Comparative Evaluation of Research Output: AIIMS Vs PGIMER

Har Kaur and Preeti Mahajan*

Medical College & Hospital, Sector 32, Chandigarh

*Dept of library & Information Science, Panjab University, Chandigarh
E-mail: harkaur@rediffmail.com; ipreeti2001@yahoo.com

ABSTRACT

Health care is one of the field in which constant research is going on. Research has been amplified in the last decade. The main objective of this paper is to compare the quality of research output of the two high profile health care institutions of North India—All India Institute of Medical Science, New Delhi and Post Graduate Institute of Medical Education and Research, Chandigarh. The study has been conducted using *Scopus* citation database. In this paper, research output of these institutions during 1999-2008 has been compared in the form of growth of publication, rank of various subjects, further citations of these publications has been observed to check the quality of the research using three year window in addition to the *h*-index as well as the International collaboration of publications (ICP). Except difference in total number of publications, growth, rank, quality and ICP all are almost the same. Difference in number of publications can be due to the limitations of the study and duration of establishment of these institutes. Earlier, due to paucity of means to gauge the quality of the research, it was not possible to observe the quality of the research. Hence, an effort has been made to create awareness amongst the medical fraternity about the quality check of their research, which is now possible through these citation databases.

Keywords: All India Institute of Medical Science, Post Graduate Institute of Medical Education and Research

1. INTRODUCTION

Research is defined as human activity based on intellectual application in the investigation of matter. It includes gathering of data, information, and facts for the advancement of knowledge. Easy availability of e-resources and e-databases has amplified the research today. It is increasing at such a high speed that sometimes quality of research gets ignored. Hence, the quality check of research is the need of the hour. One study estimated that there are 40,000 journals for the sciences and that the researchers are filling those journals at the rate of one article every 30 seconds, 24 hours a day and seven days a week. In gauging the quantity and quality of research, citation databases have been playing an important role. Two main world-wide interdisciplinary S&T bibliographical databases, namely, *Web of Science* and *Scopus* are currently being used worldwide. In this paper, quality and quantity of two high quality, health care institutes, namely, All India Institute of Medical Sciences (AIIMS), New Delhi and Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh has been discussed.

1.1 All India Institute of Medical Sciences

The AIIMS was established as an institution of national importance by an Act of Parliament with the objects to develop patterns of teaching in undergraduate and post graduate medical education in all its branches so as to demonstrate a high standard of medical education in India; to bring together in one place educational facilities of the highest order for the training of personnel in all important branches of health activity; and to attain self-sufficiency in post-graduate medical-education. The Institute provides comprehensive facilities for teaching, research and patient-care. Teaching and research are conducted in 42 disciplines. In the field of medical research, AIIMS leads, having more than 600 research publications (national and international) by its faculty and researchers in a year[1].

1.2 Post Graduate Institute of Medical Education and Research

The PGIMER, inaugurated in 1962, was originally under the Government of undivided Punjab. After the

reorganisation of the state, the administrative control of the institute passed on to the Union Territory of Chandigarh in November 1966. The Institute became an autonomous body under the Act of Parliament in 1967 functioning under the Ministry of Health and Family Welfare, Government of India. It undertakes research in the areas of tuberculosis, malaria, leprosy, diarrhoea, fertility control, family planning, blindness, cancer, community health, parasitic diseases, tetanus, preventable oral diseases, child health and nutrition, etc. A unique feature of research at this Institute is the establishment of the Department of Experimental Medicine which helps various clinical departments to have an in-depth research at the level of molecular biology and basic sciences to correlate with the various clinical problems, e.g., hypertension, coronary artery disease, rheumatic heart diseases, mal-absorption, etc. The research output of PGIMER has been incredible and has found recognition at the various national and international forums. Every year more than 500 research papers (national and international) are published in national and international journals. A number of departments of PGIMER have been designated as research centres by WHO and various national agencies[2].

2. LITERATURE REVIEW

Some relevant studies have been undertaken on the evaluation of the research output of different institutions of India. Ranking of institutions has also been done. Jeevan, & Gupta[3], studied the profile of a research university, with a view to get an idea about the performance and impact of research produced in each department, and has also compared the impact of research in various departments. Nagpaul[4] in his paper has analysed the pattern of cooperation links among fifty most prolific institutions in India. His study described that the network of relationships among these institutions is sparse and more than two third of the cells in the collaboration matrix are empty. The network is centralised, but no institution dominates the network. It is only a set of few institutions that dominate the network. He has graphically depicted the network of relationships among these institutions above a certain threshold of cooperation strength. The block model indicated the isolation and marginality of certain clusters (or blocks) of institutions.

Kumbar[5], et al. described the growth, contribution and impact of research carried out by the scientists of University of Mysore in science and technology. Their study indicated the patterns of communication of university scientists and also studied the extent of concentration and scattering of their research output in different journals. They have analysed the strong and weak areas of university research, their growth rate and impact in terms of average citations received. They also studied the output and impact of research under different existing subject and departments of the university. They further analysed the international collaborative share of research output at the overall level as well as across various subjects.

Gupta[3] et al. have analysed top pharmaceutical institutes of Inida. Their study showed that they have witnessed a major shift in their rankings measured on the basis of four indicators, viz. total papers publication output, impact in terms of average citations received per paper, h-index value and performance indicator p-index. According to their study, IICT, Hyderabad tops the list in terms of all for indicators i.e. quantity of papers, quality of papers, h-index and p-index. The 2nd rank is achieved by CDRI, Lucknow by publishing 845 papers, NCL, Pune by achieving the impact of 7.30 citations per paper, UIPS-PU, Chandigarh by scoring h-index value of 36 and NIPER, Mohali registered the p-index of 9.36. Their study concluded that although there are several ranking methods used in literature for comparison, but the authors of this communication have based the ranking on quantitative parameters such as the number of raw count of papers (P), qualitative parameters (such as mean citation rate (C/P)), and a combination of both quantitative and qualitative parameters (such as h-index and p-index). The authors leave it to the readers to decide which method is the best and most suitable in their own environment.

However, the present study would compare the quality and quantity of the research output of two high profile medical institutes of India.

3. OBJECTIVES

The main focus of the study is to analyse:

- Publication share of the top most productive eight subjects of PGI and AIIMS

- Growth of publications during the period 1999-2008

- Rank of these subject during the years 1999-03 and further 2004-08

- Quality and quantity of the research work through citations and h-Index, and

- International collaboration of both the institutes during the same period.

4. MATERIALS AND METHODS

This study is based on the publication output as indexed by Scopus database for the period 1999-2008. The study uses 10 years publications data from 1999 to 2008. In addition, it used citations data for measuring quality and visibility of these institutions research output. Three years citations window has been used for computing the quality of the research.

5. LIMITATIONS

As both the institutes have many subjects/ departments under their control, only eight most productive subjects for their publications reflected in *Scopus* database have been considered for this study, without considering human resource, clinical activities, patient's burden and courses offered and budget allocated to a particular subject/department.

6. DISCUSSIONS

6.1 Subject-wise Publications

6.1.1 AIIMS

As reflected in *Scopus* database, most productive 8 subjects of AIIMS have contributed 9838 number of papers during 1999-2008 with total citations of 20995, so average contribution of papers of a subject is 1229 papers. Only one subject, i.e. Medicine, has contributed more than average papers with a total contribution of 6737 papers. Second is Biochemistry with 1216 papers which are quite near to the average contribution as shown in Table 1.

6.1.2 PGIMER

Whereas most productive 8 subjects of PGI have contributed 5552 papers with total citations 11439 during 1998-2008. Similar to AIIMS, only one subject, i.e., Medicine, has contributed more than average papers and Biochemistry has contributed near average (Table 2).

6.2 Subject-wise Growth of Publications

6.2.1 AIIMS

Growth of publications of AIIMS for these subjects can be seen in Table 3. Overall the growth rate from 1999-03 to 2004-2008 is 36.62 per cent. Highest growth rate is of Dentistry with 64.29 per cent, followed by Neurology with 50.60 per cent, Immunology 47.69 per cent, Biochemistry with 42.69 per cent, Medicine 35.48 per cent, Public Health 32.60 per cent, Pharmacology 8.99 per cent and Physics has negative growth, i.e., 6.12 per cent.

Publications growth of all these subjects has improved during 1999-2008. It is very clear from Table 3 that during 2004-2008, all the subjects have contributed more papers than during 1999-2003 except one subject, i.e., Physics, which has contributed 52 papers during 1999-2003 and 49 papers during 2004-2008. All the subjects contributed almost double papers during 2004-2008 than 1999-2003 except Pharmacology which has shown very little growth with 243 papers during 1999-03 and 267 papers during 2004-2008.

6.2.2 PGIMER

Growth of publications of these subjects in PGIMER can be seen in Table 4 with total growth of 32.06 per cent. Maximum growth is of Nursing with 85 per cent followed by Dentistry with 52.17 per cent, Public Health with 48.21 per cent, and Medicine with 35.73 per cent, and

Table 1. Subject-wise publications of AIIMS

Subject	TP 1999-03	TC 1999-03	TP 2004-08	TC 2004-08	TP 1999-08	TC 1999-08
Medicine	2642	7179	4095	7580	6737	14759
Biochemistry	443	7179	773	8341	1216	1550
Pharmacology	243	889	267	626	510	1515
Neurology	165	566	334	669	499	1065
Immunology	161	566	307	690	468	1256
Public health	80	194	118	150	198	344
Physics	52	226	49	131	101	357

Table 2. Subject-wise Publications of PGIMER

Subject	TP 1999-03	TC 1999-03	TP 2004-08	TC 2004-08	TP 1999-08	TC 1999-08
Medicine	1579	3684	2457	3902	4036	7586
Biochemistry	225	708	337	712	562	1420
Immunology	130	447	189	680	319	1127
Pharmacology	150	351	131	350	281	701
Public Health	29	101	56	86	85	187
Neurology	119	206	93	146	212	352
Dentistry	11	6	23	15	34	21

Table 3. Subject-wise growth of publications of AIIMS

Subjects	TP 1999-03	TP 2004-08	TP 1999-08	Growth rate
Medicine	2642	4095	6737	35.48
Biochemistry	443	773	1216	42.69
Pharmacology	243	267	510	8.99
Neurology	165	334	499	50.60
Immunology	161	307	468	47.56
Public Health	80	118	198	32.20
Physics	52	49	101	-6.12

Table 4. Subject-wise growth of publications of PGIMER

Subjects	TP 1999-03	TP 2004-08	TP 1999-08	Growth rate %
Medicine	1579	2457	4036	35.73
Biochemistry	225	337	562	33.23
Immunology	130	189	319	31.22
Pharmacology	150	131	281	-14.50
Public Health	29	56	85	48.21
Neurology	119	93	212	-27.96
Dentistry	11	23	34	52.17

Biochemistry with 33.25 per cent, and Immunology with 31.22 per cent. Unlike AIIMS, PGIMER has two subjects with negative growth. These include-Neurology (27.96 per cent) and Pharmacology (14.50 per cent). When we see the growth of publications of PGI for all these subjects, similar to AIIMS a good growth can be seen for all the subjects except Neurology and Pharmacology. These two subjects have contributed fewer papers during 2004-2008 than during 1999-2003.

6.3 Subject-wise Rank of Publications

6.3.1 AIIMS

If the rank of these subjects of AIIMS during 1999-2003 and during 2004-2008 is analysed, all the subjects have maintained the same rank except few subjects like Pharmacology which has lost by two ranks as it was at 3rd rank during 1999-2003 and 5th rank during 2004-2008. Immunology has also gained 1 rank during 2004-2008.

Similarly, Dentistry has lost one rank during 2004-2008 as it shows 7th rank during 1999-2003 and 8th during 2004-2008 (Table 5).

6.3.2 PGIMER

As far as the rank position of PGIMER for the same subjects is concerned. Medicine, Biochemistry, Public Health, and Neurology has maintained their rank during 1999-2008, i.e., 1st, 2nd, 5th & 6th respectively. Immunology and nursing has gained their rank positions from 4th during 1999-2003 to 3rd rank during 2004-2008. Nursing has also gained one rank from 8th to 7th during 2004-2008. Rest of the two subjects which have lost one rank during 2004-2008 are Pharmacology and Dentistry. Hence, we can say that the rank positions like growth of publications showed not much difference for these institutions (Table 6).

Table 5. Subject-wise rank of publications of AIIMS

Subjects	TP 1999-03	TC 1999-03	TP 2004-08	TC 2004-08	TP 1999-08	TC 1999-08	Rank 1999-03	Rank 2004-08
Medicine	2642	7179	4095	7580	6737	14759	1	1
Biochemistry	443	7179	773	8341	1216	1550	2	2
Pharmacology	243	889	267	626	510	1515	3	5
Neurology	165	566	334	669	499	1065	4	3
Immunology	161	566	307	690	468	1256	5	4
Public Health	80	194	118	150	198	344	6	6
Physics	52	226	49	131	101	357	7	8

Table 6. Subject-wise rank of publications of PGIMER

Subjects	TP 1999-03	TC 1999-03	TP 2004-08	TC 2004-08	TP 1999-08	TC 1999-08	Rank 1999-03	Rank 2004-08
Medicine	1579	3684	2457	3902	4036	7586	1	1
Biochemistry	225	708	337	712	562	1420	2	2
Pharmacology	130	447	189	680	319	1127	4	3
Neurology	150	351	131	350	281	701	3	4
Immunology	29	101	56	86	85	187	6	6
Public Health	119	206	93	146	212	352	5	5
Physics	11	6	23	15	34	21	7	8

Table 7. Subject-wise _h_-index of publications of AIIMS

Subjects	TP 1999-08	TC 1999-08	_h_-Index
Medicine	6737	14759	48
Biochemistry	1216	1550	32
Pharmacology	510	1515	25
Neurology	499	1065	20
Immunology	468	1256	25
Public Health	198	344	14
Physics	101	357	14

6.4 Subject-wise _h_-index of Publications

6.4.1 AIIMS

The quantity of the research can be seen from number of papers these subjects have contributed. Similarly, we can see the quality of these research papers through _h_-index. Total _h_-index of these subjects is 186 and the average _h_-index is 23. Four subjects have higher _h_-index than the average. Rest of the subjects with lower _h_-index than the average includes neurology, Public Health, Physics and Dentistry as is shown in Table 7.

6.4.2 PGIMER

The quality of the research papers as seen through _h_-index for PGIMER, it is almost same as that of AIIMS. Four subjects have higher _h_-index than the average and rest 4 has lower _h_-index. Total _h_-index of these subjects is 128 and average _h_-index is 16 (Table 8). Hence, the _h_-index status of both the instiutions is almost the same.

6.5 Subject-wise International Collaboration of Publications

6.5.1 AIIMS

Using the _Scopus_ database, the research collaboration of these two institutes with other countries was also noted. It was seen that 1113 ICP papers have been contributed by these top most productive subjects of

Table 8. Subject-wise _h_-index of publications of PGIMER

Subjects	TP 1999-08	TC 1999-08	_h_-index
Medicine	4036	7586	35
Biochemistry	562	1420	19
Immunology	319	1127	21
Pharmacology	281	701	19
Public Health	85	187	11
Neurology	212	352	14
Dentistry	34	21	5

AIIMS, out of which Medicine has contributed 665 papers which itself is more than 50 per cent. Second contribution is from Biochemistry which has contributed 208 papers. Immunology is at number 3 with a contribution of 109 papers. Rest of the subjects has contributed almost same number of papers. Major contribution for ICP is from Medicine, followed by Biochemistry and Immunology respectively. If we compare the total papers and ICP shares, then immunology has contributed 23.3 per cent. Similarly, Physics has contributed 18.8 per cent ICP of the total papers, followed by Nursing with 18.46 per cent ICP and biochemistry with 17.1 per cent as is shown in Table 9.

6.5.2 PGIMER

Table 10 indicates that top 8 subjects of PGI have contributed a total of 502 ICP during 1999-2008. Like AIIMS, Medicine has also contributed almost 50 per cent of ICP of PGIMER, followed by Public Health with 86 ICP and Biochemistry contributed 50 ICP. Rest of the subjects has contributed almost same number of ICP with very rare difference. So, like AIIMS in PGIMER Medicine subject has major contribution of ICP followed by Public Health and Biochemistry.

7. CONCLUSIONS

The analysis of the data indicates that contributions of total papers is higher in the case of AIIMS with a total of 9838 papers and 20995 citations, whereas PGIMER has contributed 5552 papers with 11439 citations. This may be due to the fact that human resources, clinical

Table 9. Subject-wise International collaboration of publications of AIIMS

Subjects	TP 1999-08	TC 1999-08	ACPP 1999-08	ICP 1999-08	% Share of ICP 1999-08	_h_-index
Medicine	6737	14759	2.19	665	9.87	48
Biochemistry	1216	1550	1.28	208	17.1	32
Pharmacology	510	1515	2.97	40	7.84	25
Neurology	499	1065	2.13	40	8.02	20
Immunology	468	1256	2.68	109	23.3	25
Public Health	198	344	1.74	14	7.07	14
Physics	101	357	3.53	19	18.8	14

Table 10. Subject-wise International collaboration of publications of PGIMER

Subjects	TP 1999-08	TC 1999-08	ACPP 1999-08	ICP 1999-08	% Shareof ICP 1999-08	*h*-index
Medicine	4036	7586	1.87	244	6.04	35
Biochemistry	562	1420	2.52	50	8.89	19
Pharmacology	281	701	2.49	12	4.27	19
Neurology	212	352	1.66	15	7.07	14
Immunology	319	1127	3.53	38	11.91	21
Public Health	85	187	2.2	86	101.17	11
Dentistry	34	21	0.61	34	100	05

activities, courses offered, and budget allocations for research and the infrastructure for these subjects may be different (higher or lower) from each other, which are the limitations of this study. Otherwise, growth of publications of these subjects in AIIMS and PGIMER is almost the same and percentage share is also the same except the difference of one subject (Physics) for which growth has been shown negative in case of AIIMS and two subjects (Pharmacology and Neurology) in case of PGIMER.

Similarly, the rank maintenance of these subjects of two institutions is almost the same. Pharmacology and Dentistry have lost their ranks during 2004-2008 and Immunology, Neurology, and Nursing have gained their ranks in case of AIIMS. Similarly, for PGIMER, four subjects have maintained the same ranks during 1999-2003 and 2004-2008, whereas immunology and Nursing have gained one rank during 2008-2008 and Pharmacology, and Dentistry have lost one rank each during 2004-2008. Total *h*-Index of the subjects of AIIMS is 186, whereas *h*-index of these subjects of PGIMER is 128. Higher *h*-index shows higher quality of research but in this study quantity level is different may be due to the limitations of the study. As reflected in *Scopus*, AIIMS has contributed 1113 ICP with the maximum contribution from medicine with 665 papers (more than 50 %). Similarly, PGIMER has contributed 502 ICP and medicine has

maximum contribution with 244 papers. Hence, it can be concluded that except the difference in total number of papers that can be due to the limitations of the study, both the institutions have almost the same status of growth, rank maintenance, *h*-index, and ICP.

REFERENCES

1. www.aiims.edu

2. www.pgimer.nis.in

3. Jeevan, V.K.J. & Gupta, B.M. A scientometric profile of research output from Indian Institute of Technology. Kharagpur. *Scientometrics*. **2002, 53**(1), 65-68.

4. Nagpaul, P.S. Visualising cooperation networks of elite institutions in India. *Scientometrics,* 2002, **54**(2), 213-28.

5. Kumbar, Malinath; Gupta, B.M., & Dhawan, S.M. Growth and impact of research output of University of Mysore 1996-2006: A case study. *Ann. Lib. Inform. stud.*, **55**, 185-95.

6. Gupta, B.M. & Har Kaur. Ranking of Indian pharmaceutical institutions for their research performance during 2000-2009. *Intern. J. Pharmaceutica*l, 2011, **2**(1) 99-104.