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Contributions by Women Faculties of Physics from Select Institutions of Delhi : A Scientometrics Study

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ABSTRACT

The present study aims to bring out the contribution of women faculty in the discipline of Physics in select institutions of Delhi. The study covers a total of 44 women faculties and their 802 publications during the period of 2011-2015 collected from various sources. The study presents a scientometrics analysis of 463 journal articles. The study focuses on authorship pattern, research interest areas, most productive authors, most used journals etc. The study indicates that multi-authored papers were dominated. Ratnamala Chatterjee from IIT Delhi found to be the most productive author and *Journal of Applied Physics* is the most preferred journal. CSIR-National Physical Laboratory was leading institution in publishing journal articles (145). It was noticed that majority of women authors preferred to be the second author while writing the paper jointly.

Keywords: Scientometrics; Women faculties; Physics; Collaborative Coefficient

1. INTRODUCTION

Women are an important section of the academic workforce, more particularly in the science and technology domain. Department of Science and Technology (DST) Govt. of India launched 'Women Scientists Scheme (WOS)' during 2002-2003. This initiative primarily aimed at providing opportunities to women scientists and technologists. In 2014, DST has restructured all the women specific programmes under one umbrella known as knowledge involvement in research advancement through nurturing (KIRAN). KIRAN is addressing various issues related with women scientists (e.g. unemployment, relocation) and aimed to provide opportunities in research (WOS-A), technology development/demonstration (WOS-B), and self-employment (WOS-C), etc[1].

The study is an attempt to analyse the trends and growth of research publications among the women faculties/scientists in select institutions of Delhi and to shed light on their contributions. It was found during the study that the number of women faculties is less in comparison to male faculties.

2. LITERATURE REVIEW

Several bibliometric and scientometrics studies have been done in the past all over the world in every discipline. In India several studies have been conducted in scientometrics on faculties and scientist's research outputs. Garg and Kumar[2] have conducted a study on women scientists in life sciences in India during 2008-2009. They analysed 9,957 papers published by Indian scientists and did a comparative study of contributions of male and female scientists. They found that only 340 articles were contributed by female scientists exclusively and 4,671 were jointly by male and female scientists. The study supports that female contribution is less as compare to male scientists. Another study was conducted by Radhakrishnan and Velmurugun[3] on the contributions made by faculty members of Periyar University, India, during 1998-2014. The study focused on publishing trends, authorship pattern, their TLCS, TLCR and so on. Also, a study by Hasan[4], *et al.* found no significant difference in the contributions made by the male and female research scholars of CSIR. Sotudeh and Khoshian[5] studied performance of male and female scientists in terms of their output and impact in the discipline of nano science and technology and found that women perform equally well as their men counter parts in terms of output and impact. Gupta[6], *et al.* in their study analyses India's performance in science and technology (S&T), using publications data and different quantitative and qualitative measures. Its focuses on India's global publication share, growth rate, citation quality, international collaborative publications share, its publication share and distribute on in various broad and narrow subjects using 15 years data from the Scopus. The study suggests the need to increase the pace of Indian scientific research and also improve its quality compared with other developed and developing countries.

Senthil kumar and Ulaganathan[7] analysed the Astrophysics research output in India from the year 1989-2014. The findings of the study revealed that the highest number of publications is in 2013 with 913 records having a global citation score 4342 and local citation score of 324.The study shows that major source of publication in Astrophysics research comes in the form of articles. Nagarkar[8], *et al.* conducted a research on

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the papers published by faculty of life sciences by Savitribai Phule Pune University, India during 1999-2013. The study found that the research productivity of faculty members is increasing, their publications are getting good citations and thereby their journals have better impact factor. Jeyamala and Balasubramainan[9] conducted a research on nuclear physics during 1999-2013 globally. They found that collaborative author's contribution is very high in Nuclear Physics.

3. OBJECTIVES

(i) To identify the faculties by gender and different forms of publications by women authors;
(ii) To make year-wise distribution of journal articles and conference papers and to identify the authorship pattern;
(iii) To know the main research interest areas/specialisations of authors and preferred position of women authors in the sequence of authors in papers written jointly with male scientists;
(iv) To identify the most productive women authors and their highly cited research papers;
(v) To know the year-wise break-up of journal articles in Indian and foreign journals, to identify the country-wise distribution of journal articles and distribution of journals by country of origin;
(vi) To make a rank list of most preferred journals.

4. METHODOLOGY

The data collected from individual scientists/faculties working in the concerned institutions for five years from 2011 to 2015. It included the curriculum vitae (CV) of the women faculties downloaded from the institute websites and some faculties have sent their CVs to the corresponding author by mail. Other sources that were made use included Web of Science, Research Gate, Google Scholar and Annual Reports of the institutes. The most difficult task of any bibliometric/ scientometrics study is to identify the gender/sex of the authors in papers authored, as bibliographic databases do not provide the gender/sex information of the authors. To overcome this problem, authors prepared the profiles and faculty list of the Physics departments and then separated the male and female faculties/scientists to see the strength of women faculty in each department. The authors have prepared a list of women faculties/scientists for each department included in the study. The authors have tried to collect all the journal and conference publications published during 2011-2015. For that purpose different sources have been used for data collection because all publications have not been covered by any single source. It includes journal articles, conference papers, books, chapters in book, monographs, invited talks/lectures, patents, research projects and research guidance. All the bibliographic details of publications were filled in Excel sheets and analysed as per the requirements of the study.

5. RESULTS AND ANALYSIS

5.1 Distribution of Faculty by Gender

Table 1 presents the list of seven institutions which were included in the study along with their staff strength in terms of male and female faculties. It clearly indicates that out of 300 faculty only 44 (14.7%) are women faculties/scientists. Data presented in Table 1 indicates that number of women faculty varied between 2 and 15. Highest number of women strength was found in CSIR-National Physical Laboratory and lowest in Jamia Millia Islamia.

5.2 Distribution of Publication Sources

From the Table 2, it is observed that the total publications are 802 for the period of 5 years. It includes journal articles, conference papers, and other resources. It can be seen that number of journal articles are highest form of publications in comparison to other forms. Study cover 463 publications published by these women faculty in academic journals during 2011-2015.

5.3 Year-wise Distribution

Year-wise distribution of publications is an important indicator of publications productivity of an Institution. The total year-wise productivity of seven institutions for five years is represented chronologically in Table 3. It can be seen that 2015 is the most productive year i.e. 144 (24.3%) in publication of journal articles and conference papers collectively followed by 2014 with 132 (22.3%) publications. Institution-wise analysis shows that University of Delhi is the leading institution among seven institutes with 168 (28.3%) publications followed by CSIR-National Physical Laboratory with 158 (26.6%) in both-Journal articles and Conference papers.

5.4 Authorship Pattern

Table 4 presents the data on the pattern of authorship of conference papers and journal articles. It is seen that only a miniscule number of papers both for conference and journal

Table 1. List of Institutions of faculty by gender

Name of University/Institute	Faculty strength	Women faculty	Percentage
CSIR-National Physical Laboratory (NPL)	145	15*	10.3
Department of Physics and Astrophysics, University of Delhi (DU)	50	8	16
Department of Physics, IIT Delhi	42	5	11.9
Department of Applied Physics, Delhi Technological University (DTU)	20	7	35
School of Physical Sciences, Jawahar Lal Nehru University (JNU)	19	3	15.7
Department of Physics, Jamia Millia Islamia (JMI)	18	2	11.1
University School of Basic and Applied Sciences, IP University (IPU)	6	4	66.7
Total	300	40	14.7

*working in Physics field only

Table 2. Distribution of publication sources

Forms	Publications	Percentage
Journal articles	463	57.8
Conference papers	130	16.3
Invited talks/lectures	152	18.9
Research Guidance (PhD)	31	3.9
Research projects	22	2.7
Books	1	0.1
Chapters in book	1	0.1
Monographs	1	0.1
Patents	1	0.1
Total	802	100

articles are single authored. Of the 463 journal articles only 2 are single authored and remaining 461 have been authored by two or more authors. Similar pattern have been observed for conference papers where six papers were single authored and rest 124 are two or more authored. Highest proportion of journal papers have been authored by more than five authors, while in case of conference publications highest proportion of papers is three authored. It indicates that physics research performed at these institutions is highly collaborative.

5.5 Collaborative Coefficient

This measure examines the strength of co-authorship. Different authors have suggested different measures for measuring the strength of collaboration. Lawani[10] suggested Collaborative Index (CI), while Subramanyam[11] suggested Degree of Collaboration (DC). Ajiferuke[12] pointed out the inadequacy in these two measures and suggested Collaborative Coefficient (CC), which incorporates some of the merits of these two measures. This measure is based on fractional productivity defined by Price and Beaver[13] and is given by the formula given as follows:

$$CC = 1 - \frac{\sum_{j=1}^{k} (1/j) F_j}{N}$$

Here F_j denotes the number of j authored research papers, N denotes total number of research papers published and k is the greatest number of authors per paper. According to Ajiferuke[12], CC tends to zero as single authored papers dominate and to 1-1/j as j-authored papers dominate. This implies that higher the value of CC, higher the probability of multi-authored papers.

Table 4. Authorship pattern of publications

No. of authors	Journal articles	%	Conference papers	%
single	2	0.4	6	4.6
Two	86	18.6	34	26.2
Three	98	21.2	38	29.2
Four	74	15.9	14	10.8
Five	74	15.9	10	7.7
Six	49	10.5	10	7.7
Seven	40	8.64	6	4.6
Eight	14	3.0	3	2.3
Nine	9	1.9	4	3.1
Ten	6	1.3	-	-
More than 10	11	2.2	5	3.9
Total	463	100	130	100

To determine the CC of journal articles and conference papers numbers of authors are calculated as shown in Table 4 during 2011-2015.

CC for Journal articles,

$$CC = 1 - \left(\frac{\begin{array}{l} \frac{1}{1}x2 + \frac{1}{2}x86 + \frac{1}{3}x98 + \frac{1}{4}x74 + \frac{1}{5}x74 + \frac{1}{6}x49 \\ + \frac{1}{7}x40 + \frac{1}{8}x14 + \frac{1}{9}x9 + \frac{1}{10}x6 + \frac{1}{11}x3 + \frac{1}{15}x2 \\ + \frac{1}{17}x1 + \frac{1}{18}x2 + \frac{1}{31}x1 + \frac{1}{46}x1 + \frac{1}{56}x1 \end{array}}{463} \right)$$

CC=0.7217

CC for Conference papers,

$$CC = 1 - \left(\frac{\begin{array}{l} \frac{1}{1}x6 + \frac{1}{2}x34 + \frac{1}{3}x38 + \frac{1}{4}x14 + \frac{1}{5}x10 + \frac{1}{6}x10 \\ + \frac{1}{7}x6 + \frac{1}{8}x3 + \frac{1}{9}x4 + \frac{1}{15}x1 + \frac{1}{19}x4 \end{array}}{130} \right)$$

CC=0.6939

Table 3. Year-wise distribution of journal articles and conference papers

Year	DU	DTU	IPU	JMI	JNU	IIT	NPL	Total
2011	27 (7)	4 (3)	0 (1)	0	8 (6)	21 (4)	21 (2)	81 (23) (17.5%)
2012	20 (7)	4 (1)	4 (6)	1 (0)	7 (4)	12 (2)	24 (3)	72 (23) (16.0%)
2013	34 (3)	9 (6)	4 (1)	4 (0)	8 (1)	18 (5)	22 (3)	99 (19) (19.9%)
2014	31 (8)	11 (13)	2 (1)	3 (0)	7 (2)	13 (3)	37 (1)	104 (28) (22.3%)
2015	21 (10)	12 (15)	2 (2)	4 (0)	3 (1)	24 (5)	41 (4)	107 (37) (24.3%)
Total	133 (35) (28.3%)	40 (38) (13.1%)	12 (11) (3.9%)	12 (0) (2.1%)	33 (14) (7.9%)	88 (19) (18.1%)	145 (13) (26.6%)	463 (130) (100%)

The calculation is based on 463 journal articles and 130 conference papers published by women scholars in collaboration with their male colleagues during 2011-2015. The value of CC indicates here that multi-authorship is dominating in both the publications-journal articles and conference papers. Hence, it can be said that authors preferred to work in collaboration rather than individual.

5.6 Research Interest Areas/Specialisations

Table 5 represents the research areas and specialisations of women faculties and it can be inferred that majority of faculties research interest area is condensed matter physics. Out of 44, 11 women faculties are working in the area of condensed matter physics. The other areas were engineering physics, materials science, molecular physics and nuclear physics.

Table 5. Research interest/specialisations areas.

Research areas/specialisations	Faculties/ scientists	Percentage
Condensed matter physics	11	25.0
Engineering physics	2	4.6
Experimental physics	2	4.6
Materials science	2	4.6
Molecular physics	2	4.6
Nuclear physics	2	4.6
Other research areas	23	52.2
Total	**44**	**100**

5.7 Preferred Position of Women Authors

In this study an attempt has been made to analyse the place of authorship when writing research papers jointly. Table 6 indicate that out of 463 journal articles, the women authors were as first author in 70 (15.2%) publications, as second author in 137 (29.6%) publications, as third author in 95 (20.5%) publications, and so on. The remaining places were from 6 to 53rd author of publications. It can be inferred that Institution wise National Physical Laboratory's women authors have preferred to write articles as a first author than other positions and same in IP University. But as the analysis shows they have preferred to be second author of publications that is highest in number of publications.

5.8 Rank List of most Productive Women Authors

As shown in Table 7, it was found that in seven institutions there were 44 women faculties and out of them, the study reveals that Ratnamala Chatterjee is the most productive author with 54 publications followed by S. Annapoorni with 33, Ranjana Mehrotra with 27 and Amarjeet Kaur with 26 publications in journal articles.

5.9 Highly Cited Research Papers where Women Authors Collaborated

Appendix A represents 10 highly cited research papers of women authors. The highest citations received by paper are 120. Out of 10, five papers are written by Amita Chandra as a co-author, University of Delhi. The least number of citations listed in the table received by a paper are 44. The analysis of distribution of citations cited by Indian journals and foreign journals, it was found that these papers received maximum citations from foreign journals. Out of 10, only 4 papers received citations in Indian journals but very less e.g. one citation out of 120 citations and so on.

5.10 Year-wise Break-up in Indian and Foreign Journals

The analysis of year-wise break-up of journal articles reveals that out of 463 journal articles, only 47 (10.1%) were published in Indian journals and rest 416 (89.9%) articles in Foreign journals. So a big difference can be seen from Table 8 that women faculties collaboratively are publishing their research work in International journals more in comparison to Indian journals. It is a co-incidence that consecutively in three years-2011, 2012 and 2013 each, there were 08 articles published in Indian journals. In both Indian journals and foreign journals 2015 is the most productive year in publication of articles.

5.11 Country-wise Distribution

Table 9 presents the data on countries of publications of journal articles. It was found in the analysis that total 14 countries were involved in publishing of articles, of which USA origin leading with 169 (36.5%) publications, followed by Netherlands with 112 (24.2%) and UK with 100 (21.6%). Rest 10 countries shares publications between 16 to one. It can be observed from the analysis that Institution-wise National Physical Laboratory is leading with 44 publications from USA followed by University of Delhi (50) and IIT with 39.The other

Table 6. Preferred position of women authors

Place of Author	DU	DTU	IPU	JMI	JNU	IIT	NPL	Total (per cent)
First Author	11	12	3	0	1	6	37	70 (15.2)
Second Author	48	11	7	5	6	29	31	137 (29.6)
Third Author	22	12	0	2	13	13	33	95 (20.5)
Fourth Author	17	1	0	0	4	13	24	59 (12.7)
Fifth Author	17	4	1	3	8	12	10	55 (11.8)
Other Positions (6-53)	18	0	1	2	1	15	10	47 (10.2)
Total	133 (28.6%)	40 (8.5%)	12 (2.4%)	12 (2.4%)	33 (7.0%)	88 (19.0%)	145 (32.1%)	463 (100)

Table 7. Rank list of most productive women authors (Journal articles)

Author	Affiliation	Publications	Percentage	Rank
Ratnamala Chatterjee	IIT, Delhi	54	11.7	1
S. Annapoorni	University of Delhi	33	7.1	2
Ranjana Mehrotra	NPL, Delhi	27	5.8	3
Amarjeet Kaur	University of Delhi	26	5.6	4
Nita Dilawar	NPL, Delhi	21	4.5	5
Anjana Dogra	NPL, Delhi	18	3.9	6
Amita Chandra	University of Delhi	18	3.9	7
Rupmanjari Ghosh	JNU, Delhi	17	3.7	8
Poonam Arora	NPL, Delhi	15	3.2	9
Shyama Rath	University of Delhi	14	3.0	10
Tanuja Mohanty	JNU, Delhi	14	3.0	10
Vandana	NPL, Delhi	14	3.0	10
Jyoti Rajput	University of Delhi	13	2.8	11
Poonam Silotia	University of Delhi	13	2.8	11
Rishu Chaujar	DTU, Delhi	13	2.8	11

countries China, Switzerland, Japan, Singapore, South Korea, Canada, Saudi Arabia, Spain and Taiwan.

5.12 Distribution of Journals by Country of Origin

Table 10 analysed that journals originating from 14 different countries were involved in publishing 198 journals in which authors have published their 463 articles. Of these, highest numbers of journals are from USA, followed by UK, Netherlands, India and Germany. The other countries China, Switzerland, Japan, Singapore, South Korea, Canada, Saudi Arabia, Spain and Taiwan.

5.13 Rank List of Most Preferred Journals

The rank list of 15 most preferred journals is as listed in Table 11. Out of 198 journals, *Journal of Applied Physics* has published the highest number of articles i.e. 36 (7.8%) followed by *Applied Physics Letters* with 18 (3.9%) publications. It was found during the analysis that out of 198 journals, 112 journals with single publication. Hence, the journal *Journal of Applied Physics* dominates by occupying first rank and it can be said most preferred also by women faculties/scientists.

6. FINDINGS AND CONCLUSIONS

The major findings of the study are drawn on the basis of analysis done during the period of 2011-15

- It is identified during the study that 300 faculties were found in the seven institutions in Delhi, among which only 44 are women faculties. Highest number of women strength is from CSIR-National Physical Laboratory and lowest in Jamia Millia Islamia.
- It is noteworthy to mention that among sources of publications, highest research output is published in the form of journal articles.
- It is found that 2015 is the most productive year with 107 articles (23.1%) in physics and CSIR-National Physical Laboratory was leading institution in publishing journal articles with 145 articles.
- Of the 463 journal articles only 2 were single authored and rest 461 have been authored by two or more authors. Similar pattern have been observed for conference papers where six papers were single authored and rest 124 are two or more authored. The value of CC, 0.7217-Journal articles and 0.6939 for Conference papers also indicates that physics research performed at these institutions is highly collaborative.

Table 8. Year-wise break-up of journal articles in Indian and Foreign journals

Year	Indian journals	Foreign journals	Total
2011	08	73	81
2012	08	64	72
2013	08	91	99
2014	11	93	104
2015	12	95	107
Total	47 (10.1%)	416 (89.9%)	463 (100%)

Table 10. Countries of origin of journals

Origin of Country	No. of Journals
USA	59
UK	50
Netherlands	47
India	20
Germany	6
Other 9 countries	16
Total	198

Table 9. Country-wise distribution of journal articles

Country	DU	DTU	IPU	JMI	JNU	IIT	NPL	Total (per cent)
USA	50	10	5	2	19	39	44	169 (36.5)
Netherlands	37	5	3	3	4	19	41	112 (24.2)
UK	31	9	2	3	9	19	27	100 (21.6)
India	6	10	1	2	1	2	25	47 (10.2)
Germany	6	2	0	0	0	4	4	16 (3.4)
Other 9 Countries	3	4	1	2	0	5	4	19 (4.1)
Total	133 (28.6%)	40 (8.5%)	12 (2.4%)	12 (2.4%)	33 (7.0%)	88 (19.0%)	145 32.1%)	463 (100)

Table 11. List of most preferred journals

Name of Journal	IF (2015)	Articles	Percentage	Rank
Journal of Applied Physics	2.101	36	7.8	1
Applied Physics Letters	3.142	18	3.9	2
MAPAN-Journal of Metrology Society of India	0.634	11	2.3	3
Materials Chemistry and Physics	2.101	09	1.9	4
RSC Advances	3.289	08	1.7	5
Pramana	0.692	08	1.7	5
Physical Review C	3.146	08	1.7	5
Journal of Alloys and Compounds	3.014	08	1.7	5
AIP Advances	1.444	08	1.7	5
Journal of Materials Science	2.302	07	1.5	6
Journal of Magnetism and Magnetic Materials	2.357	07	1.5	6
Applied Surface Science	3.150	07	1.5	6
Applied Physics A	1.694	07	1.5	6
Physics Letters A	1.677	06	1.3	7
Journal of Photochemistry and Photobiology B Biology	3.035	06	1.3	7

- It was noticed that majority of women authors preferred to be the second author while writing the paper jointly.
- It is commendable to state that Ratnamala Chatterjee (IIT, Delhi) has got first position among the most prolific authors with 54 journal publications.
- It is found that amongst highly cited papers, a paper written as a co-author by Amita Chandra (University of Delhi) received 120 highest citations. Of which only one citation in Indian journal and rest 119 citations received in foreign journals.
- The 463 articles published in journals originated from 14 countries with USA as the leading country with 169 (36.5%) publications and these publications appeared in 198 journals, of which 59 were published from USA. Among 198 journals the most preferred journal was *Journal of Applied Physics* (USA).

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REFERENCES

1. Department of Science and Technology, Women Scientists Programs. http://www.dst.gov.in/scientific-programmes/scientific-engineering-research/women-scientists-programs (Accessed on 15-01-2017)
2. Garg, K.C. & Kumar, S. Scientometric profile of Indian scientific output in life sciences with a focus on the contributions of women scientists. *Scientometrics*, 2014, **98**, 1771-1783.
3. Radhakrishnan, N. & Velmurugan, C. Scholarly Publications by the Faculty members of Periyar University, Salem, India: A Scientometric approach. *Library Philosophy and Practice (e-journal)*, 2015, 1324.
4. Hasan, S.A.; Sharma, M.K.; Khilnani, S. & Luthra, R. Research productivity of female research scholars and their migration pattern in pursuit higher education and research. *Current Science*, 2012, **103**, 611–612.
5. Sotudeh, H. & Khoshian, N. Gender differences in science: The case of scientific productivity in nano science and technology during 2005–2007. *Scientometrics*, 2013. doi:10.1007/s11192-013-1035-7.
6. Gupta, B.M.; Bala, Adarsh & Kshitig, Avinash, S&T Publications Output of India: A Scientometric Analyses of PublicationsOutput, 1996-2011. *Library Philosophy and Practice* (e-journal). 2013. Paper 921.http://digitalcommons.unl.edu/libphilprac/921
7. Senthilkumar, R., & Ulaganathan, G. (2016) Scientometric Analysis of Astrophysics Research Output in India 26 years. *J. Lib. Info. Sci.*, 2016, **6**(1), 1-10.
8. Nagarkar, S.P.; Chaitayana Veer & Kumbhar, R. Bibliometric Analysis of Papers Published by Faculty of Life Science Departments of Savitribai Phule Pune University during 1999-2013. *DESIDOC J. Lib. Info. Technol.*, 2015, **35**(5), 368-375.
9. Jeyamala, B. & Balasubramainan, P. Research publication output in 'Nuclear Physics': A Scientometric Analysis. *J. Adv. Lib. Info. Sci.*, 2016, **5**, (2), 124-131.
10. Lawani, S.M. Quality, Collaboration and Citations in cancer reseach: A 268 bibliometric study. *Ph.D. Dissertation*, Florida State University,1980, p395.
11. Subramanyam, K. Bibliometric studeis of research collaboration: A review. *J. Info. Sci.*, 1983, **6**, 33-38.
12. Ajiferuke, I., Burrel, Q. & Tague, J. Collaborative coefficient: A single measure of the degree of collaboration in research. *Scientometrics*, 1988, **14**, 421-433.
13. Price, D. De Solla & Beaver, D. De B. Collaboration in an invisible college. *American Psychologist*, 1966, **21**, 1011.

CONTRIBUTORS

Dr Bebi obtained her BLIS, MLIS, MPhil (LIS) and PhD (LIS) from, DLIS, University of Delhi, Delhi. She also obtained MA (Political Science) from University of Delhi. Presently, she is a Post-Doctoral Fellow (UGC- Dr. S. Radharkrishnan Post-Doctoral Fellowship in Humanities and Social Sciences) in the Department of Library and Information Science, University of Delhi, Delhi. Her area of expertise includes Electronic Resources, Bibliometrics, Scientometrics and related areas.
Contribution in the current study: collection of data, analysis of data, manuscript writing and revision of manuscript.

Dr Shailendra Kumar has done his PhD in Library and Information Science, he got his Master degree in LIS and B.Sc. from University of Delhi. He is presently working as Associate Professor in DLIS, University of Delhi. He served also IGNOU, CSIR and INSA at Delhi. He has to his credit more than 75 publications and five books. He has delivered more than 130 invited lectures at various universities and conferences. His interest areas are Library and Information Management Softwares, E-Learning and Scientometrics.
Contribution in the current study: conceptualisation, guidance, suggestions and corrections in the manuscript.

Appendix

Highly cited research papers where women authors collaborated

Details of authors and their affiliations	Citations	Citations in IJ*	Citations in FJ*
Avanish Pratap Singh[1,2], Parveen Garg[1,2], Firoz Alam[1], Kuldeep Singh[1] , R.B. Mathur[1], R.P. Tandon[2], **Amita Chandra[2]**, S.K. Dhawan[1] [1]CSIR-National Physical Laboratory, New Delhi;[2]Department of Physics and Astrophysics, University of Delhi *CARBON* 50 (2012), 3868-3875	120	1	119
N. Piro[1], F. Rohde[1], C. Schuck[1], M. Almendros[1], J. Huwer[1], **Joyee Ghosh[2]**, A. Haase[1], M. Hennrich[1], F. Dubin[1], J. Eschner[1,3]. [1]ICFO, Spain; [2]IIT, Delhi; [3]Universitat des Saarlandes, Germany *Nature Physics* 7 (2011), 17-20	101	0	101
Avanish Pratap Singh[1,2], Monika Mishra[1], **Amita Chandra[2]**, S K Dhawan[1]. [1]CSIR-National Physical Laboratory, New Delhi; [2]Department of Physics and Astrophysics, University of Delhi *Nanotechnology* 22 (2011), 465701	96	2	94
Avanish Pratap Singh[1,2], Bipin Kumar Gupta[1], Monika Mishra[1], Govind[1], **Amita Chandra[2]**, R.B. Mathur[1], S.K. Dhawan[1]. [1]CSIR-National Physical Laboratory, New Delhi; [2]Department of Physics and Astrophysics, University of Delhi *CARBON* 56 (2013), 86-96	94	3	91
Shubhda Srivastava, Kiran Jain, Vidya Nand Singh, S K Singh, Vijayan Narayanasamy[1], **Nita Dilawar**, Govind Gupta, T D Senguttuvan. CSIR-National Physical Laboratory, New Delhi *Nanotechnology* 23 (2012)	93	0	93
SK Srivastava, D Kumar, **Vandana**, Mukul Sharma, Ravi Kumar, PK Singh. CSIR-National Physical Laboratory, New Delhi *Solar Energy Materials and Solar Cells* 100 (2012), 33-38	87	0	87
Deepak K Jangir[1], Sonika Charak[1], **Ranjana Mehrotra[1]**, Suman Kundu[2]. [1]CSIR-National Physical Laboratory, New Delhi; [2]Department of Biochemistry, (South Campus) University of Delhi *Journal of Photochemistry and Photobiology B Biology*105 (2011), 143-148	69	0	69
Avanish Pratap Singh[1], Monika Mishra[1], Daniel P. Hashim[2], T.N. Narayanan[3], Myung Gwan Hahm[4], Pawan Kumar[1], Jaya Dwivedi[1], Garima Kedawat[5], Ankit Gupta[1], Bhanu Pratap Singh[1], **Amita Chandra[6]** [1]CSIR-National Physical Laboratory, New Delhi; [2]Rice University, USA ; [3]TIFR, Hyderabad, India; [4]Korea Institute of Material Science, Republic of Korea; [5]Department of Physics, University of Rajasthan, India; [6]Department of Physics and Astrophysics, University of Delhi *CARBON*85 (2015), 79-88.	53	0	53

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