INDIAN RESEARCH OUTPUT ON JAUNDICE LITERATURE USING SCOPUS DATABASE: A SCIENTOMETRIC STUDY (1998-2017)

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h   The paper highlights the output on "Jaundice" research publications in India during the period (1998-2017) using the Scopus database. It is found that a total of 3193 research papers were published on 'Jaundice' research, out of that the highest i.e 9.74% of the research papers were published during 2012 and 2015. It has been also observed that the maximum annual growth rate 71.88 was recorded in the year 2000, while the highest 0.533 relational growth rate recorded in the year 2000 and the highest 8.25 doubling time was recorded in 2017. S K Sarin from Institute of Liver and Biliary Sciences, Department of Hepatology, New Delhi was the most productive author with 26 contributions; 65 h-index; and 16691 citations.

Keywords: Scientometrics, Jaundice, Annual Growth Rate (AGR), Compound Annual Growth Rate (CAGR), Relative Growth Rate (RGR) and Doubling Time (Dt.).

INTRODUCTION

Scientometrics is the study of measuring and analysing science, technology and innovation. In recent years it has come to play a major role in the measurement and evaluation of research performance. Scientometrics is concerned with the quantitative features and characteristics of science and scientific research. "Jaundice is a yellow discolouration of the skin, mucous membranes, and the whites of the eyes caused by increased amounts of bilirubin in the blood. Jaundice is a sign of an underlying disease process. Bilirubin is a by-product of the daily natural breakdown and destruction of red blood cells in the body" (https://www.emedicinehealth. com/ jaundice/article_em.htm). A total of 3193 publications were recorded in which 102 research papers were open access while 3091 publications were other types accessible during the period of study .

Access Type	No. of Publications
Open Access	102
Other	3091
Total	**3193**

REVIEW OF LITERATURE

Yeshawant and Ravi (2016) analyzed scientometric dimensions of Blood cancer research during the period 2004-2013. The primary data was collected by the PubMed database, published by NLM. The study examines the various scientometric parameters such as country-wise distribution, year-wise growth of publication, and found that 324 publications are published in the field of Blood Cancer in the year 2012, followed by 308 publications in the year 2013 and also found that 1731 (89.41%) of publication contributed by Indian scientists, followed by 127 (6.56%) of publications contributed by a Pakistani scientist. The mean of publications produced per year was 173 during the period of study. Gupta et al (2016) conducted a study on Lung Cancer in India during 2005-2014. The Scopus database was used to collect the primary data for the study. A total of 3653 publications were published on lung cancer for the period of study. The average growth rate of the publications was 18.81%, and the maximum contribution came from United States of America i.e. 9.23% of publications, followed by China with 11.19% of publications, while the 15 highly prefered journals together contributed 20.23% of the total journal contributions.. A similar study was conducted by Jeyshankar and Babu (2013) on a scientometric analysis of Leukemia research (1960-2011). The data were collected by the Scopus database, in which a total of 2120 research papers were published on Leukemia research. The study examines various scientometric parameters such as the growth of publications, authorship pattern, relative growth rate, doubling time and found that 865 (40.80%) of publications were published from 2007 to 2011. The highest i.e 0.45 relative growth rate was recorded for the period (1972-1976), and 10.57 recorded the maximum doubling time during the period (1992-1996). The highest, i.e. 1689 (79.67%) publications were contributed by multiple authors, followed by two authors with 295 (13.92%) of contributions. Shukla (2019) carried out a scientometric analysis of genetic disorder research in India during the period 2008-2017. The data were collected by using the Scopus database and found that 504 (13.72%) articles were published in 2017, while the lowest, i.e. 184 (5.01%) of records were published in 2008. 36.27% annual growth rate was recorded in 2012 while the highest relative growth, i.e. 0.75 was recorded in 2009. The overall RGR shown a decreasing trend however, the doubling time has shown an increasing trend. The highest,i.e. 70.38% of records were article type documents. Siva et al (2019) conducted a scientometric analysis on Hepatitis C research for a period from 2009-2018. The primary data were collected by Scopus database. The study examines various scientometric parameters and found that the relative growth rate lay between 0.71 to 0.10 and correspondingly the doubling time was 0.98 to 7.28. The highest number,i.e. 41141 (68.65%) of records were found article type document.

METHODOLOGY

The data source used for the study was Scopus, a very comprehensive multidisciplinary citation database indexing a large number of science and technology journals worldwide. The Scopus is an international online bibliographic database which is owned by Elsevier. The following search string was used for data collection i.e.: (TITLE-ABS-KEY (Jaundice) AND (LIMIT-TO (AFFILCOUNTRY, "India")) AND (LIMIT-TO (PUBYEAR, 2017 to 1998))). A total of 3193 records were found during the period of study. These records along with full bibliographical details such as Title, Authors, Source, Year, Affiliation, Document Type, etc. have been extracted from the Scopus database. The data so obtained was downloaded and exported into excel sheets where the final analysis was performed on the patterns of scientometrics.

OBJECTIVES OF THE STUDY

The main objectives of the study are to:
1. analysis the year wise growth of publications.
2. identify the annual growth and compound annual growth rate of jaundice research publications.
3. analysis the relative growth and doubling time.
4. find out the scientific prolific of the contributors.
5. identify the Document Wise Publication Distribution.

DATA ANALYSIS AND INTERPRETATION

Year Wise Growth of Publications

The table 1 shows the year wise growth rate of publications on Jaundice during the period (1998-2017). The maximum research papers were published in the year 2012 and 2015 i.e. 311 (9.74%) publications each, followed by 294 (9.21%) publications in the year 2014. The overall data description was given on the year-wise growth rate of publication in table 1.

Table 1: Year-wise growth of publications

Year	No. of Publications	Percentage of Publications	Cumulative Percentage
1998	46	1.44	1.44
1999	32	1.00	2.44
2000	55	1.72	4.16
2001	44	1.38	5.54
2002	75	2.35	7.89
2003	85	2.66	10.55
2004	88	2.76	13.31
2005	108	3.38	16.69
2006	110	3.45	20.14
2007	107	3.35	23.49
2008	144	4.51	28
2009	143	4.48	32.48
2010	211	6.61	39.09
2011	264	8.27	47.36
2012	311	9.74	57.1
2013	264	8.27	65.37
2014	294	9.21	74.58
2015	311	9.74	84.32
2016	244	7.64	91.96
2017	257	8.05	100
Total	**3193**	**100.00**	

YEAR-WISE GROWTH OF PUBLICATION

Annual Growth of Publications

The table 2 depicts the annual growth rate of publications. It has been clearly shown that the maximum AGR 71.88 recorded in the year 2000, followed by 70.46 AGR recorded in the year 2002 and the minimum AGR -30.44 was recorded in the year 1999. The table 2 shows all the AGR data year wise. The Annual Growth Rate (AGR) is calculated using the formula given by Kumar and Kaliyaperumal (2015).

$$AGR = \frac{EndValue - FirstValue}{FirstValue} \times 100$$

Table 2: Annual growth of publications

Year	No. of Publications	AGR
1998	46	0.00
1999	32	-30.44
2000	55	71.88
2001	44	-20.00
2002	75	70.46
2003	85	13.33
2004	88	3.53
2005	108	22.73
2006	110	1.85
2007	107	-2.73
2008	144	34.58

2009	143	-0.69
2010	211	47.55
2011	264	25.12
2012	311	17.80
2013	264	-15.11
2014	294	11.36
2015	311	5.78
2016	244	-21.54
2017	257	5.33
Total	3193	

Compound Annual Growth of Publications

The table 3 describes the Compound Annual Growth Rate (CAGR) of publications on jaundice (1998-2017). The compound annual growth rate is calculated by taking the nth root of the total percentage growth rate, where n is the number of years in the period being considered. The highest CAGR was recorded in 2000 i.e. 19.79%, followed by 11.26% in the year 2002, and the lowest CAGR (-16.59%) recorded in the year 1999. The CAGR data is shown in table 3. The compound annual growth rate was calculated by the following formula available on https://www.investopedia.com/terms/c/ cagr.asp.

$$CAGR = [(EndingValue / BeginningValue)^{1/n} - 1$$
$$CAGR = [(EndingValue / BeginningValue)^{1/n} - 1$$

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Table 3: Compound Annual Growth of publications

Year	No. of Publications	Cumulative Frequency	CAGR	(%) CAGR
1998	46	46	0.000	0.00
1999	32	78	-0.166	-16.59
2000	55	133	0.198	19.79
2001	44	177	-0.054	-5.43
2002	75	252	0.113	11.26
2003	85	337	0.021	2.11
2004	88	425	0.005	0.50
2005	108	533	0.026	2.59
2006	110	643	0.002	0.20
2007	107	750	-0.003	-0.28
2008	144	894	0.027	2.74
2009	143	1037	-0.001	-0.06
2010	211	1248	0.030	3.04
2011	264	1512	0.016	1.61
2012	311	1823	0.011	1.10
2013	264	2087	-0.010	-1.02
2014	294	2381	0.006	0.64

2015	311	2692	0.003	0.31
2016	244	2936	-0.013	-1.27
2017	257	3193	0.003	0.26

Relative Growth Rate and Doubling Time of Publications

The table 4 and figure 2 shows the relative growth rate and doubling time of publications on Jaundice during the period of study. The growth rate of all publications has been measured on the basis of RGR and Dt. The particular model is developed by3 in 1985. On the observation of table 4, it has been clearly shown that the maximum 0.533 RGR recorded in the year 2000 and 8.25 Dt. recorded in 2017. The table 4 depicted the full description of RGR and Dt. The mathematical representation of the mean relative growth rate of articles over a specific period is derived from the following formula:

$$RGR = \frac{W2 - W1}{T2 - T1}$$

Where,

RGR = Growth Rate over the specific period of the interval,
W1 = Log$_e$ (natural log of the initial number of contributions)

W2 = Log$_e$ (natural log of the final number of contributions)
T1 = the unit of initial time
T2 = the unit of the final time

Doubling Time

It is defined that there is a straight uniformity existing between RGR and Dt. "If the number of contributions of a subject doubles, during the period of study, then the difference between the logarithm of the numbers at the starting and at the last of the period must be the logarithms of the number 2. If a single uses a "natural logarithm" this difference has a particular value of 0.693 (Beaie and Acol, 2009).

The formula of corresponding Dt for contributions and pages measurement.

$$DoublingTime(Dt) = \frac{0.693}{R}$$

Table 4: Relative Growth Rate and Doubling time of publication

Year	No. of Publications	Cumulative Sum	W1	W2	RGR	Dt
1998	46	46	0	3.829	0	0
1999	32	78	3.829	4.357	0.528	1.313
2000	55	133	4.357	4.89	0.533	1.3
2001	44	177	4.89	5.176	0.286	2.423
2002	75	252	5.176	5.529	0.353	1.963

2003	85	337	5.529	5.82	0.291	2.381
2004	88	425	5.82	6.052	0.232	2.987
2005	108	533	6.052	6.279	0.227	3.053
2006	110	643	6.279	6.466	0.187	3.706
2007	107	750	6.466	6.62	0.154	4.5
2008	144	894	6.62	6.796	0.176	3.938
2009	143	1037	6.796	6.944	0.148	4.682
2010	211	1248	6.944	7.129	0.185	3.746
2011	264	1512	7.129	7.321	0.192	3.609
2012	311	1823	7.321	7.508	0.187	3.706
2013	264	2087	7.508	7.643	0.135	5.133
2014	294	2381	7.643	7.775	0.132	5.25
2015	311	2692	7.775	7.898	0.123	5.634
2016	244	2936	7.898	7.985	0.087	7.966
2017	257	3193	7.985	8.069	0.084	8.25

Figure 2: Relative Growth Rate and Doubling Time of publications

Scientific Profile of Authors: Publications, Affiliation; h-index and Citations

The table 5 depicts the most productive authors ; total publications; h-index; and total citations received during the period of study. The most prolific author was S K Sarin with 26 contributions; 65 h-index; and 16691 citations, followed by R K Dhiman with 25 publications; 33 h-index; 4040 citations and P Kumar have 23 publications; 20 h-index; 1441 citations and S.K Yachha 22 publications and the same 22 h-index; 1614 citations while U Poddar 21 contributions; 20 h-index; 1214 citations. The overall data of the top 15 most productive authors were given in table 5.

Table 5: Scientific Profile of Authors Publications; Affiliation; h-index and Citations

Author Name & Affiliation	Total No. of Publications	h-index	Citations
Sarin, S.K. (Institute of Liver and Biliary Sciences, Department of Hepatology, New Delhi, India)	26	65	16691
Dhiman, R.K. (Postgraduate Institute of Medical Education and Research, Chandigarh, India)	25	33	4040
Kumar, P. (Kalawati Saran Children's Hospital, Department of Pediatrics, New Delhi, India)	23	20	1441
Yachha, S.K. (Sanjay Gandhi Postgraduate Institute of Medical Sciences Lucknow, Department of Pediatric Gastroenterology, Lucknow, India)	22	22	1614
Poddar, U. (Sanjay Gandhi Postgraduate Institute of Medical Sciences Lucknow, Department of Pediatric Gastroenterology, Lucknow, India)	21	20	1214
Chawla, Y.K. (Postgraduate Institute of Medical Education and Research, Department of Hepatology, Chandigarh, India)	20	42	7838
Chawla, Y. (Postgraduate Institute of Medical Education and Research, Department of Hepatology, Chandigarh, India)	19	42	7838
Narang, A. (Cosmo Hospital, Department of Neonatology, Mohali, India)	19	23	2516
Singh, K. (Postgraduate Institute of Medical Education and Research, Department of Gastroenterology, Chandigarh, India)	19	32	4359
Bhasin, D.K. (Postgraduate Institute of Medical Education and Research, Department of Gastroenterology, Chandigarh, India)	16	26	4519
Chawla, D. (Government Medical College & Hospital, Chandigarh, Chandigarh, India)	16	14	570
Deorari, A.K. (All India Institute of Medical Sciences, New Delhi, Department of Pediatrics, New Delhi, India)	16	24	2559
Paul, V.K. (All India Institute of Medical Sciences, New Delhi, Department of Pediatrics, New Delhi, India)	15	36	11962

| Rana, S.S. (Postgraduate Institute of Medical Education and Research, Department of Gastroenterology and General Surgery, Chandigarh, India) | 15 | 20 | 1510 |
| Srivastava, A. (Sanjay Gandhi Postgraduate Institute of Medical Sciences Lucknow, Department of Pediatric Gastroenterology, Lucknow, India) | 15 | 15 | 576 |

Document Wise Publication Distribution

The table 6 describes the document wise distribution of publications on Jaundice from (1998-2017). The highest,i.e. 2451 (76.76%) publications were 'Article' type documents, followed by 'Reviews' with 328, constituting (10.27%) of publications and 245 (7.67%) of publications were 'Letters'.The other data is given in table 6.

Table 6: Document wisedistribution of publications

Document Type	Total No. of Publications	Percentage of Publication
Article	2451	76.76
Review	328	10.27
Letter	245	7.67
Note	71	2.22
Conference Paper	49	1.53
Editorial	21	0.66
Short Survey	14	0.44
Book Chapter	13	0.41
Erratum	1	0.03
Total	**3193**	**100**

Figure 4: Document wise publication distribution

Figure 5 (a) and (b) shows the source title and affiliation name on 'Jaundice' during the period (1998-2017). It has been clearly shown that the maximum 108 publications were source title *Indian Journal of Pediatrics* followed by *Journal Of Clinical And Diagnostic Research* source title with 102 publications and 259 publication's affiliation was 'Postgraduate Institute of Medical Education and Research', followed by 207 publication's affiliated with "All India Institute of Medical Sciences, New Delhi". The overall data of top ten source title and affiliation name has been showing in figure 5 (a) and (b).

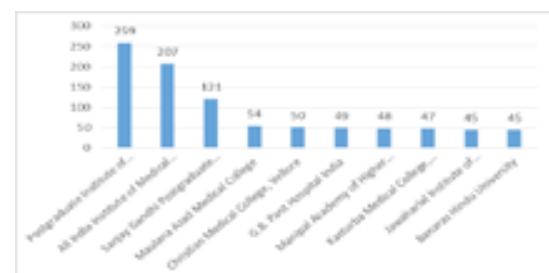**Figure 5 (a): Top ten source title in Jaundice research**

Figure 5 (b): Top ten affiliation in Jaundice research

DISCUSSIONS AND CONCLUSION

The study measures the different parameters of

scientometrics on 'Jaundice' research in India. Jaundice, also known as icterus, is "a yellowish or greenish pigmentation of the skin and whites of the eyes due to high bilirubin levels. It is commonly associated with itchiness. The face may be pale and the urine dark." It is observed from 9.74% publications were published in two years i.e. 2012 and 2015, while only 1% of publication was published in the year 1999. The highest annual growth rate and compound annual growth rate were recorded in the year 2000 i.e. 71.88 and 19.79% respectively. 0.533 relative Growth Rate (RGR) was recorded in the year 2000 and Doubling Time (Dt) was recorded 8.25 in the year 2017. It is also found that the Relative Growth rate was shown a decreasing trend while the doubling time was shown an increasing trends. Majority of scientists have contributed their research papers in journals and the maximum of 26 publications were contributed by S K Sarin from Institute of Liver and Biliary Sciences, Department of Hepatology, New Delhi. and received a total 65 h-index and 16691 total citations during the period of study.

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