07
206	Biology of blood and marrow transplantation	10	0.07
207	Biophysical Journal	10	0.07
208	British Journal of Sports Medicine	10	0.07
209	Critical Care	10	0.07
210	Emerging Themes in Epidemiology	10	0.07
211	Frontiers in Psychology	10	0.07
212	Infectious Diseases of Poverty	10	0.07
213	Iranian Journal of Microbiology	10	0.07
214	Journal of Bacteriology	10	0.07
215	Journal of Epidemiology and Global Health	10	0.07
216	Journal of Immunology Research	10	0.07
217	Molecules	10	0.07
218	Papillomavirus Research	10	0.07
219	Revista de Sa+¦de P+¦blica	10	0.07
220	Viral Immunology	10	0.07
221	Acta Orthopaedica	9	0.06
222	British Journal of Clinical Pharmacology	9	0.06
223	Bulletin of the New York Academy of Medicine	9	0.06
224	Current Opinion in Immunology	9	0.06
225	Frontiers in Cellular and Infection Microbiology	9	0.06
226	Frontiers in Pharmacology	9	0.06
227	Implementation Science : IS	9	0.06
228	Journal of Clinical Virology	9	0.06
229	Journal of Epidemiology	9	0.06
230	Journal of Global Infectious Diseases	9	0.06
231	Journal of Neuro Engineering and Rehabilitation	9	0.06
232	Journal of Preventive Medicine and Hygiene	9	0.06
233	Journal of the American Medical Informatics Association: JAMIA	9	0.06
234	Journal of the Pediatric Infectious Diseases Society	9	0.06
235	Parasites & Vectors	9	0.06
236	Social Science & Medicine (1982)	9	0.06
237	The Lancet. Infectious diseases	9	0.06
238	The Pediatric Infectious Disease Journal	9	0.06
239	The Scientific World Journal	9	0.06
240	Topics in Spinal Cord Injury Rehabilitation	9	0.06

X. AUTHORSHIP PATTERN OF RESEARCH OUTPUT OF POLIO LITERATURE

The authorship pattern of research output of Polio literature is offered in the Table VI. The multi-authored papers observed the major percentage. A complete of 84.34% of publications are written by multiple authors. The ratio of single and multiple authors publications is 1:6 found within the field of Polio literature. However, it was visible that meager percent i.e. 2.02% of records represent anonymous authorship. The high occurrence by means of more than one authors' publications is the phenomenon of scientific research.

TABLE VI SINGLE VS MULTI AUTHORED PUBLICATIONS ON POLIO RESEARCH

Year	Anonymous		Single Authored		Multi Authored		Total	%
	Records	%	Records	%	Records	%		
1990	12	3.13	40	1.55	114	0.71	166	0.88
1991	10	2.61	51	1.97	119	0.74	180	0.95
1992	20	5.22	40	1.55	165	1.03	225	1.19
1993	13	3.39	38	1.47	158	0.99	209	1.10
1994	15	3.92	44	1.70	134	0.84	193	1.02
1995	17	4.44	54	2.09	152	0.95	223	1.18
1996	11	2.87	64	2.48	143	0.89	218	1.15
1997	1	0.26	129	4.99	165	1.03	295	1.56
1998	10	2.61	58	2.24	168	1.05	236	1.24
1999	4	1.04	81	3.13	190	1.19	275	1.45
2000	9	2.35	121	4.68	197	1.23	327	1.73
2001	5	1.31	88	3.40	171	1.07	264	1.39
2002	19	4.96	67	2.59	175	1.09	261	1.38
2003	7	1.83	86	3.33	207	1.29	300	1.58
2004	27	7.05	102	3.95	247	1.54	376	1.98
2005	4	1.04	71	2.75	255	1.59	330	1.74
2006	7	1.83	64	2.48	263	1.64	334	1.76
2007	6	1.57	85	3.29	352	2.20	443	2.34
2008	10	2.61	83	3.21	447	2.80	540	2.85
2009	5	1.31	76	2.94	519	3.25	600	3.17
2010	7	1.83	90	3.48	614	3.84	711	3.75
2011	16	4.18	94	3.64	727	4.55	837	4.42
2012	12	3.13	99	3.83	868	5.43	979	5.16
2013	16	4.18	136	5.26	1069	6.69	1221	6.44
2014	16	4.18	140	5.42	1207	7.55	1363	7.19
2015	18	4.70	132	5.11	1230	7.69	1380	7.28
2016	12	3.13	132	5.11	1384	8.66	1528	8.06
2017	23	6.01	124	4.80	1525	9.54	1672	8.82
2018	19	4.96	102	3.95	1466	9.17	1587	8.37
2019	32	8.36	94	3.64	1557	9.74	1683	8.88
Total	383	100.00	2585	100.00	15988	100.00	18956	100.00

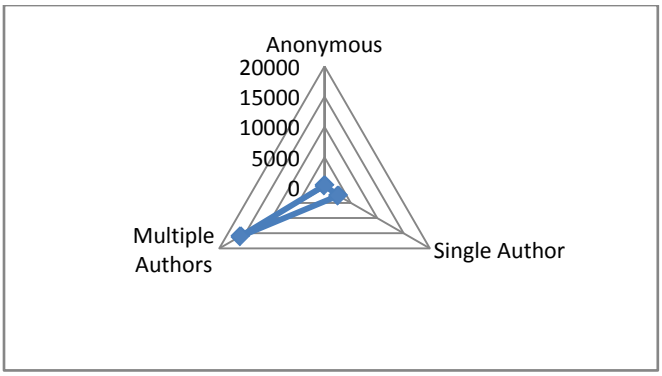

Fig. 3 Authorship Pattern in Polio

XI. DEGREE OF COLLABORATION ON POLIO RESEARCH

The Degree of Collaboration by year-wise is presented in Table VII. The Degree of Collaboration in the field of Polio literature has been measured with the help of the formula created by K. Subramaniam. Consequently, the Degree of Collaboration has been taken into consideration for the year 1991 is as follows:

$$C = \frac{119}{119 + 51} = \frac{119}{170}$$

= Degree of Collaboration 0.70

Similarly, the Degree of Collaboration is considered for every year and presented in Table VII. It is visible from the table that the year-wise Degree of Collaboration indicates the ratio in-between 0.56 to 0.94 in the study of the degree of collaboration in the subject of Polio literature (Fig. 4).

At the identical time the year-wise Degree of Collaboration falls more than 0.5 and exposed that more than one author papers are ruled within the field of Polio literature. The average Degree of Collaboration arrived at 0.86.

TABLE VII DEGREE OF COLLABORATION ON POLIO RESEARCH

Year	Anonymous	Single Author	Two Authors	Three Authors	Four Authors	Five Authors	More than Five Author	Total	More than One Author	Degree of Collaboration
1990	12	40	33	29	17	14	21	166	114	0.74
1991	10	51	39	24	18	19	19	180	119	0.70
1992	20	40	49	35	23	21	37	225	165	0.80
1993	13	38	39	41	24	23	31	209	158	0.81
1994	15	44	30	26	23	15	40	193	134	0.75
1995	17	54	34	35	24	21	38	223	152	0.74
1996	11	64	50	26	27	16	24	218	143	0.69
1997	1	129	53	32	25	13	42	295	165	0.56
1998	10	58	28	29	29	35	47	236	168	0.74
1999	4	81	35	34	40	31	50	275	190	0.70
2000	9	121	47	27	18	30	75	327	197	0.62
2001	5	88	38	26	28	21	58	264	171	0.66
2002	19	67	32	34	26	24	59	261	175	0.72
2003	7	86	35	34	35	24	79	300	207	0.71
2004	27	102	67	43	32	31	74	376	247	0.71
2005	4	71	62	43	30	26	94	330	255	0.78
2006	7	64	66	44	30	27	96	334	263	0.80
2007	6	85	70	51	59	44	128	443	352	0.81
2008	10	83	91	64	68	69	155	540	447	0.84
2009	5	76	97	85	66	50	221	600	519	0.87
2010	7	90	121	97	85	56	255	711	614	0.87
2011	16	94	138	97	94	85	313	837	727	0.89
2012	12	99	136	146	114	92	380	979	868	0.90
2013	16	136	186	165	141	111	466	1221	1069	0.89
2014	16	140	180	177	160	131	559	1363	1207	0.90
2015	18	132	186	182	158	138	566	1380	1230	0.90
2016	12	132	182	180	175	173	674	1528	1384	0.91
2017	23	124	183	172	219	151	800	1672	1525	0.92
2018	19	102	177	185	179	160	765	1587	1466	0.93
2019	32	94	156	200	187	175	839	1683	1557	0.94
Total	383	2585	2640	2363	2154	1826	7005	18956	15988	0.86

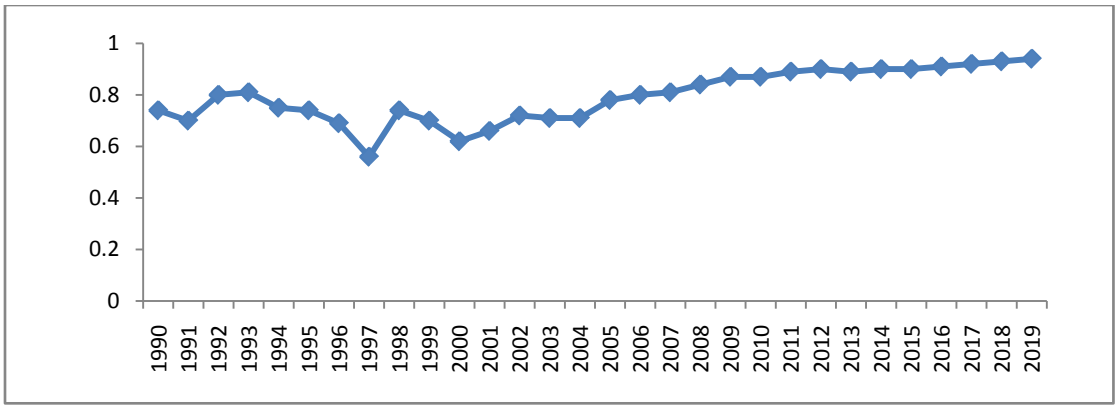

Fig. 4 Degree of Collaboration in Polio Research

XII. MAJOR FINDINGS

1. A total of 18956 records are covered in the field of Polio literature.
2. It was observed that 76.54% records are covered journal articles.
3. Relative Growth Rate (RGR) has been decreasing but fluctuation trend.
4. Doubling Time (Dt) has shown an increasing, but it is also in a fluctuation trend.
5. A complete of 240 Journals had been recognized as core journals within the area of Polio literature.
6. A complete of 84.34% of publications is written by more than one author.
7. The ratio of single and multiple authors publications is 1:6 observed in the discipline of Polio literature.
8. The meager percent i.e. 2.02% of records represent anonymous authorship.
9. The average Degree of Collaboration arrived at 0.86. It shows that multi-authored papers ruled in the field of Polio literature.

XIII. CONCLUSION

The results were confirmed that fluctuation of records on Polio research productivity. The maximum numbers of records had been included by journal articles in the field of Polio literature. Core journals were identified in the discipline of Polio literature. Additional the research productivity of Polio confirms the implications of Bradford's Law of Scattering. The average Degree of Collaboration arrived at 0.86. It suggests that multi-authored papers dominated within the subject of Polio literature.

REFERENCES

[1] Retrieved from https://en.wikipedia.org/wiki/Polio.

[2] Baker D. (1976). Recent trends in the growth of chemical literature. *Chemical and Engineering News*, *54*, 23-27.

[3] Conard, G. M. (1957). Growth of biological literature and the future of biological abstracts. *Federal Proceedings*, *16*, 711-715.

[4] May, K. O. (1966). Quantitative growth of the mathematical literature. *Science, 154*, 1672-1673.

[5] Lamb, G. H. (1971). The coincidence of quality and quantity in the literature of mathematics. (Ph.D. dissertation, Case Western Reserve University). *Dissertation Abstracts International*, *32*/06-A, 33-40.

[6] Sengupta, I. N. (1973). Recent growth of the literature of biochemistry and changes of ranking of periodicals. *Journal of Documentation*, *29*, 192-211.

[7] Sengupta, I. N. (1974). Choosing physiology journals: A recent study of the growth of its literature. *Annals of Library Science and Documentation*, *20*, 39-57.

[8] Sengupta, I. N. (1975). Choosing microbiology journals: Study of the growth of literature in the field. *Annals of Library Science and Documentation*, *21*, 39-57.

[9] Ramesh Babu, B. & Ramakrishnan, J. (2007). Trends in the growth of literature on hepatitis (1984-2003), *Journal of Korean Library and Information Science Society*, *38*(2), 31-50.

[10] Schloman, B. E. (1997). Mapping the literature of allied health: project overview, *Bulletin of Medical Library Association, 85(*3), 271-77.

[11] Ramesh Kundra, *et al.,* (1999). Behavior of Bradford's Law towards citation data on Indian Medical Journal. *In International Conference on Scientometrics and Informetrics Proceedings*, Colima; Mexico. 580.

[12] Ramesh Babu, B. & Ramakrishnan, J. (2007). Indian contributions to the field of hepatitis (1984-2003): A Scientometric Study. *In Third International Conference on Webometrics, Informetrics, Scientometrics Science and Society & Eighth COLLNET Meeting*. ICAR Symposium Hall, National Agriculture Science Complex; New Delhi (India). 22-32.

[13] Lewin, H. S. (2008, April).Diabetes Mellitus publication patterns, 1984-2005. *Journal of Medical Library Association*, *86*(2), 155-158.

[14] Krishnamoorthy, G., Ramakrishnan, J. & Devi, S. (2009, September). Bibliometric Analysis of literature on diabetes (1995-2004). *Annals of Library and Information Studies*, *54*, 150-155.

[15] Macias-Chapula, C. A. (2000). AIDS in Haiti: a bibliometric analysis. *Bulletin of Medical Library Association*, *88*(1), 56-61.

[16] Hartinah, S. *et al.,* (2001). Indonesian Nutrition Research Papers 1979-2000: A Bibliometric Analysis. *In Proceedings of the 8th International Conference on Scientometrics and Informetrics*. Bibliometrics & Informetrics Research Group; Sydney [Australia]. 225-34.

[17] Divya Srivastava. (2004). Collaborative Activity in the Field of Biomedical Sciences: A Bibliometric Analysis of Biomedical Publications. *In Information and knowledge Management in Health Sciences: Newer Perspectives MLAI 2004 National Convention*, Dr. ALM Post Graduate Institute of Basic Medical Sciences, University of Madras; Chennai (India), 181-96.

[18] Hunt, R. (1978). Plant growth analysis: London: Edward Arnold.

[19] Blackman, V. H. (1919). The compound interest law and plant Growth, *Annals of Botany*, *33*, 353-360.

[20] Mahapatra, M. (1985). On the Validity of the theory of Exponential Growth of Scientific Literature, *Proceedings of the 15th IASLIC Conference*, Bangalore, 61-70.

[21] Bradford, S. C. (1934). Sources of Information on specific subjects, *Engineering*, *137*, 85-86.

[22] Subramanyam, K. (1993). Bibliometric Studies of Research Collaboration: A Review. *Journal of Information Science, 6*, 33-38.