

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Library Philosophy and Practice (e-journal)

Libraries at University of Nebraska-Lincoln

January 2021

Lung Cancer Research in India and Iran: A Scientometric Study

Rabiya Mushtaq

University of Kashmir, India, rabiya.mushtaq15@gmail.com

Fayaz Ahmad Loan

University of Kashmir, India, fayazlib@yahoo.co.in

Follow this and additional works at: <https://digitalcommons.unl.edu/libphilprac>



Part of the [Library and Information Science Commons](#)

Mushtaq, Rabiya and Loan, Fayaz Ahmad, "Lung Cancer Research in India and Iran: A Scientometric Study" (2021). *Library Philosophy and Practice (e-journal)*. 4761.

<https://digitalcommons.unl.edu/libphilprac/4761>

Lung Cancer Research in India and Iran: A Scientometric Study

Rabiya Mushtaq

Research Scholar,

Centre of Central Asian Studies

University of Kashmir, Srinagar, J&K, (India)

E-mail: rabiya.mushtaq15@gmail.com

Dr. Fayaz Ahmad Loan,

Documentation Officer,

Centre of Central Asian Studies

University of Kashmir, Srinagar, J&K, (India)

E-mail: fayazlib@yahoo.co.in (Corresponding author)

ABSTRACT

The study aims to provide global research productivity on lung cancer with an in-depth analysis of the growth & development of India and Iran. The study focuses on the authorship collaborative patterns among Indian and Iranian medical scientists as well. The research started with the selection of terms on “Lung cancer”. Three terms- *Lung Cancer*, *Lung Neoplasm*, and *Pulmonary Neoplasm* were selected from the Medical Subject Headings (MeSH) to retrieve the data from the Web of Science (WoS). The Boolean Operator “OR” was executed to retrieve the records. The data related to Lung cancer research from 1989-2017 was retrieved and downloaded in the excel file after restricting the country to India and Iran. Later, *Microsoft Excel*, *STATA*, and *EViews* software were used to analyze the data. Three important means- *annual growth rate (AGR)*, *relative growth rate (RGR)*, and *Doubling Time (DT)* have been used to trace the development of literature from 1989 to 2017. Further, authorship patterns were analyzed using the authorship collaboration and collaborative coefficient methods. The findings of the study show that there is a strong and considerable relationship between the Gross Domestic Production (GDP) of nations and publication productivity. The annual growth rate is slow in the onset as compared to the later years, which is a positive sign of the improvement in the research productivity of India and Iran while as relative growth rate shows a decrease, doubling time shows an increasing trend in both nations towards the end of 2017. Authors prefer to work in collaboration rather than individually.

Keywords: Lung Cancer, Lung Neoplasm, Pulmonary Neoplasm, Research Productivity, Scientometrics, Bibliometrics

INTRODUCTION

Cancer is the most dangerous deadly disease in the world. Presently, it is one of the biggest challenges for the medical community to find its cure and decrease its damage. Cancer was the sixth major cause of death before a couple of decades and currently, it is the second major cause of death (Park, 2013). According to the National Cancer Institute (NCI, 2018):

- Cancer is one of the leading causes of death worldwide. In 2012, there were 14 million new cases and 8.2 million cancer-related deaths worldwide.
- It is expected that new cancer cases will rise to 22 million within the next two decades.
- More than 60% of the world's new cancer cases are reported in Africa, Asia, and Central and South America; 70% of the world's cancer deaths also occur in these regions.

According to the World Health Organization (WHO, 2018), "Cancer is a major cause of death worldwide, accounting for 8.8 million deaths in 2015. The most common causes of cancer death are cancers of:

- Lung (1 690 000 deaths)
- Liver (788 000 deaths)
- Colorectal (774 000 deaths)
- Stomach (754 000 deaths)
- Breast (571 000 deaths)

Cancer affects anybody irrespective of caste, creed, and colour, and gender and poses a great financial threat to families across the globe. According to the (World Cancer Research Fund International, 2012), "In the year 2012 about 14.1 million cancer cases have been reported around the world. Among which 7.4 million cases were in men and 6.7 million in women. According to International Agency for Research on Cancer (2018), "Lung cancer is dreadful cancer-causing death of a large fraction of population; it is responsible for nearly one in five (1.59 million deaths, 19.4% of the total) in the world". Smoking is considered to be the basic cause of this cancer and is responsible for about 85 percent all kinds of lung cancer. Therefore, lung cancer has been one of the prominent fields of research worldwide. In the context of Library and Information Science, the status of the research in a particular area of knowledge can be measured using scientometric study, as it is very useful to evaluate the intellectual output and to measure the research productivity. The term "Scientometrics" was introduced by Nalimov & Mulchenko in 1969 and defined it as "the science of measurement and analysis of science". Briefly, scientometrics is the application of quantitative methods,

which deals with the analysis of science viewed as an information process. The present study takes into consideration the scientometric analysis of Lung Cancer research in India and Iran.

REVIEW OF LITERATURE

Lung cancer research is a focus area of medical scientists worldwide and information scientists gauge the development continuously. Ho, Satoh, and Lin (2010) identified the bibliometric trends to map quantitatively the research trends in lung cancer in Japan using the Science Citation Index (SCI) from 1991 to 2008. The results revealed that high impact articles concerned with lung cancer have been published by researchers in Japan. There has been exponential growth in scientometric studies since its inception to identify and trace the research trends in various fields of science and technology. By using scientometrics as a tool for exploring cancer research, scholarly contents have been analyzed to a greater extent (Lewison & Roe, 2012). Chitra, Jeysankar, and Abu (2014) analyzed the research output on lung cancer in G7 and Brazil, Russia, India, and China (BRIC) nations by using the Scopus database and presented a comparative analysis using compound annual growth rate (CAGR) and collaboration coefficient. The authors concluded that G7 nations showed a decreasing trend for the last five years in lung cancer research whereas BRIC nations showed a significant growth both in terms of article count and their proportion. Gupta, Ahmad, Gupta, and Bansal (2016) analyzed the lung cancer research by using the Scopus database and from the year 2005 to 2014 and revealed that the United States (20.29%) is the highest contributor, followed by China (11.19%) and Japan (10.03%) respectively. The authors further included that the publications of India on lung cancer have increased from 143 in the year 2005 to 630 by the year 2014 with an annual growth rate of about 18.81%. Aggarwal et al. (2016) analyzed the position of lung cancer research globally and found that lung cancer research represented only about 5.6% of the total global output but has marked an increase of 1.2% since 2004. The authors further revealed that although lung cancer imposes a large burden in terms of social aspects; economically the extent of global research output is not up to the mark. The present study is also a step forward to analyze the research productivity of India and Iran in the field of lung cancer.

RESEARCH DESIGN

a) Objectives

1. To identify the prominent nations globally contributing to the research productivity of lung cancer;
2. To identify the annual growth rate, relative growth rate, and doubling time of the lung cancer literature in India and Iran; and
3. To identify the collaborative authorship patterns of Indian and Iranian authors in lung cancer using authorship collaboration and collaborative coefficient.

b) Hypothesis

To signify a sound relationship between publication count and GDP, the following hypotheses were formulated.

H₀: There is no relation between the number of publications and the GDP of a nation.

H₁: There is a significant relationship between the number of publications and the GDP of a nation.

c) Methodology

The research started with the selection of the terms. Three terms- *Lung Cancer*, *Lung Neoplasm*, and *Pulmonary Neoplasm* were selected from the Medical Subject Headings (MeSH) to retrieve the data from the Web of Science (WOS) maintained by the Thomson Reuters. The Boolean Operator "OR" was executed to retrieve records. The data related to lung cancer research from 1989-2017 was retrieved and downloaded in the excel file. The records of India and Iran were retrieved by restricting the country to India and Iran respectively. Later, the *STATA* and *Eviews* software were used to analyze the data.

To identify the correlation between GDP and lung cancer publication, Karl Pearson's Correlation coefficient was calculated for the publication count and GDP.

$$r = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum(x_i - \bar{x})^2} \sqrt{\sum(y_i - \bar{y})^2}}$$

It is found the coefficient of correlation is, $r = 0.95$, i.e. GDP and Publications are highly correlated using the *STATA* software. However to test whether this coefficient is significant or not the T-test was applied which is given by:

$$t = \frac{r\sqrt{n-2}}{1-r^2}$$

After making use of *STATA* and cross-checked in *EViews*, it is found that the above coefficient ($r = 0.95$) is significant at a 1% level of significance. With $p = 0.01$, the null

hypothesis is rejected and it is concluded that GDP and Publication are correlated at 1% level the more budget on health and research activities resulting in more number of research publications. In order, to understand the growth and development of literature on lung cancer annual growth rate, relative growth rate, and doubling time values are calculated.

Annual Growth Rate can be calculated by using the formula:

$$[(\text{Last Value} - \text{Initial Value}) \div \text{Initial Value}] 100$$

Relative Growth Rate (RGR) can simply be defined as the increase in the number of articles or pages per unit of time. The mean relative growth rate over a specific time interval can be calculated as follows:

Relative Growth Rate (RGR)

$$1 - 2R = \frac{\log W_2 - \log W_1}{T_2 - T_1}$$

Whereas

1-2 R- mean relative growth rate over the specific period

$\log_e W_1$ - log of the initial number of articles

$\log_e W_2$ - log of the final number of articles after a specific period

$T_2 - T_1$ - the unit difference between the initial time and the final time

Here a year is taken as the unit of time.

Doubling time is calculated by $0.693/R$.

Furthermore to understand the nature (extent and pattern) of authorship degree of collaboration and collaborative coefficient are calculated.

Degree of collaboration

C = Degree of collaboration

N_M = Number of multi-authored papers

N_S = Number of single-authored papers

$$C = \frac{N_M}{(N_M + N_S)}$$

To understand the nature of authorship in the two nations collaborative coefficient (CC) has been calculated as recommended by **Ajiferuke (1988)** for both nations

$$CC = 1 - \frac{\sum_{j=1}^k \left(\frac{1}{j}\right) f_j}{N}$$

F_j = the number of authored papers

N = total number of research published; and

k = the number of authors per paper

F_j = the number of authored papers

DATA ANALYSIS

1. Ranking of Countries

The top ten countries contribute 89.77% of the total research productivity whereas rest of the countries contributes 10.23% only. The USA (151,903; 35.75%) leads the list in the publication productivity on lung cancer followed by the Peoples Republic of China (48,897; 11.51 %), Japan (40591; 9.55%), UK (27,230; 6.40%) and Germany (25,720; 6.05%) respectively. India stands at 15th (7475; 1.76%) position and Iran (1715; 0.40%) at 34th position (Table 1). The spiral of the top ten countries shows that there is wide difference between contribution of the USA and other countries (Fig. 1).

Table 1: Position of India and Iran

Rank	Nation	Publication	Percentage	GDP [Billion US\$ at Constant Prices 2010]
1	USA	151,903	35.75	17348.63
2	China	48,897	11.51	10131.87
3	Japan	40,591	9.55	6141.36
4	United Kingdom	27,230	6.40	2818.70
5	Germany	25,720	6.05	3883.87
6	Italy	23,252	5.47	2120.57
7	France	20,945	4.93	2875.31
8	Canada	17,262	4.06	1868.16
9	South	14,124	3.32	1345.95

	Korea			
10	Spain	12,746	3.00	1509.75
15	India	7,475	1.76	2660.37
34	Iran	1716	0.40	560.88

Source: GDP obtained from World Development Indicators (As per 2017 data)

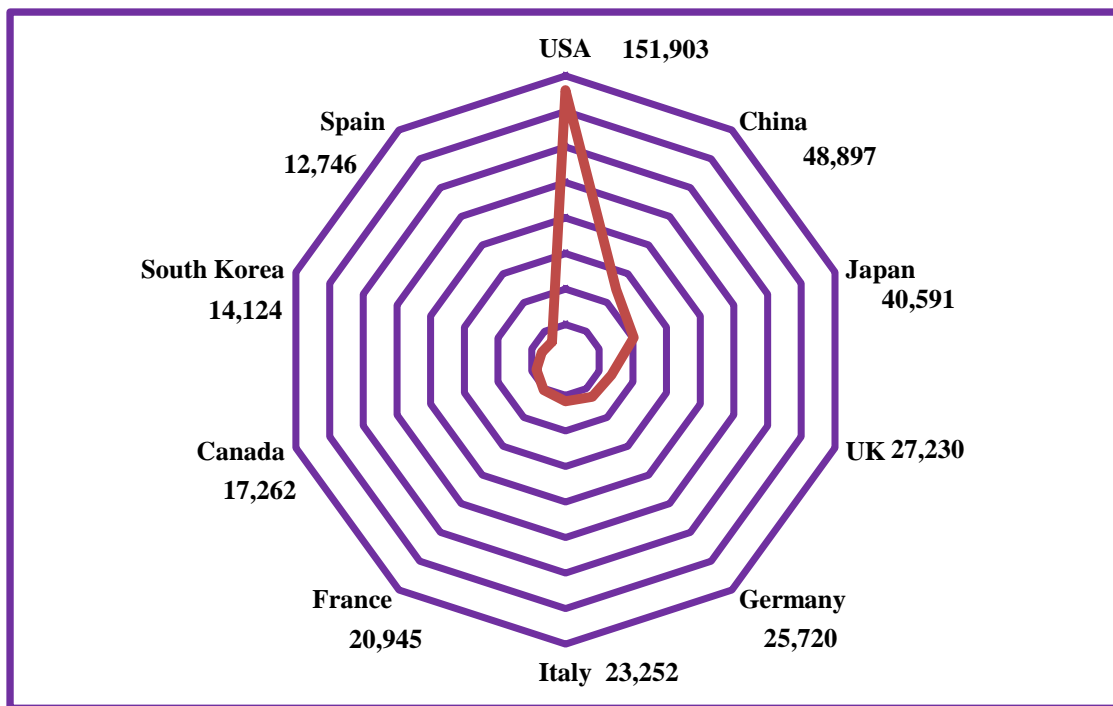


Fig 1: Spiral of Countries in Lung Cancer Research

2. Annual Growth Rate

It is evident that India published 7475 publications pertaining to lung cancer from 1989 to 2017 whereas 1715 publications were published from Iran. Both the countries have started with the modest beginning in 1989 and later accelerate their contribution annually and the highest number of publications in recent years (Table 2). The annual growth rate of the literature shows fluctuations in literature growth from 1989 to 2017 in both nations. India has progressed positively whereas Iran has witnessed a negative or decreasing trend in the initial years; however, over the period of time the increasing trend is evident in the literature. The fluctuations in the literature growth can be most probably due to uneven publishing activity of the nations.

Table 2: Annual Growth Rate in India and Iran

India	Iran
-------	------

Year	Publications	Cumulative	Annual Growth Rate	Publications	Cumulative	Annual Growth Rate
1989	30	30	0	2	2	-
1990	31	61	3.3	0	2	-
1991	34	95	9.7	0	2	-
1992	30	125	-11.8	2	4	-
1993	47	172	56.7	1	5	-50
1994	43	215	-8.5	2	7	100
1995	46	261	6.10	1	8	-50
1996	36	297	-21.7	3	11	200
1997	36	333	0	1	12	-67
1998	34	367	-5.6	7	19	600
1999	53	420	55.8	1	20	-86
2000	46	466	-13.2	4	24	300
2001	63	529	36.9	3	27	-25
2002	81	610	28.6	6	33	100
2003	81	691	0	10	43	67
2004	135	826	66.7	10	53	0
2005	156	982	15.6	30	83	200
2006	168	1150	7.7	26	109	-13
2007	220	1370	30.10	49	158	88
2008	276	1646	25.5	59	217	20
2009	332	1978	20.3	74	291	25
2010	392	2370	18.1	71	362	-4
2011	479	2849	22.2	121	483	70
2012	539	3388	12.5	125	608	3
2013	603	3991	11.8	146	754	17
2014	714	4705	18.4	184	938	26
2015	835	5540	16.9	191	1129	4
2016	918	6458	9.9	262	1391	37
2017	1017	7475	10.8	325	1716	24

3. Relative Growth Rate (RGR) and Doubling Time (Dt)

In India, the RGR is found to exhibit the highest value of 0.71 and the lowest of 0.10. Year-wise calculated values of RGR for India depict that year 1989 has the highest RGR of 0.71 however, later shows a decreasing trend dipping as low as 0.10 for the years 1998 and 2000. The current RGR isn't encouraging as at the end of 2017, its value is 0.14. The RGR of Iran shows a fluctuating trend over the years, the least RGR of Iran is in the year 1999 of 0.05 and the highest value of RGR is 0.69 in the year 1992. In 2017, it shows a value of 0.21. Doubling time (Dt) is also showing a fluctuating trend for both nations. India has experienced the highest Doubling time in the years 1998 and 2000 of 6.93 and for Iran, its highest for the year 1999 showing a value of 13.86 but both nations have experienced an increase in Dt by the end of 2017 as compared to 1989 (Table 3).

Table 3: Relative Growth Rate (RGR) and Doubling Time (DT)

Year	India						Iran					
	Output	Cumulative	W ₁	W ₂	RGR	DT	Output	Cumulative	W ₁	W ₂	RGR	DT
1989	30	30	-	3.40	-	-	2	-	-	0.69	-	-
1990	31	61	3.40	4.11	0.71	0.97	0	2	0.69	0.69	0	-
1991	34	95	4.11	4.55	0.44	1.57	0	2	0.69	0.69	0	-
1992	30	125	4.55	4.82	0.27	2.56	2	4	0.69	1.38	0.69	1.00
1993	47	172	4.82	5.14	0.32	2.16	1	5	1.38	1.60	0.22	3.15
1994	43	215	5.14	5.37	0.23	3.01	2	7	1.60	1.94	0.34	2.03
1995	46	261	5.37	5.56	0.19	3.64	1	8	1.94	2.07	0.13	5.33
1996	36	297	5.56	5.69	0.13	5.33	3	11	2.07	2.39	0.32	2.16
1997	36	333	5.69	5.80	0.11	6.3	1	12	2.39	2.48	0.09	7.7
1998	34	367	5.80	5.90	0.10	6.93	7	19	2.48	2.94	0.46	1.5
1999	53	420	5.90	6.04	0.14	4.95	1	20	2.94	2.99	0.05	13.86
2000	46	466	6.04	6.14	0.10	6.93	4	24	2.99	3.17	0.18	3.85
2001	63	529	6.14	6.27	0.13	5.33	3	27	3.17	3.29	0.12	5.77
2002	81	610	6.27	6.41	0.14	4.95	6	33	3.29	3.49	0.20	3.46
2003	81	691	6.41	6.53	0.12	5.77	10	43	3.49	3.76	0.27	2.56
2004	135	825	6.53	6.71	0.18	3.85	10	53	3.76	3.97	0.21	3.3
2005	156	982	6.71	6.88	0.17	4.07	30	83	3.97	4.41	0.44	1.57
2006	168	1150	6.88	7.04	0.16	4.33	26	109	4.41	4.69	0.28	2.47
2007	220	1370	7.04	7.22	0.18	3.85	49	158	4.69	5.06	0.37	1.87
2008	276	1646	7.22	7.40	0.18	3.85	59	217	5.06	5.37	0.31	2.23
2009	332	1978	7.40	7.58	0.18	3.85	74	291	5.37	5.67	0.3	2.31
2010	392	2370	7.58	7.77	0.19	3.64	71	362	5.67	5.89	0.22	3.15
2011	479	2849	7.77	7.95	0.18	3.85	121	483	5.89	6.18	0.29	2.38
2012	539	3388	7.95	8.12	0.17	4.07	125	608	6.18	6.41	0.23	3.01
2013	603	3991	8.12	8.29	0.17	4.07	146	754	6.41	6.62	0.21	3.3
2014	714	4705	8.29	8.45	0.16	4.33	184	938	6.62	6.84	0.22	3.15
2015	835	5540	8.45	8.61	0.16	4.33	191	1129	6.84	7.02	0.18	3.85
2016	918	6458	8.61	8.77	0.16	4.33	262	1391	7.02	7.23	0.21	3.3
2017	1017	7475	8.77	8.91	0.14	4.95	325	1716	7.23	7.44	0.21	3.3

4. Authorship Patterns**a) Authorship Collaboration**

It is clear from the data that single authorship is the least choice of medical scientists in both nations in 28 years as less than 3% of the publications have been authored by a single author in both countries. The degree of collaboration of both countries is very high, *i.e.* (0.98 for Iran and 0.97 for India). The findings are in tune with earlier studies like Karisiddappa, Maheswarappa & Shirol (1990), Bandyopadhyay (2001), and Biradar & Tadasad (2015) found similar results in Psychology, Mathematics, and Economics as well.

Table 4: Degree of Author Collaboration

Authorship	India		Iran	
	Number of Publications	Percentage	Number of Publications	Percentage
Single	218	2.92	40	2.33
Two	688	9.20	129	7.52
Three	602	8.05	111	6.47
More than Three	5967	79.83	1436	83.68

$$C(\text{India}) = 7257/7475$$

$$C(\text{Iran}) = 1676/1716$$

$$C(\text{India}) = 0.97$$

$$C(\text{Iran}) = 0.97$$

b) Collaborative Coefficient.

$$CC(\text{India}) = 1 - \left[\frac{(218 \times \frac{1}{1}) + (688 \times \frac{1}{2}) + (602 \times \frac{1}{3})}{7475} \right]$$

$$CC(\text{India}) = 0.89$$

Similarly, for Iran

$$CC(\text{Iran}) = 0.91$$

The value of the collaboration coefficient (CC) is above 0.50, *i.e.* (0.89 for India and 0.91 for Iran). This also confirms that both nations prefer multiple authorship patterns. Singh (2017) also calculated the same value for the biotechnology research in India and found that there is a great tendency of Indian authors towards multi-authorship.

CONCLUSION

The findings of the study show that there is a strong and considerable relationship between the Gross Domestic Production (GDP) of nations and publication productivity. The annual growth rate is slow in the onset as compared to the later years which is a positive sign of the

improvement in the research of the two nations while as relative growth rate shows a decrease, doubling time shows an increasing trend in both nations towards the end of 2017. Authors like to work in collaboration rather than single authorship. This is an indication that multi-authorship and multi-disciplinary research is prevalent among the medical scientists of India and Iran to find a solution to an acute disease for the betterment and healthy life of the world community.

REFERENCES

- Aggarwal, A., Lewison, G., Idir, S., Peters, M., Aldige, C., Boerckel, W., Boyle, P., Sullivan, R. (2016). The State of Lung Cancer Research: A Global Analysis. *Journal of Thoracic Oncology*, 11(7), 1040-1050
- Bandyopadhyay, A.K. (2001). Authorship Pattern in Different Disciplines. *Annals of Library and Information Studies*, 48(4), (139-147). Retrieved from: <http://nopr.niscair.res.in/bitstream/123456789/17909/1/ALIS%2048%284%29%2013%209-147.pdf>
- Biradar, N., & Tadasad, P.G. (2015). Authorship Pattern and Collaborative Research in Economics. *Journal of Indian Library Association*, 51(4), 21-39. Retrieved from: <https://www.ilaindia.net/jila/index.php/jila/article/view/22>
- Chitra, V., Jeysankar, R., Abu, K.S. (2014). Lung Cancer Research in G7 and BRIC Countries: A Comparative Analysis by Scientometric Method. *International Journal of Advanced Library and Information Science*, 2(1):72-81.
- Devi, M. B. (2013). Lokta's law revisited in toxicology literature. *Library Philosophy and Practice*. Retrieved from: <http://digitalcommons.unl.edu/libphilprac/1019>
- Ho, Y. S., Satoh, H. and Lin, S. Y. (2010) Japanese lung cancer research trends and performance in Science Citation Index. *Internal Medicine*, 49(20):2219-28. Retrieved from <http://dx.doi.org/10.2169/internalmedicine.49.3687>; Pmid: 20962440
- International Agency for Research on Cancer (2018). *Estimated Cancer Incidence, Mortality and Prevalence Worldwide*. Retrieved from: http://globocan.iarc.fr/pages/fact_sheets_cancer.aspx

- Karisiddappa, C.R. Maheswarappa, B.C. and Shirol, M.V (1990). Authorship Pattern and collaborative research in psychology. *IASLIC Bulletin* .35(2), 73-78.
- Lewison, G. & Roe, P. (2012). The evaluation of Indian cancer research, 1990–2010. *Scientometrics*, 93(1), 167-181.
- Nalimov, V.V. & Mul'chenko, Z.M. (1989). Study of science development as an information process. *Scientometrics*, 15, 33–43.
- Ritu, G., Ahmad, K.K., Gupta, B.M, and Bansal, M. (2016). Lung Cancer in India: A Scientometric Study of Publications during 2005–14. *International Journal of Medicine and Public Health*, 6(4), (201-208). Retrieved from: <http://www.ijmedph.org/sites/default/files/10.5530ijmedph.2016.4.11.pdf>
- Singh, K.P., Bebi, (2014). Application of Bradford's Law on journal citations: A study of Ph.D. theses in social science of university of Delhi. *Annals of Library and Information Studies*, 61, 112-120.

About the authors

*Rabiya Mushtaq is a PhD Scholar at the Centre of Central Asian Studies, University of Kashmir, Jammu & Kashmir (India), where she conducts research on “**Research Productivity of the Medical Scientists in the field of Oncology: A Scientometric Study of India and Iran**” So far, she has published more than 11 research papers in international and journals, five book chapters and conference/seminar papers.

**Dr. Fayaz Ahmad Loan is Documentation Officer at the Centre of Central Asian Studies, University of Kashmir, Jammu & Kashmir (India), where he conducts research on different aspects of library and information science. He is the life member of Indian Library Association (ILA), Indian Association of Special Libraries and Information Centres (IASLIC) and few other national associations. So far, he has published more than 40 research papers in international and journals, ten book chapters in edited books, thirteen conference/seminar papers and four newspaper/magazine articles. He has also completed two research projects in the field of library and information science. Fayaz Ahmad Loan can be contacted at: fayazlib@yahoo.co.in