BIBLIOMETRIC STUDY OF OBESITY RESEARCH OUTPUT DURING THE YEAR 2010-2014

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Abstract

Bibliometric is the type of research method; it is an emerging area of research in the Library and Information Science field. This paper discusses the bibliometric study of obesity research output during the year 2010-2014. This study mainly focused on the authorship pattern, citation analysis, Publication Efficiency Index, length of articles, relative growth rate, Distribution of year wise citation analysis, degree of collaboration, country wise distribution of publications, and time series analysis of total authored papers also.

Keywords: Degree of Collaboration, Authorship pattern, Collaborative Coefficient, Modified Collaborative Coefficient, Time Series Analysis.

Introduction

Bibliometric is the type of research method; it is an emerging area of research in the Library and Information Science field. The term "bibliometrics" is coined from two words "biblio" and "metrics". The word biblio is derived from the combination of a Latin and Greek word biblion-means a book or paper, metrics indicates the science of metre i.e. measurement. The study of Obesity, is one of the most pervasive, chronic diseases in need of new strategies for medical treatment and prevention. As a leading cause of United States mortality, morbidity, disability, healthcare utilization and health care costs, the high prevalence of obesity continues to strain the United States health care system.

OBJECTIVES OF THE STUDY

To calculate the year wise distribution of the publication

- To find put the growth of literature- Time series analysis and Relative growth rate and doubling time
- To examine the Exponential growth rate and Year wise authorship pattern of obesity research output
- To analysis on Single vs multi authors and degree of collaboration

- To examine the time series analysis of single authored articles and multi authored articles
- To evaluate the collaboration is indicated in obesity output and Lotka's law of author productivity
- To calculate the publication efficiency index and the source wise distribution of obesity publications
- To find out the institution wise distribution of publication on obesity in India

RESEARCH METHODOLOGY, LIMITATION OF THE STUDY

The methodology followed in this study, the Web of Science (WoS) data were searched for obesity records of papers. The data were collected from the WoS database for the periods 2010-2014 (Five years) in India. I can see that nearly 1212 bibliographic records of the Indian contributions in Obesity research. A total of 1212 records were downloaded and analyzed by using Histcite. The collected data have been analyzed with the Manual, Microsoft Excel Sheet and presented in the form of tables.

DATA ANALYZING AND INTERPRETATION

Table 1- Year wise distribution of publications

S. No	Years	Records	%	TLCS	TGCS
1	2010	179	14.8	240	4030
2	2011	208	17.2	195	2184
3	2012	265	21.9	121	1953
4	2013	285	23.5	81	1087
5	2014	275	22.7	6	438
Total		**1212**	**100**	**643**	**9692**

Table 1 shows that year wise distribution of publications on obesity research in India, during the period 2010 to 2014 (5 years) a total of publications 1212 were published. The highest number of publications 285 in the 2013 with 81 Total Local Citation Score (TLCS) and 1087 Total Global Citation Score (TGCS) and values was scaled and being a first position.

Table -2 Growth of Literature - Time Series Analysis

Year	No. Of Publications	X	X^2	Xy
2010	179	-2	4	-358
2011	208	-1	1	-208
2012	265	0	0	0
2013	285	1	1	285
2014	275	2	4	550
Total	**1212**		**10**	**269**

The straight line equation is applied to arrive at estimates for future growth under the Time Series Analysis.

Straight Line Y c= a+bX:

Since ∑x = 0

$a = \frac{\sum Y}{N} = \frac{1212}{5} = 242$ $b = \frac{\sum Y}{\sum X^2} = \frac{269}{10} = 26.7$

Estimated literature in 2020 is when X = 2020 – 2012 = 8

= 242+26.7 ×8 = 242 +213.6 = **455.6**

Estimated literature in 2025 is when X = 2025 – 2012 = 13

= 242 + 26.7 × 13 = 255 + 347.1 = **589.1**

The predicted value of literature output for the year 2020 is 455.6 and the predicted literature output for the year 2025 in 587.1.

On the application of formula of time series analysis and subsequently, from the results obtained separately from the results obtained for the years 2020 and 2025, it is found that the future trend of growth of research articles in obesity research India output may take on the increasing trend during the year to come. The inference from the calculations proved that the positive growth at the India level in the research literature output of obesity.

3- Relative Growth Rate and Doubling Time

Year	No. of Cont	Cum. no. of cont	W1	W2	R (a) W2-W1	Mean R (a) (1-2)	Doubling Time Dt (a)	Mean Dt (a) (1-2)
2010	179	179	-	5.19	-		-	
2011	208	387	5.34	5.96	0.62		1.12	
2012	265	652	5.58	6.48	0.9	0.51	0.77	0.95
2013	285	937	5.65	6.84	1.19		0.58	
2014	275	1212	5.62	7.10	1.42	1.31	0.49	0.54
Total						**0.91**		**0.75**

Cont - Contributions

Table 3 shows that the Relative Growth Rate of total contribution published had gradually increased. The Growth rate in 0.62 in 2011, which is increased up to 1.42 in 2014. The mean relative growth rate during the period 2010-2012 was 0.51 and it was increased during the year 2013-2014 is 1.31. The overall study period has witnessed a mean Relative Growth Rate in 0.91. In generally Relative Growth Rate of publications of all sources in obesity output has shown an increasing trend.

The Mean Doubling time during the period 2010-2012 is 0.95 and for 2013-2014 is 0.54. The overall study period has witnessed a Mean Doubling Time as 0.75. In generally Doubling Time of Publications of all sources in obesity output has shown a decreasing trend.

4 - Exponential Growth Rate

S.No	Year	Publications	Exponential Growth rate
1	2010	179	-
2	2011	208	1.16
3	2012	265	1.27
4	2013	285	1.08
5	2014	275	0.96
Total		**1212**	**4.47**

Table 4 shows that Exponential Growth Rate of publications in obesity during the period of 2010 to 2014 (5 years). The highest growth rate 1.27 was found during 2012 with 265 Publications. Followed by the year 2011 the growth rate is 1.16 with 208 publications. In the year 2013 the growth rate is 1.08 with 285 publications. The lowest growth rate 0.96 with 275 publications in the year 2014. It is also found that the Exponential Growth Rate was found to be 4.47 and average growth rate has positive value showing the increasing trend obesity research.

5 - Year wise Authorship pattern of Obesity research output

Authors	2010	2011	2012	2013	2014	Total	%	TA	%
Single author	10	11	6	26	9	62	5.12	62	0.79
Double authors	29	25	41	28	35	158	13.02	316	4.01
Three authors	35	35	42	48	40	200	16.50	600	7.62
Four authors	26	33	30	37	32	158	13.04	632	8.02
Five authors	20	97	38	34	45	164	13.53	820	10.41
Six authors	17	16	31	29	34	127	10.58	767	9.74
Seven authors	15	13	21	18	21	88	7.26	616	7.82
Eight authors	5	17	13	21	18	74	6.11	592	7.52
Nine authors	5	10	7	12	4	38	3.14	342	4.34
Ten authors	1	2	5	4	7	19	1.57	190	2.41
Above ten authors	16	19	31	28	30	124	10.23	2940	37.32
Total	**179**	**208**	**265**	**285**	**275**	**1212**	**100**	**7877**	**100**

TA – Total no. of Author

Table 5 examine that the authorship pattern is analyzed to determine the type of research and their percentage; it finds that the authorship pattern of obesity research in India during the period 2010-2014 value of the articles (1212), the highest number of records in the year 2013 produced by authors 285 records. The lowest record output in obesity observed in the year 2010 (179 records). Among this authorship pattern, the three authors collaboration output has been leading leveled, followed by two authored collaborations and four authored collaboration output leading leveled. Highest level of Total Authored papers is more than ten authors the value of 2940 (37.32).

6 - Single vs. Multi Authors

S .No	Authorship pattern	Publications	%
1	Single Author	62	05.12
2	Multiple Authors	1150	94.88
Total		**1212**	**100**

Table 6 shows that the distribution of single Vs. Multi authors of obesity research output. For the purpose of analysis, the researchers have classified the study two phase viz.,

first phase Single author and next phase Multi-authors. It is clear from the following that the Single author 5.12% and Multi authors (collaborative contributions) 94.88%.

7 - Single Vs Multi Authors and Degree of Collaboration

Year	Single Author		Multi Authors		Total	Degree of Collaboration
	No. of output	Percentage	No. of output	Percentage		
2010	10	16.13	169	14.70	179	0.94
2011	11	17.74	197	17.13	208	0.95
2012	6	9.68	259	22.51	265	0.98
2013	26	41.94	259	22.51	285	0.91
2014	9	14.52	266	23.13	275	0.98
Total	**62**	**100**	**1150**	**100**	**1212**	**4.76**

Table 7 shows that the degree of collaboration in obesity output during the period 2010-2014. The degree of collaboration is 4.76. The highest level of contribution produced in the single authored publication is 26 (41.94%) in the year of 2013. The highest level of contribution produced in the multiple authored publications 266 (23.13%) in the year of 2014.

8 - Time Series Analysis of Single Authored articles

Year	No. of Publications	X	X^2	Xy
2010	10	-2	4	-20
2011	11	-1	1	-11
2012	6	0	0	0
2013	26	1	1	26
2014	9	2	4	18
Total	**62**		**10**	**13**

The Straight line equation is applied to arrive at estimates for future growth under the time Series Analysis.

Straight Line Y c= a+bX:

Since $\sum x = 0$

$a = \frac{\sum Y}{N} = \frac{62}{5} = 12.4$ $\quad b = \frac{\sum Y}{\sum X^2} = \frac{13}{10} = 1.3$

Estimated literature in 2020 is when X = 2020 – 2012 = 8

= 12.4+ 1.3× 8 = **109.6**

Estimated literature in 2025 is when X = 2025 – 2012 = 13

= 12.4+1.3× 13 = 178.1

On the application of formula of time series analysis and subsequently, from the results obtained separately for the years 2020 and 2025, it is found that the future trend of growth may take a decreasing trend during the year to come. The inference is that there is a negative growth level of obesity output.

9 - Time Series Analysis of Multi- Authored articles

Year	No. Of Publications	X	X^2	XY
2010	169	-2	4	338
2011	197	-1	1	197
2012	259	0	0	0
2013	259	1	1	259
2014	266	2	4	532
Total	**1150**			**256**

The straight line equation is applied to arrive at estimates for future growth under the time Series Analysis.

Straight Line Y c= a+bX:

Since ∑x = 0

a = $\frac{\sum Y}{N} = \frac{1150}{5}$ = 230 b = $\frac{\sum Y}{\sum X^2} = \frac{256}{10}$ = 25.6

Estimated literature in 2020 is when X = 2020 – 2012 = 7

= 230+ 25.6 × 8= 2044.8

Estimated literature in 2025 is when X = 2025 – 2012 = 13

= 244.8 + 85.6 × 16= 3660.8

From the results of the Time Series, it is found that the trend of obesity research output by Multi authors' shows up an increasing trend and estimated in the year 2020 and the same trend may also be expected in 2025. Hence the inference is that the rate of growth is positive in co-authored publications of articles in obesity research.

Table:10 - Collaboration indices in obesity output

Years	1A	2A	3A	4A	5A	6A	7A	8A	9A	10A	11A	Total	CC	MCC
2010	10	29	35	26	20	17	15	5	5	1	16	179	0.56	0.57
2011	11	25	35	33	97	16	13	17	10	2	19	208	0.65	0.65
2012	6	41	42	30	38	31	21	13	7	5	31	265	0.73	0.74
2013	26	28	48	37	34	29	18	21	12	4	28	285	0.69	0.70
2014	9	35	40	32	45	34	21	18	4	7	30	275	0.73	0.74
Total	**62**	**158**	**200**	**158**	**164**	**127**	**88**	**74**	**38**	**19**	**128**	**1212**	**0.72**	**0.72**

The distribution of year wise Collaboration Coefficient (CC) and Modified Collaborative Coefficient (MCC) has been presented in the table. It is seen from the table that the value the Modified collaborative coefficient has been calculated with minimum of 0.57 (179) in the year 2010 and maximum of 0.74 (265) in the year 2012 and 0.74 (275) in the year 2014. Collaborative Coefficient has been calculated with minimum of 0.56 (179) in the year 2010 and maximum of 0.73 (275) in the year 2014.

Table:11 - Lotka's Law of Author productivity

x	Y	ΣX = log x	ΣY = log y	ΣX*Y	ΣX*X
1	62	0	4.13	0	0
2	316	0.69	5.76	3.97	0.48
3	600	1.10	6.40	7.04	1.21
4	632	1.39	6.45	8.97	1.93
5	820	1.61	6.71	10.74	2.59
6	767	1.79	6.64	11.89	3.20
7	616	1.95	6.42	12.52	3.80
8	592	2.1	6.38	13.40	4.33
9	342	2.19	5.83	12.77	4.84
10	190	2.30	5.25	12.08	5.29
11	21	2.39	3.04	7.27	5.71
12	6	2.48	1.79	4.44	6.15
13	18	2.56	2.89	7.40	6.55
14	12	2.64	2.48	6.55	6.97
15	13	2.71	2.56	5.76	7.34
16	8	2.77	2.08	5.76	7.67
17	3	2.83	1.11	3.11	8.01
18	4	2.89	1.39	4.02	8.35
19	6	2.94	1.79	5.26	8.64
20	3	2.99	1.10	3.29	8.94
21	5	3.04	1.61	4.89	9.24
22	5	3.09	1.61	4.97	9.55

23	2	3.14	0.69	2.17	9.86
24	3	3.18	1.10	3.50	10.11
25	1	3.22	0	0	10.37
27	2	3.29	0.69	2.27	10.82
30	1	3.40	0	0	11.56
35	1	3.56	0	0	12.67
40	1	3.69	0	0	13.62
41	1	3.71	0	0	13.76
42	1	3.74	0	0	13.99
44	1	3.78	0	0	14.28
57	1	4.04	0	0	16.32
65	1	4.17	0	0	17.39
67	1	4.20	0	0	17.64
140	1	4.94	0	0	24.40
300	1	5.70	0	0	32.49
375	1	5.93	0	0	35.16
Total	**5061**	**110.14**	**85.89**	**164.04**	**384.87**

$$n = \frac{N\sum XY - \sum X \sum Y}{N\sum X^2 - \left(\sum X\right)^2}$$

$$= \frac{38(164.04) - (110.14)(85.89)}{38(384.87) - (110{,}14)^2} = -1.293541959$$

Table 11 reveals that the application of Lotka's law with respect to author productivity of Obesity research output. It means that the collaborative authors' contribution is very high. It explains the fact that the tabulated value shows that observed author's value is more than expected value. Thus the present analysis clearly invalidates the Lotka's findings. In the present analysis, productivity is attributed to several factors. If a complete publications detail of an author is taken, the Lotka's law testing may present a different picture.

The productivity of the topic contribution of the selected Obesity research in India was verified to find the conformity with Lotka's inverse square law using Pao's (1985) method. This table 11 result shows that different number authors. The 'n' value as 1.29354 provides the value.

$$c = \frac{1}{[\sum_{1}^{p-1} \frac{1}{x^n} + \frac{1}{(n-1)\left(p^{n-1}\right)} + \frac{1}{2\,p^n} + \frac{n}{24\,(p-1)^{n+1}}]}$$

$$c = \frac{1}{3.360553445} = 0.297570033$$

Here 'n' is substituted with the value 2.2054 and 'c' is calculated as 0.6724 using the equation, while 'p' is assumed to be 20. By replacing the values of 'n' and 'c' in the above table difference is calculated.

Table - 12 Publication Efficiency Index

Year	Total no. of articles	Total no. of citations	ARPP	PEI
2010	179	4030	22.51	2.82
2011	208	2184	10.5	1.35
2012	265	1953	7.37	0.92
2013	285	1087	3.81	0.47
2014	275	438	1.59	0.20
Total	**1212**	**9692**	7.59	1.15

Table -12 describes the year wise Publications Efficiency Index (PEI). PEI has been calculated for the obesity publications. The highest PEI value is 2.82 (2010). The lowest PEI value is 0.20 (2014). The average PEI value is 0.99. And then the Average reference per publication is 7.59.

13 - Source wise distribution of Obesity Publications

S.NO	Source wise	Records	%	TLCS	TGCS
1	Article	949	78.3	524	7490
2	Review	144	11.9	114	2069
3	Meeting Abstract	66	5.4	0	0
4	Editorial Material	29	2.4	3	49
5	Letter	14	1.2	1	9
6	Article; Proceedings Paper	7	0.6	0	71
7	Article; Book Chapter	3	0.2	1	4
Total		**1212**	**100**	**643**	**9692**

Table 13 shows that the different type of documents captured Indian Scientist from Obesity research. The articles from journals captured top positions and jointed the fraternity of review. It is observed from the that articles from journals highest number of 949 (78.3%) publications. These articles covered 524 TLCS and 7490 TGCS. Followed by Review; 144 (11.9%) publications with 114 TLCS and 2069 TGCS. The next followed by Editorial

material 29 (2.4) publication with 3 TLCS and 49 TGCS. Then followed by Letter 14 (1.2%) publication with 1 TLCS and 9 TGCS, followed by Article; Proceeding paper 7 (0.6%) publications with 71 TGCS, and followed by remaining document types scored the lowest number of records Articles; Book chapter 3 (0.2) and 1TLCS; TGCS 4.

14 - Institution wise Distribution of Publications on Obesity in India (Top20)

S.NO	Name of the Institution	Records	%	TLCS	TGCS
1	All India Inst Med Sci	104	8.6	146	935
2	CSIR	35	2.9	26	208
3	Postgrad Inst Med Educ & Res	32	2.6	25	302
4	Publ Hlth Fdn India	32	2.6	33	543
5	Madras Diabet Res Fdn	31	2.6	35	389
6	Natl Inst Nutr	31	2.6	36	156
7	Indian Council Med Res	28	2.3	33	194
8	Indian Stat Inst	26	2.1	32	205
9	Univ Delhi	24	2	17	149
10	Diabet Fdn India	23	1.9	98	430
11	Fortis Hosp	20	1.7	73	291
12	Panjab Univ	18	1.5	7	111
13	Christian Med Coll & Hosp	17	1.4	10	115
14	London Sch Hyg & Trop Med	17	1.4	20	1380
15	Ctr Chron Dis Control	16	1.3	7	327
16	Fortis Escorts Hosp	16	1.3	44	325
17	Maharaja Sayajirao Univ Baroda	15	1.2	12	69
18	Univ Oxford	15	1.2	46	1590
19	Dr Mohans Diabet Special Ctr	14	1.2	11	95
20	Queensland Univ Technol	14	1.2	26	141

The research productivity of institutions may vary depending on their nature and involvement in research activities. So, there is a need to examine institution wise research output of obesity in India for the purpose of the empirical validation.

Table 14 shows that the most prolific institutions wise productivity of obesity India output. Among them all India Institution Medical Science the highest number of research publications 104 (8.6%) with Total local Citation Score (TLCS) 146 and Total global Citation Score (TGCS) 935 respectively. Followed the institute CSIR has 35 publications with 26 TLCS and 935 TGCS respectively. The two institutions were published 32 and above articles in obesity in India.

15 - Collaboration country wise Distribution of Publications (Top 20)

S.NO	Country	Records	%	TLCS	TGCS
1	India	1207	99.6	643	9684
2	USA	156	12.9	177	4119
3	UK	94	7.8	101	3280
4	Australia	42	3.5	63	2574
5	Peoples R China	41	3.4	49	1591
6	Canada	30	2.5	46	2007
7	Switzerland	23	1.9	45	1621
8	Brazil	22	1.8	35	1103
9	Japan	22	1.8	23	1500
10	Taiwan	20	1.7	14	570
11	Germany	17	1.4	23	2283
12	South Africa	17	1.4	30	480
13	South Korea	17	1.4	19	1156
14	Singapore	16	1.3	27	1356
15	Denmark	14	1.2	28	1845
16	Italy	14	1.2	26	2058
17	France	13	1.1	21	1409
18	Sweden	13	1.1	26	1989
19	Netherlands	12	1	17	1410
20	Mexico	11	0.9	25	303

The total number of Indian publications in obesity involved in 59 international collaboration during the period 2010 t0 2014, of which contribution of top 20 countries are listed in table 15 the largest contribution to international collaborative papers of India in obesity research comes from (99.6% share) it is dominated first position. Followed by the country United State America (12.9%) goes to second position, followed by United Kingdom (7.8%) goes to Tired position, followed by Australia (3.5%) goes to fourth position, followed by peoples R china (3.4%) goes to fifth position, followed by Canada (2.5%) goes to sixth position, followed by Switzerland (1.9%) goes to seventh position, followed by Brazil and Japan (1.8%) goes to eighth position, followed by Taiwan (1.7) goes to ninth position, followed by Germany, South Africa and South Korea (1.7) goes to tenth position, followed by Singapore (1.3%) goes to eleventh position, followed by Denmark and Italy (1.2) goes to Twelfth position, followed by France and Sweden (1.1) goes to Thirteenth position, Netherlands (1) goes to fourteenth position. Finally Mexico and other thirty nine countries (0.9%) goes to fifteenth position.

VIII. Finding and Conclusion

- This study finds out the year wise distribution of publications on obesity research in India, during the period 2010 to 2014 (5 years) a total of publications 1212 were published. The highest number of publications 285 in the 2013.
- This study analyzed the Relative Growth Rate in 0.91. Mean Doubling Time as 0.75. Exponential Growth Rate was found to be 4.47.
- The study finalized on the highest level of Total Authored papers is more than ten authors the value of 2940 (37.32).
- This study finds out the Single author 5.12% and Multi authors (collaborative contributions) 94.88%. The degree of collaboration is 4.76.
- This study identified the modified collaborative coefficient has been calculated with a maximum of 0.74 (265) in the year 2012 and 0.74 (275) in the year 2014. Collaborative Coefficient has been calculated with a maximum of 0.73 (275) in the year 2014.
- This study finds out the here 'n' is substituted with the value 2.2054 and 'c' is calculated as 0.6724 using the equation, while 'p' is assumed to be 20. By replacing the values of 'n' and 'c' in the above table difference is calculated.
- The average PEI value is 0.99. And then the Average reference per publication is 7.59. It is observed from the that articles from journals highest number of 949 (78.3%) publications.
- Among them all India Institution, Medical Science the highest number of research publications 104 (8.6%) with Total local Citation Score (TLCS) 146 and Total global Citation Score (TGCS) 935 respectively.

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