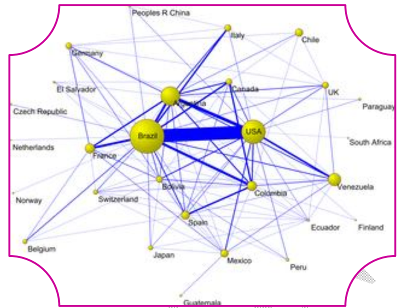
REVIEW OF RESEARCH
IMPACT FACTOR : 5.7631(UIF) UGC APPROVED JOURNAL NO. 48514 ISSN: 2249-894X

VOLUME - 8 | ISSUE - 3 | DECEMBER - 2018

STANDARDISATION IN RENDERING OF AUTHOR NAMES LEADING TO ACCURACY IN RANKING OF AUTHORS – A PROOF THROUGH SCIENTOMETRIC ANALYSIS OF CHAGAS DISEASE RESEARCH LITERATURE



Dr. R. Natarajan[1] and S. Krishnakumar[2]
[1]Assistant Professor,Dept. of Library & Information Science,Annamalai University.
[2]Research Scholar ,Dept. . of Library & Information Science,Annamalai University.

ABSTRACT

Chagas disease was named after the Brazilian physician Carlos Chagas who discovered the disease in 1909. It is caused by the parasite Trypanosomacruzi*, which is transmitted to animals and people by insect vectors and is found only in the Americas. Still the disease is prevailing in the Americas. The bibliographic databases like Medline, Scopus etc use two variant forms of author names as author name and full author name. This creates discrepancy in listing the high productive authors. For example, the names Charle, Elizabeth having 5 publications and Charle, Eric having 8publications will be listed as charle, E with 13 publications. Hence, ranking of authors according to short form and full will have two types leading to an ambiguity in identifying high prolific authors. This study illustrates this ambiguity in ranking of authorsusing scientometric analysis of Chagas disease research as case study.*

KEYWORDS: *parasite Trypanosomacruzi , authorsusing scientometric analysis , high productive authors.*

INTRODUCTION :

Chagas disease is named after the Brazilian physician Carlos Chagas, who discovered the disease in 1909. It is caused by the parasite *Trypanosomacruzi*, which is transmitted to animals and people by insect vectors and is found only in the Americas (mainly, in rural areas of Latin America where poverty is widespread). Chagas disease (*T. cruzi* infection) is also referred to as American trypanosomiasis. In the United States, Chagas disease is considered one of the neglected parasitic infections (NPI), a group of five parasitic diseases that have been targeted by CDC for public health action.About 6 million to 7 million people worldwide are estimated to be infected by Chagas disease. Chagas disease is found mainly in endemic areas of 21 Latin American countries *(1)*, where it is mostly vector-borne transmitted to humans by contact with faeces or urine of triatomine bugs, known as 'kissing bugs', among many other names, depending on the geographical area.

According to Francis Narin (1976), publication and citation count is used for assessing the scientific activity. This is being adopted for nearly a century. While publication count is used as a quantitative measure, citation count is used as a qualitative tool. One of the quantitative measure in the field of bibliometrics/scientometrics is author productivity and identification of high productive authors in a field. This paper is a novel effort to identify the discrepancies in rendering author names and thereby suggesting a standaridsed format for rendering the name of the authors in research publications.

PREVIOUS STUDIES

Ramos et al (2011) conducted a bibliometric analysis of the literature on Chagas disease research indexed in PubMed during a 70-year period from 1940 to 2009. It was found that countries with more estimated cases of Chagas disease produced less research on Chagas disease than some developed countries . González-Alcaide G, Salinas A, Ramos JM (2018) examined patterns of research on Chagas cardiomyopathy, identifying the main countries, authors, research clusters, and topics addressed; and measuring the contribution of different countries.It was found that the number of published records increased from 156 in 1980–1984 to 311 in 2010–2014. There were more clinical than basic studies, though very few of the documents were clinical trials. Brazil and the USA are currently leading the research on this subject, while some highly endemic countries, such as Bolivia, have contributed very little. Delgado-Osorio N et al (2014) used SCI (1980-2013), MEDLINE/GOPUBMED (1802-2013), Scopus (1959-2013), SCIELO (2004-2013), and LILACS (1980-2013) toanalyse the literature output on Chagas disease. It was found that Brazil has the highest output in the region. Despite advances in controlling Chagas disease, scientific production is low, particularly for regional bibliographic databases, which calls for more research on this disease.

OBJECTIVES

Though the prime aim of this aim is to reveal the results of the ambiguity in rendering author names in the bibliographic databases, the other objectives include

- Trend of research in Chagas disease
- Authorship pattern in Chagas disease research
- High productive authors in Chagas disease research
- Ranking of authors according to the full form of the author names and short form of author names
- Variation in the collaboration index due to the rendering of author names

METHODS

Publised records for the period from 1940 to 2017 were downloaded from Medline database. To retrieve documents, a search was composed with the MeSH terms or descriptors “Chagas disease” or“Trypanosomacruzi”. The total records downloaded is 11984. These records in the text form are converted into database and necessary tables are formed using structured query language.

Discussion

Table 1 Trend of Research in Chagas disease – Before millennium

Year	Publications	Percent	Relative Growth rate
1940's	56	0.94	
1950's	420	7.06	6.50
1960's	772	12.98	0.84
1970's	977	16.42	0.27
1980's	1646	27.67	0.68
1990's	2078	34.93	0.26
	5949	100.00	

Chagas disease was identified in the year 1909. But research publications in this subject area are available in Medline from 1946 onwards. There is gradual increase in the number of publications in each decade from 1940’s. The growth in the first decade (1950’s) is maximum and is minimum in the last decade before the millennium (1990’s).

Table 2 Trend of Research in Chagas disease – After millennium

Year	Publications	Percent	Relative growth rate
2001	234	3.88	
2002	214	3.55	-0.09
2003	243	4.03	0.14
2004	231	3.83	-0.05
2005	273	4.52	0.18
2006	296	4.90	0.08
2007	318	5.27	0.07
2008	334	5.53	0.05
2009	451	7.47	0.35
2010	406	6.73	-0.10
2011	457	7.57	0.13
2012	412	6.83	-0.10
2013	428	7.09	0.04
2014	457	7.57	0.07
2015	461	7.64	0.01
2016	410	6.79	-0.11
2017	410	6.79	0.00
	6035	100.00	

The trend of research in the field of chagas disease is not uniform after the millennium. There are negative growth during the years 2002, 2004,2010, 2012 and 2016. In the year 2017 there is no growth. Chagas disease is a virus disease that affects people of the Americas and the incidence is very less. Hence the growth rate of research is not uniform.

Table3 Authorship pattern

Year	Publications	Percent
1	1640	13.68
2	1557	12.99
4	1549	12.93
3	1519	12.68
5	1435	11.97
6	1195	9.97
7	936	7.81
8	631	5.27
9	460	3.84
10	379	3.16
More than 10 authors	683	5.70
	11984	100.00

Table 3 shows that the authorship pattern ranges from solo research to as many as more than 10 authors. In case of Chagas disease research, single authored publications are the highest. The next highest number of publications are the result of joint authorship. (12.99%). Here it is to be noted that as the number of authors increases from 1 to 9, the number of publications decreases. Hence it can be presumed that team research is more in Chagas disease and the optimum number of members in team research is 2

Table 4 Authorship pattern before millennium

No of Authors/Year	1940's	1950's	1960's	1970's	1980's	1990's	Total
1	31	193	307	212	235	264	1242
2	18	114	190	216	287	247	1072
3	4	56	131	199	289	289	968
4	3	33	73	137	265	351	862
5	0	9	42	98	234	306	689
6	0	10	16	55	139	221	441
7	0	2	12	29	94	165	302
8	0	2	0	19	43	105	169
9	0	1	1	6	34	52	94
10	0	0	0	4	26	47	77
More than 10	0	0	0	2	0	31	33
Total	56	420	772	977	1646	2078	5949

The authorship pattern before millennium shows a highest number of publications by single authors. The percentage of collaborative publications (publications by two or more number of authors) is increasing from the first decade (1940's) to 1990's.

Table 5 Authorship pattern after millennium

Year	One aut	Two auth	Three Auth	Four Auth	Five Auth	Six Auth	Seven Auth	Eight Auth	Nine Auth	Ten Aut h	Mor e than ten auth	Total
2001	24	34	27	33	30	33	20	11	10	7	5	234
2002	11	22	27	37	31	20	26	14	10	5	11	214
2003	20	24	26	31	38	34	23	10	17	9	11	243
2004	11	22	21	32	41	32	20	15	16	9	12	231
2005	19	26	24	39	55	29	25	14	12	9	21	273
2006	28	18	24	41	43	25	23	31	17	22	24	296
2007	31	24	35	28	46	41	29	27	14	16	27	318
2008	16	29	30	36	40	54	35	29	16	22	27	334
2009	58	40	51	46	49	48	48	27	20	27	37	451
2010	35	31	32	55	37	57	56	32	20	15	36	406
2011	28	49	50	66	55	49	37	25	25	23	50	457
2012	17	31	31	47	51	52	48	31	23	21	60	412
2013	19	24	30	43	41	66	44	39	35	29	58	428
2014	19	32	50	49	52	58	48	36	29	19	65	457
2015	28	41	36	38	48	56	41	37	37	31	68	461
2016	20	18	31	40	48	55	49	41	30	14	64	410
2017	14	20	26	26	41	45	62	43	35	24	74	410
	398	485	551	687	746	754	634	462	366	302	650	6035

After the millennium, the authorship pattern in chagas disease research has a drastic change. Single authored publications are highest in the year 2009 and in all the other years, as the number of authors increases to 4, the number of publications increases. Hence it can be inferred that the optimum number of authors in chagas disease research is 4.

Table 6 Collaboration index – After millennium

Year	Publications	Authors (short form)	Collaboration index	Authors (full form)	Collaboration index
2001	234	762	3.26	762	3.26
2002	214	747	3.49	804	3.76
2003	243	882	3.63	935	3.85
2004	231	912	3.95	970	4.20
2005	273	1088	3.99	1149	4.21
2006	296	1189	4.02	1262	4.26
2007	318	1288	4.05	1369	4.31
2008	334	1391	4.16	1497	4.48
2009	451	1625	3.60	1735	3.85
2010	406	1643	4.05	1747	4.30
2011	457	1838	4.02	1940	4.25
2012	412	1921	4.66	2026	4.92
2013	428	2124	4.96	2249	5.25
2014	457	2052	4.49	2166	4.74
2015	461	2245	4.87	2354	5.11
2016	410	2089	5.10	2188	5.34
2017	410	2208	5.39	2303	5.62

In 1980,Lawani introduced collaboration index (CI) as the average number of authors per article. From an analysis of the collaboration index during the decades from 1940's onwards it is found that there is no variation in the collaboration index. At the same time the collaboration index varies from 3.26 to 5.39 when the short name of the authors are considered. This varies from 3.26 to 5.62 when the full form of the name of the authors are considered. The variation in the collaboration index calculated for short form of author names and full author names suggest that a standardization must be followed in rendering of the name of the authors similar to the cataloguing rules.

Table 7 High Productive authors

Rank	Author Name (Short form)	Publications	Author Name (Full form)	Publications
1.	Tanowitz HB	83	Amato Neto, V	65
2.	Chiari E	80	Schenone, H	55
3.	Amato Neto V	79	Lopes, E R	52
4.	Bestetti RB	72	Tanowitz, Herbert B	49
5.	Mady C	70	Bellotti, G	47
6.	Dias JC	68	Contreras, M C	46
7.	Rocha MO	67	Weiss, Louis M	44
8.	Ribeiro AL	66	Chiari, Egler	43
9.	Apt W	65	Andrade, S G	43
10.	Gazzinelli RT	60	Torrico, Faustino	40
11.	Rassi A	60	Apt, W	40
12.	Weiss LM	59	Gilman, Robert H	40
13.	Luquetti AO	58	Bestetti, Reinaldo B	39
14.	Schenone H	56	Mady, C	39
15.	Gurtler RE	56	Rojas, A	38
16.	Lopes ER	53	Chiari, E	37
17.	Teixeira MM	52	Guhl, Felipe	35
18.	Correa-Oliveira R	51	Rassi, A	34
19.	Torrico F	50	Dias, Joao Carlos Pinto	33

Table 7 lists the ranked list of authors by short form as well as full form. Tanowitz HB has the highest number of publications(83) according to short form and Tanowitz, Herbert B has only 49 publications $9) Similar changes are found in all the ranked list of authors. An analysis of list of authors in the full form shows that there are variant forms of names for the same author Tanowitz, Herbert B as Tanowitz, H B (31 publications), Tanowitz, H (9 publications), Tanowitz, Herbert (2 publications), Tanowitz, Herbert Bernard (2 publications) and Tanowitz, Hebert B (1 publication). This non-standardized rendering of author names leads to ambiguity in the ranking of authors. This has impact on other qualitative indicators like h-index, g-index and the like.

Table 8 Ranking of authors according to positional share

Rank By Pubs	Author	Pubs	Positional Share	Rank By Pubs	Author	Pubs	Positional Share
4	Bestetti RB	72	27.84	1	Amato Neto, V	65	18.85
6	Dias JC	68	23.15	9	Andrade, S G	43	18.59
3	Amato Neto V	79	23.05	2	Schenone, H	55	18.36
20	Andrade SG	50	19.98	13	Bestetti, Reinaldo B	39	16.74
14	Schenone H	56	18.65	45	Kierszenbaum, F	27	14.53
9	Apt W	65	16.67	3	Lopes, E R	52	13.00
28	Coura JR	45	16.04	19	Dias, Joao Carlos Pinto	33	12.66
104	Kierszenbaum F	27	14.53	11	Apt, W	40	12.44
1	Tanowitz HB	83	14.07	21	Ribeiro, R D	32	12.24
8	Ribeiro AL	66	13.63	96	Pellegrino, J	20	11.77
11	Rassi A	60	13.50	55	Bestetti, R B	25	10.02
36	Dantas RO	39	13.24	46	Forattini, O P	27	9.99
7	Rocha MO	67	13.14	31	Dantas, R O	30	9.78
16	Lopes ER	53	13.07	88	Andrade, Z A	21	9.70
15	Gurtler RE	56	13.03	97	Teixeira, A R	20	9.59
67	Ribeiro RD	32	12.24	6	Contreras, M C	46	9.34
65	Teixeira AR	32	12.09	53	Rassi, AnisJr	25	9.30
191	Pellegrino J	20	11.77	51	Dias, J C	26	9.01
21	Guhl F	50	11.64	22	Szarfman, A	32	8.74
2	Chiari E	80	11.16	129	Tarleton, R L	18	8.49

Author productivity is a measure for ranking the authors according to their publication output. The most common methods for ranking authors are 1. Total Publication count and 2. Equal share method by assigning equal share for each collaborating author. In a collaborative publication it is not necessarily that all the co-authors contribute equal effort in the research. It is a common fact that the author named first might have put maximum effort. As the position of the author name moves from the first to the last position, the effort of the co-authors may decrease. There may be some authors whose name may be included just because of the mantra “Publish or Perish”. Hence Kumaravel (2012) has introduced a new method for ranking of authors by assigning each author an ordinal value in the decreasing order according to their position. Hence the authors can be ranked on the basis of weighted share by their position in the author list.

Dr.S.R.Ranganathan’s canon of Prepotence supports this method. The canon says that “The potency of an author is concentrated more on the first author who is also called prime author”. According to Kumaravel(2012), each author named in a publication is given a value according to his/her position in the authors place and this value is termed as potence value (PV). Therefore, prime PV is accorded to the first author and then PV goes decreasing to the second, third and so on.

For example, if there are n authors for a publication, the potency value (PV) of an author in pth position ($p \leq n$) for that publication can be calculated as

$PV = (n - p + 1) / n\sum$ where $n\sum = 1+2+3+ \dots n$ and $PV \leq 1$

For example, the potency of each author in a work by 4 authors, can be calculated as

1st Position = $(4 - 1 + 1) / 4\sum = 4 / (1+2+3+4) = 4 / 10$ i.e 0,4

2nd position = $(4 - 2 + 1)/4\sum = 3/10$ i.e 0.3

3rd position = (4 -3 +1)/4∑ = 2/10 i.e 0.2
4th position = (4 -4 +1)/4∑ = 1/10 i.e 0.1

Prepotence Index (PI) – a measure to evaluate Authors Specialization

Kumaravel proposed that the prepotence index or specilisationof an author can be measured by arriving thepotence value of the author. The formula for PI is PV/N where N is the total number of publications by the author.

The value of PI ranges from 0 to 1. The PI value nearer to 1 indicates the higher involvement of the author in most of his collaborative publications. The PI value nearer to zero indicates that the author has been involved in majority of his collaborative publications for name sake. From this index, the potential or specialisation of an author in a subject can be measured.

A close look at the table 7 shows the number of publications by an author cannot be a measure to designate an author to be a specialist in the field. The specialization of an author in a field can be measured by PI.

Table 9 Author specialization for short form (Prepotence index)

Rank according to publication count	Author	Count (N)	Positional value(PV)	PI = PV/N
191	Pellegrino J	20	11.77	0.59
104	Kierszenbaum F	27	14.53	0.54
164	Andrade ZA	21	9.70	0.46
20	Andrade SG	50	19.98	0.40
4	Bestetti RB	72	27.84	0.39
67	Ribeiro RD	32	12.24	0.38
95	Rassi A Jr	28	10.70	0.38
117	Schmunis GA	25	9.46	0.38
65	Teixeira AR	32	12.09	0.38
99	Forattini OP	27	9.99	0.37
193	Schofield CJ	19	6.85	0.36
28	Coura JR	45	16.04	0.36
85	Rossi MA	28	9.86	0.35
77	Tarleton RL	30	10.24	0.34
6	Dias JC	68	23.15	0.34
36	Dantas RO	39	13.24	0.34
91	Cardoni RL	28	9.50	0.34
200	da Rocha e Silva EO	19	6.33	0.33
14	Schenone H	56	18.65	0.33
198	Villalta F	19	6.21	0.33

Table 9 shows the prepotence index of authors listed by short names. The prepotence index (author specialization) is higher for the author Pellegrino J with 20 publications and this is followed byKierszenbaum Fwiuth 27 publicaitons. The third ranked author is Andrade ZA with 21 publications. A close analysis of table 9 shows that the ranking of authors or the list of high prolific authors is changed when arranged according to the prepotence index.

Table 10 Author specialisaion for full form (Prepotence index)

Rank according to publication count	Author	Count (N)	Positional value(PV)	PI = PV/N
96	Pellegrino, J	20	11.77	0.59
45	Kierszenbaum, F	27	14.53	0.54
167	Rossi, M A	16	8.09	0.51
97	Teixeira, A R	20	9.59	0.48
129	Tarleton, R L	18	8.49	0.47
88	Andrade, Z A	21	9.70	0.46
9	Andrade, S G	43	18.59	0.43
13	Bestetti, Reinaldo B	39	16.74	0.43
114	Avila, J L	19	7.89	0.42
131	Coura, Jose Rodrigues	18	7.22	0.40
55	Bestetti, R B	25	10.02	0.40
198	Wen, Jian-Jun	15	5.93	0.40
200	Schofield, C J	15	5.82	0.39
19	Dias, Joao Carlos Pinto	33	12.66	0.38
21	Ribeiro, R D	32	12.24	0.38
53	Rassi, AnisJr	25	9.30	0.37
46	Forattini, O P	27	9.99	0.37
71	Schmunis, G A	23	8.12	0.35
61	Cardoni, R L	24	8.48	0.35
62	Coura, J R	24	8.47	0.35

Table 10 shows the prepotence index of authors listed by full form of the names. The prepotence index (author specialization) is higher for the author Pellegrino J with 20 publications and this is followed byKierszenbaum Fwiuth 27 publicaitons. The third ranked author is Rossi, M A with 16publications. A close analysis of table 10 shows that the ranking of authors or the list of high prolific authors is changed when arranged according to the prepotence index. Also it can be inferred that the total number of publicationscan not decide the specialization of the author in a specific field.

Table 11 Verification of Lotka's law (Short names)

No of papers	No of authors	X^n*Y =K
1	14246	14246
2	3025	14191.3
3	1221	14148.03
4	691	15207.99
5	426	15421.01
6	277	15057.65
7	217	16635.21
8	148	15281.02
9	127	17051.58
10	103	17491.91
11	73	15333.05
12	56	14281.12
13	58	17681.6
14	39	14025.88
15	43	18036.49
16	35	16953.35
17	23	12753.49

Lotka's Law states that "the number (of authors) making **n** contributions is about **$1/n^2$** of those making one; and the proportion of all contributors , that make a single contribution is about 60 percent (Lotka 1926,cited in Potter 1988). This means that out of all the authors given in a field, 60 percent will have just one publication, and 15 percent will have two publications ($1/2^2$ times of 60), 7 percent of authors will have three publications ($1/3^2$ times of 60), and so on. According to Lotka's Law of scientific productivity, only 6% of the authors in a field will produce more than 10 articles. This can be mathematically expressed as X^n*Y= K where K is constant for n having a value of 2. Lotka'sLaw, when applied to large bodies of literature over a fairly long period of time, can be accurate in general, but not statistically exact. It is often used to estimate the frequency with which authors will appear in an online catalog (Potter 1988).

The total number of unique authors (identified by short form) who have contributed to chagas disease research is 21048 of which 14246 (67.68%) have contributed only one paper and 567 authors (2.69%) have contributed more than 10 papers. These two figures do not coincide with lorka's findings. But the mathematical calculations for X^n*y showsalmost constant value k for n 2.3(Column 3). Hence the present study deviates Lotka's law.

Table 12 Verification of Lotka's law (Full names)

No of papers	No of authors	X^n*Y = K
1	17831	17831.00
2	3326	17554.73
3	1356	18938.72
4	716	19946.05
5	434	20654.65
6	268	19755.94
7	196	20916.61
8	171	25142.71

9	109	21262.22
10	75	18839.15
11	49	15471.72
12	51	19842.90
13	47	22159.60
14	32	18024.25
15	38	25258.21
16	18	13968.84

The total number of unique authors (identified by full form) who have contributed to chagas disease research is 24882 of which 17831 (71.66 %) have contributed only one paper and 400 authors (1.60%) have contributed more than 10 papers. These two figures do not coincide with lorka's findings. Also the mathematical calculations for X^n*y do not result in a constant value k (Column 3). Hence the present study deviates Lotka's law. Hence it is found that Lotkas' values are much more nearer when short form of author names are considered.

CONCLUSION

Quantitative study of science, and particularly bibliometrics, is a well-developed field of research with its own international community, international journals, conferences, institutes and research groups within universities and national research organizations. Large scale bibliometricresearches are mainly done using Science Citation Index (SCI), SCOPUS, PUBMED etc. All these databases have their own standards for rendering of the bibliographic elements like author, title, publication type, abstract, author address, references etc. The results of this study has shown that author productivity studies and the validation of Lotka's law varies due to the ambiguity of rendering of personal name of the authors. Also this has impact on other qualitative indicators like h-index since Thomsons Reuters calculates the H-index, G-index etc. Though there are solutions like Orcid, Researcheridetc for this, research can be carried out to direct the authors to convert the names into unique identifiers. Probably Ranganathan's cataloguing rules can solve this .

REFERENCES

1. Delgado-Osorio N et al (2014). Bibliometric assessment of the contributions of literature on Chagas disease in Latin America and the Caribbean. Recent Patents Antiinfective Drug Discov. Vol. 9(3). Pp.202-8.
2. González-Alcaide G, Salinas A, Ramos JM (2018) Scientometrics analysis of research activity and collaboration patterns in Chagas cardiomyopathy. PLoSNegl Trop Dis. Vol. 12(6).
3. http://www.who.int/news-room/fact-sheets/detail/chagas-disease-(american-trypanosomiasis)
4. https://www.cdc.gov/parasites/chagas/index.html
5. Kumaravel, J.P.S., A. Manoharan, B. Kanagavel, M. KarthiRajan and L. Mohamed Idhris. 2012. "Dr. S. R. Ranganathan's Canon of Prepotence applied to Bibliometrics leading to a new indicator - Prepotency index (PI)." Paper presented at 8th International Conference on Webometrics, Informetrics and Scientometrics (WIS) and 13th COLLNET Meeting in Seoul, Korea, October 23-26, 2012
6. Lawani, S.M. 1980. Quality, collaboration, and citations in cancer research: a bliometric study (PhD thesis). Florida: Florida State University
7. LOTKA, A.J. (1926), "The Frequency Distribution of Scientific Productivity", Journal of the Washington Academy of Science, Vol. 16 (12), pp. 317-323.
8. Muñoz J et al. (2007). Congenital Trypanosomacruziinfection in a non-endemic area. Trans R Soc Trop Med Hyg. Vol. 101. Pp.1161-1162.

9. Narin,Francis. (1976) Evaluative bibliometrics: The use of publication and citation analysis In the evaluation of scientific activity. Contract report to the National Science Foundation. USA.
10. Ramos et al (2011). Mapping of Chagas disease research: analysis of publications in the period between 1940 and 2009. Revista da SociedadeBrasileirade Medicina Tropical . Vol.44(6). Pp.708-716.
11. Schmunis GA and Yadon ZE(2010). Chagas disease, a Latin American health problem becoming a world health problem. Acta Trop. Vol.115. Pp.14-21

Dr. R. Natarajan
Assistant Professor,Dept. of Library & Information Science,Annamalai University.

S. Krishnakumar
Research Scholar ,Dept. . of Library & Information Science,Annamalai University.