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Research Productivity of All India Institute of Medical Sciences (AIIMS): A Scientometric Analysis

Jeyshankar -. Ramalingam -

Dept. of Library and Information Science, Alagappa UNiversity, Tamil Nadu, India, jeyshankar71@gmail.com

Nishavathi E

Research Scholar, Department of Library and Information Science Alagappa University, Karaikudi, Librarian, Government Law College, Chengalpattu, nishavathiphd@gmail.com

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Research Productivity of All India Institute of Medical Sciences (AIIMS): A Scientometric Analysis

E. Nishavathi

Research Scholar, Department of Library and Information Science
Alagappa University, Karaikudi
Librarian, Government Law College, Chengalpattu
E-mail: nishavathiphd@gmail.com

&

Dr. R. Jeysankar

Assistant Professor
Department of Library and Information Science
Alagappa University, Karaikudi – 630 003.
E-mail: jeysankar71@gmail.com

ABSTRACT: *This study evinces the growth of research literature produced by AIIMS (All India Institute of Medical Sciences) for the period of 2007 to 2016. A total of 14410 records were retrieved from the Scopus database. Descriptive statistics for the research publication output revealed mean = 1441, Sd = 318.92, minimum = 1087, maximum = 2141 at 95.0% confidence level. The curve fitting methodology was used to fit the growth of research publication of AIIMS. R square value for exponential growth model is higher (0.908) than the linear growth model (0.849). Journals are identified as most preferred publication pattern (69.42%). The research output of top 20 department aggregates to 57.77% of total productivity. This study also identified the top 20 most preferred journals by the faculties of AIIMS and comparison was made with the previous study revealed Indian Journal of Pediatrics, Indian Journal of Medical Research, and Indian Pediatrics were the most preferred journals among the faculties. The observation of this study exhibits that AIIMS plays a vital role in reducing disease burden of India by means of quantitative and qualitative research publications.*

Keywords: Scientometrics, Bibliometrics, Statistical Analysis, Medical Research, Medical Education.

1. INTRODUCTION

All India Institute of Medical Sciences, New Delhi (AIIMS) is the precursor of medical education institution in India established to evince excellence in all branches of medical education by an act of Parliament in 1956. AIIMS, New Delhi provides medical, Para-medical, and Nursing education, training and care to patients. AIIMS, New Delhi creates enormous specialist (MD/MS), super-specialists (DM/MCh), Phd scholars, allied health and basic science experts including nurses and paramedical professionals with its 47 departments covering 71 branches of disciplines, 7 centers, and 650 faculty members. AIIMS, New Delhi plays a vital role in medical research with over 2000 publication in a year by its researcher. Researchers, Faculties of AIIMS, New Delhi conducted over 610 funded research projects and received extramural research grant of more than Rs. 72 crores, intramural research grant of Rs. 5.04 crores. It also operate hospital and 7 specialty centers , comprehensive rural health centers in Haryana and ensures wellbeing of approximately 8 lakhs of people through Centre for Community of Medicine. AIIMS, New Delhi aims to provide superior health care to Indian people through quality medical education, cost-effective patient care and innovative biomedical research. It also extends its health services to outside of India.

Government of India launched the Pradhan Mantri Swasthya SurakshaYojana (PMSSY) under the Ministry of Health and Family Welfare, Nirman Bhawan, New Delhi, with the objectives of correcting regional imbalances in the availability of affordable and reliable tertiary healthcare services, augmenting facilities for quality medical education creating a critical mass of doctors and conducting research in the country relevant to the area.

Under PMSSY, during the year 2012 -2013 six AIIMS were established in the country at Bhopal, Bhubneshwar, Patna, Jodhpur, Raipur and Rishikesh recognized as an Institute of National Importance by the Government of India.

Medical education institutions are the major sources of medical information which will helps to reduce the disease burden of a nation. India is the second largest populated country in the world. India spends 5296(in million current US \$) as capital health expenditure and occupies 170th place in the total world health expenditure, public (% of total health expenditure) with the value of 30.04 during the year 2014. There are

479 institutions across the country imparting medical education (MBBS) and involved in research activities. Research output of an institution is an important indicator of that institute's quality of education and clinical care. AIIMS, New Delhi ranked 3rd among the top10 global medical institutions during the year 2004 – 2014 with 11377 research publication output which includes original articles, clinical trials, case reports, reviews, reports of conferences and symposia.

Mesoscopic scientometrics indicators utilized to evaluate the research organization or any other institution which includes research productivity – publication output; impact – citation analysis; collaboration – co-authorship, co-word and network analysis. As defined by Pritchard bibliometrics uses mathematic and statistical methods to scientific literature to measure and to evaluate the productivity of an individual, institution, and nation.

Scientometrics indicators are also derived from the descriptive statistical measures such as central tendency, dispersion, skewness and measures of relationship. Furthermore inferential statistics such as estimation of population parameters and the testing of statistical hypotheses provides consummate evaluation of research productivity of an institution. Scientometrics study of research productivity AIIMS with inferential statistical measures unveiled a nuanced and more accurate evaluation of scientific literature and its impact on reduction of disease burden in India.

2. LITERATURE REVIEW

Corpus of literatures is available for scientometrics analysis to assess and evaluate the research productivity of a nation, institution, individual, discipline. This study reviewed the literature from the perspective of institutional productivity and statistical approaches to scientometrics analysis of institutional productivity.

In India, scientometrics literatures are recorded in Institute of National Importance, Indian Institute of Technology (IITs); Research and development Institutions – Central Tuber Crops Research Institute(CTCRI), Thiruvananthapuram, CSRI – Central Electro Chemical Research Institute (CECRI), Central Potato Research Institute (CPRI) and Universities – Pondicherry University, Maharshi Dayanand University, University of Mysore, University of Kerala to reference a few.

In the context of medical educational institutions, Bala and Gupta studies the research output of the Government Medical College and Hospital, (GMCH), Chandigarh, covered in Scopus for the period of 16 years (1992 – 1997). The study revealed that GMCH has an annual publication growth rate of 19.79%, occupies 9th place in the research output and 12th in h-index and occupies 13th rank in average citations per pater among the top 15 medical colleges of the country. Pratap and Gupta used p-index to measure performance of Indian medical colleges in the county over the period of 10 years (1999 – 2008). The study identifies top 30 institutions in the area of medicine, and also top 5 medical institutions in various areas of specialization in India. Pudovkinet. at evaluated productivity and citation impact of 66 researchers of the Deutsche Rheum Forschungs Zentium(DRFX) seen through Web of Science during the year 2004 – 2008 and productivity are compared with group leader vs. regular scientists, of male vs. female scientists. Study concluded that leaders are more prolific and more cited than the regular scientists. Kaur and Preeti compared the quality of research output of AIIMS and PGIMER (Post Graduate Institute of Medical Education and Research, Chandigarh for the period 1999 – 2008. A subject wise analysis of growth of publication, its h-index and international collaboration has been studied and concluded that except the differences in total number of productivity and citations of article both the institutions have almost same level of growth, rank, h-index and ICP. AIIMS contributed higher number of paper 9838 and 209995 citation, whereas PGIMER 5552 articles with 11439 citations. Wani, Hameed and Iqbal analyzed the research productivity of AIIMS during the year 1959 – 2011 as reflected in Scopus database. This study unveiled that the discipline medicine has highest productivity of 14381 articles, articles (12820) are the most preferred publication pattern, nationally 14.25%, internationally 5.66% and locally 80.09% collaborated by the AIIMS. Senthilkumar and Ulaganathan probed the research productivity of AIIMS indexed in the Indian citation index during the year 2004 – 2015. Totally 4847 articles were analyzed for author, subject, and year wise distribution of literatures along with its citation scores. 1282 research articles published by the scientists of CECRI during the period 2000-2009 by Jeyshankar (2009). It is found that 2009 was the most productive year with 194 articles (15.13%) published in the year. Collaborative research was dominant with the highest degree of collaboration being 0.98,

in the year 2005. Further, the study investigated authorship pattern, co-authorship pattern, highly prolific authors and highly preferred journals by the scientists of CECRI. Jeyshankar (2015) evaluated the research publication trend among scientists of Indira Gandhi Centre for Atomic Research during the period 1989-2013. Data were analyzed based on type of publication, year of publication, language, source, country, institutions, most preferred journals and most prolific authors among other variables. The study revealed that majority (96.26%) of the researchers preferred to publish their research papers in joint authorship only and the degree of author collaboration ranges from 0.84 to 0.99 and its mean value is 0.95. It also revealed that IGCAR scientists preferred to publish their work in the Journal of Nuclear Materials and Transactions of the Indian Institute of Metals. The top three collaborative institutions with IGCAR are Indian Institute of Technology, Chennai, Bhabha Atomic Research Centre, Mumbai and Anna University, Chennai. Vellaichamy and Jeyshankar (2015) evaluated the publication pattern of Pondicherry University based on the data collected from Scopus database over a period of twenty seven years from 1987-2013.. The study shows that majority (84.8%) of the researchers preferred to their research papers are joint authorship and the degree of collaboration ranges varies from 0.61 to 0.96 and its mean value 0.88. The study also analysed that Physics and Astronomy which produces more number of papers while the multi-authorship also possesses a lead role in this subject. S.A. Abbasi is the most prolific author (contributed 132 articles) in the present study. The researchers are most preferred to publish their work in the journal of Acta Crystallographic a Section E Structure Reports Online (2.17%) followed by current science (1.79%).

Raan made an empirical approach to research group indicators in the field of medical covering 10000 publications produced by 65 research group with 1,85,000 citations and 148 chemistry research group produced 18000 publications and 1.75,000 citations over a period of 10 years. Important finding is that statistical behavior of advanced bibliometric indicator is benchmarking between research groups in terms of reference values based on mean values and variances. Yazdani.et..al deployed scientometrics indicators along with statistical measures to evaluate and determine the factor that affect scientific output of 30 research centers affiliated to Tehran University of Medical Sciences. The median value of scientometrics indicators, g, e, A, hg, indices

and impact index were 17.5, 11.2, 22.9, 14.3, 16.5 and 1.6 respectively. This study shown that an inverse significant correlation between the age of the centers and number of published papers, a significant correlation between the number of papers and budget line, no significant relationship with number of papers and of real property, a significant negative relationship between the number of papers and the number of joint project. Misra et al statistically analyzed the relationship between single & multi – authored publication, indexed & non-indexed journals from 207 publication of IMS and SUM, Bhubaneswar during 2009 to 2013. This study confirmed that there is no significant difference between the publication of clinical and pre-clinical department and designation of authors were found statistically significant at $p=0.01$.

Though several studies provide scientometrics literatures on medical educational institutions, a few among them approached statistically. A gap has been felt in the literature of statistical approach to scientometrics information pertaining to AIIMS. The present study made an attempt to approach the research productivity of AIIMS statistically.

3. OBJECTIVES

- To analyze the growth pattern of research publication output of AIIMS during 2007 – 2016
- To envisage research publication output of AIIMS for the year 2020 to 2025
- To determine the most productive journal preferred by the faculties of AIIMS to publish their research output
- To investigate preferred publication pattern of faculties in AIIMS during 2007 - 2016
- To identify the most prolific faculties, and department in AIIMS and
- To examine authorship patterns, degree of collaboration among the faculties of AIIMS.

4. HYPOTHESES

Following hypotheses were drawn from the objectives of the study.

1. Linear growth model fits to the trajectory growth of research output published by the AIIMS' Scientists than the exponential growth model.

2. The faculty members preferred to publish their research output significantly in the Indian journals
3. The research productivity of educational departments are most productive than the productivity of Hospitals / Specialty Centers of AIIMS and
4. Faculties of AIIMS are tending to collaborate the research activities.

5. METHODOLOGIES

The sources for this study have been retrieved from Scopus bibliographical databases and annual reports of AIIMS available on internet. Bibliographical details are distributed in MS Excel worksheet for statistical analysis. Scientometrics indicators are derived with the help of MySQL and Bibexcel. Scientific productivity of all seven AIIMS has been studied but statistical inferences are drawn only for the six AIIMS. AIIMS, Patna have been eliminated from the statistical approach because of unavailability of annual report in the web.

6. DATA ANALYSIS

Table1 shows descriptive statistics like mean, median, standard deviations of research publication output of AIIMS' scientists (n=14410). The mean value exceeds 45% of their standard deviation. A low standard deviation value 318.929 indicates the yearly productivity distending to be close to the mean of the overall productivity during the study period.

Table1: Descriptive Statistics of Research Publication output of AIIMS' Scientists during the year 2007 – 2016.

Sl. no	Descriptive Statistics	Value
1.	Mean	1441
2.	Standard Error	100.8543504
3.	Median	1331.5
4.	Standard Deviation	318.9294593
5.	Sample Variance	101716
6.	Kurtosis	1.411349136
7.	Skewness	1.271203577
8.	Minimum	1087
9.	Maximum	2141
10.	Sum	14410
11.	Count	10

12.	Largest(1)	2141
13.	Smallest(1)	1087
14.	Confidence Level(95.0%)	228.1483912

Table 2 summarizes the annual research publication output, and their accumulative values along with the corresponding percentages. The annual research productivity increased constantly except in the year 2015. 0.07% of decline has been observed from the table. The year 2016 has been identified as the most productive year with 14.86% of cumulative output.

Table 2. Annual Research Publication Output of AIIMS Scientists

Sl. no	Year	Output	Cum. Output	% of Cum. Output
1.	2007	1087	1087	7.54
2.	2008	1182	2269	8.2
3.	2009	1216	3485	8.44
4.	2010	1281	4766	8.89
5.	2011	1313	6079	9.11
6.	2012	1350	7429	9.37
7.	2013	1444	8873	10.02
8.	2014	1703	10576	11.82
9.	2015	1693	12269	11.75
10.	2016	2141	14410	14.86
Total		14410		100

The growth of AIIMS research productivity is also illustrated in figure 1 to reveal best fit model. A simple linear and exponential growth model was performed on 10 years of data. The figure 1 indicates the research publication output grows exponentially. The average exponential growth rate is 6.78% during the year 2007 – 2016. The best fit of the curve gives $y=4E-54e^{0.0648x}$. This was evident from the table 3 by the higher value of co-efficient of determination $R^2 = 0.9084$ verses linear: $R^2 = 0.8366$.

Table 2. Annual Research Publication Output of AIIMS Scientists

Table 3 (a) Fit Statistics:

Sl. no	Growth Models	Observations	R ² Value	Df	Significance
1.	Linear Model	10	0.849	8	5%
2.	Exponential Model	10	0.908	8	5%

Hypothesis: *Linear growth model fits to the trajectory growth of research output published by the AIIMS’ Scientists than the exponential growth model.*

Inferences: Hypothesis has been tested by the P value method. The P value for the linear growth model given in the table 3(b) is 0.000148 which is smaller than the σ (5% or 0.05). Hence the null hypothesis “**Linear growth model fits to the trajectory growth of research output published by the AIIMS’ Scientists than the exponential growth model**” was rejected. It has been proven by the statistical analysis that the growth of research publication output of AIIMS scientists for the period 2007 – 2016 is exponential.

Table 3(b) Linear growth model fits

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	-193906	29018.47	-6.68216	0.000156	260822.8455	-126989.409	-260822.8455	-126989.409
X Variable 1	97.11515	14.42627	6.731827	0.000148	63.84811198	130.3821911	63.84811198	130.3821911

The following exponential growth equation has been used to predict the research publication output of faculties of AIIMS for the year 2020 and 2025. The rate of growth is 0.0678 for the span period of 10 years. The calculation is based on the assumption that the growth rate remains constant during the period of study.

$$y(t) = ae^{kt}$$

Where a is the value at the starting time, k is the rate of growth and t is the time.

The values are substituted in the equation $y(14) = 1087 e^{0.06778514(14)}$

$$= 1087 e^{0.948991962}$$

$$= 1087 * 2.58310283$$

$$= 2808$$

The predicted research publication output of faculties of AIIMS for the year 2020 is computed as 2808 and for the year 2025 are 3682.35.

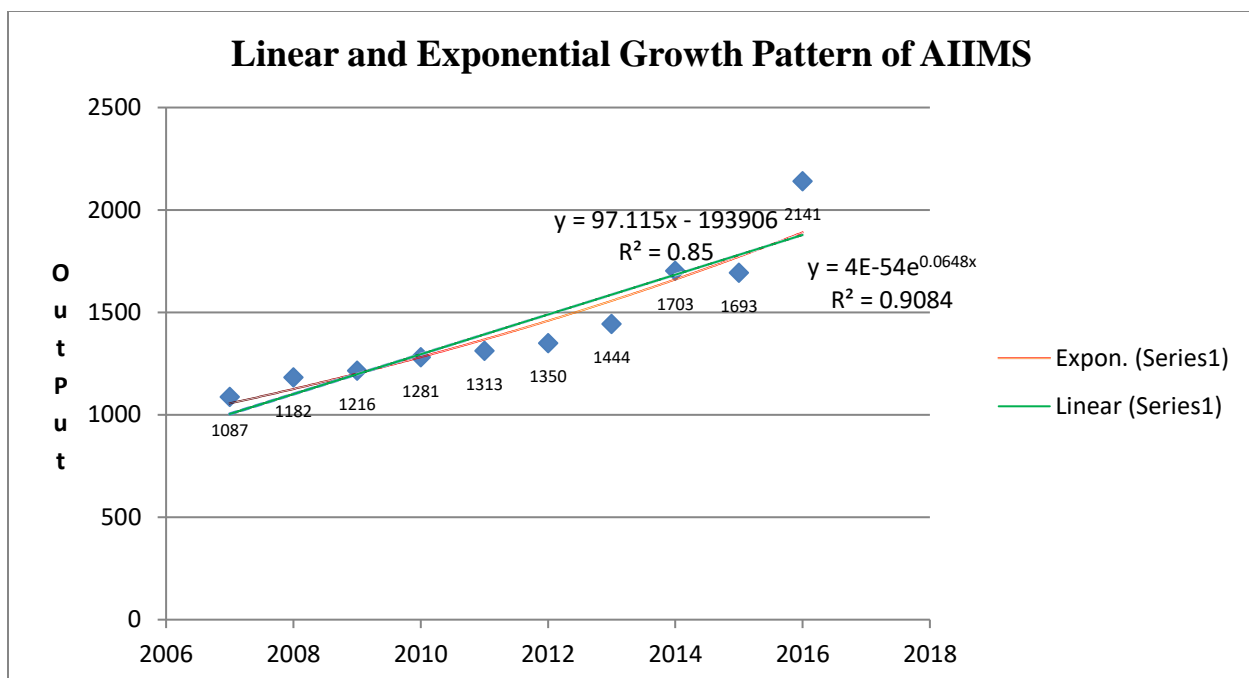


Table 4 shows that the total publications (n = 14410) have been cited 10 times during the period 2007 – 2016. Even though the annual publication output is gradually increasing the average citation per paper has follows decreasing trend till the year 2011. The relationship between citations and the publication growth of research output is provided in the figure 2.

Table 4: Distribution of Average Citations of Per Paper

Sl. no	Year	Output	Cum. Output	% of Cum. Output	Total Citation	Average Citation Per Paper
1.	2007	1087	1087	7.54	17711	16.29
2.	2008	1182	2269	8.2	18475	15.63
3.	2009	1216	3485	8.44	15578	12.81
4.	2010	1281	4766	8.89	18771	14.65
5.	2011	1313	6079	9.11	14545	11.08
6.	2012	1350	7429	9.37	23922	17.72
7.	2013	1444	8873	10.02	10551	7.31
8.	2014	1703	10576	11.82	8818	5.18
9.	2015	1693	12269	11.75	9160	5.41
10.	2016	2141	14410	14.86	5364	2.51
Total		14410			142895	

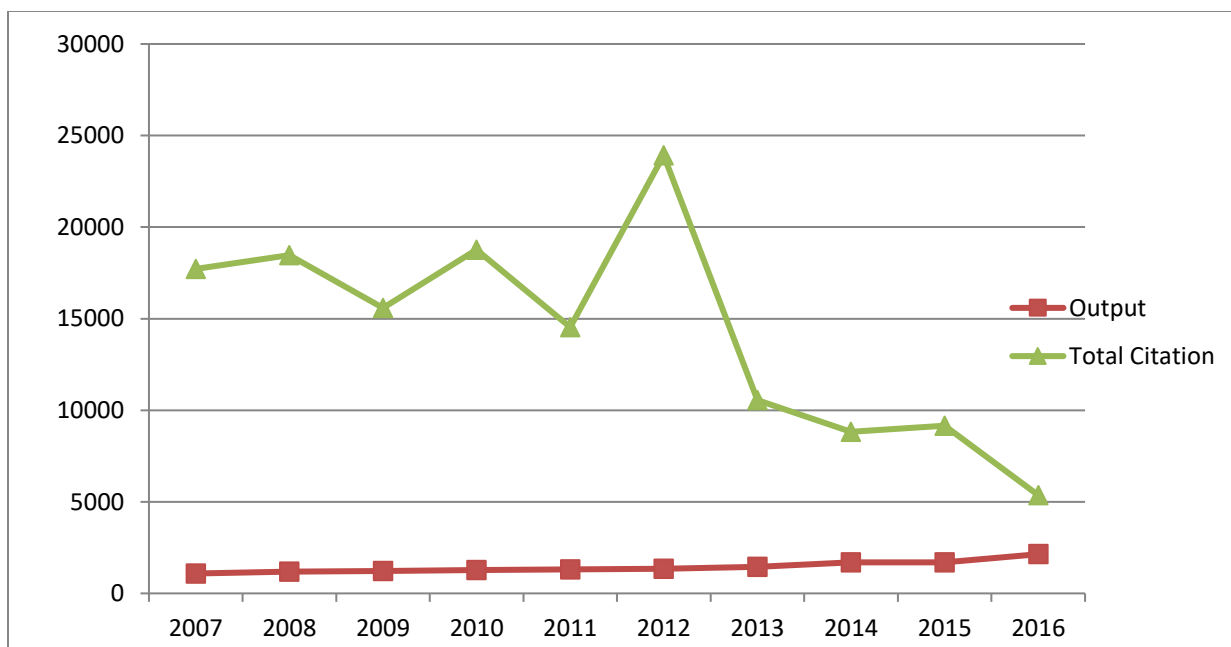


Figure 2: **Distribution of Average Citations of Per Paper**

Table 5 exhibits the preferred publication pattern of faculties of AIIMS during 2007 – 2016. From 2007 – 2016, the most preferred publication pattern is journal article contributing 69.42 % of the total (n = 14410). Letter (1745), Review (1283), notes (379), editorial (312) and book chapter (205) aggregates to 27.23 %, the remaining 3.34 % of publication are erratum, short survey, book, articles in press, and auto biography. Table 5 reflects a steady increase in the journal articles except in the year 2015. During 2015 number of journal articles has been decreased from 1234 to 1135. On the contrary there has been increase in all patterns of publications apart from autobiography.

Table 5: Preferred Publication Patterns of Faculties of AIIMS during 2007 -2016.

Year	Article	Editorial	Review	Letter	Conference Papers	Notes	Short Survey	Erratum	Book	Book Chapter	Articles In Press	Autobiography
2007	751	25	96	143	28	14	17	3	1	9	0	0
2008	818	19	97	171	47	13	6	6	0	5	0	0
2009	846	26	117	165	17	23	9	4	1	8	0	0
2010	951	14	89	159	45	12	2	1	1	7	0	0
2011	904	23	126	165	33	40	6	2	0	12	2	0
2012	978	27	111	154	28	21	4	6	1	16	4	0
2013	1036	27	120	145	22	53	5	5	2	20	9	0

2014	1234	37	141	191	18	56	3	5	0	12	6	0
2015	1135	53	152	206	21	60	12	9	1	38	6	0
2016	1351	61	234	246	32	87	9	9	3	78	30	1
Total	10004	312	1283	1745	291	379	73	50	10	205	57	1

Table 6 depicts the research output of top 20 departments of AIIMS. This study categorized department as a broad subject domain which consists of educational departments, specialty centers, outreach OPD, and hospitals. The research output of top 20 department aggregates to 8325 is the 57.77% of the overall productivity of AIIMS for the span period of 10 years. The top 10 departments has attained higher than the mean output of 416.25 papers per department.

Table 6: Departmental Productivity of research publications

Rank	Department	Productivity
1	Department of Pathology	892
2	Department of Nuclear Medicine	667
3	Dr. Rajendra Prasad Centre for Ophthalmic Sciences	656
4	Department of Radio Diagnostics	486
5	Department of Anaesthesiology	471
6	Department of Neurology	439
7	Department of Neurosurgery	435
8	Department of Obstetrics & Gynaecology	424
9	Department of Hematology	405
10	Department of Pediatrics	371
11	Department of Radiation Oncology	364
12	Department of Biochemistry	359
13	Department of Biophysics	330
14	Department of Paediatrics	324
15	Department of Microbiology	310
16	Department of Pharmacology	299
17	Department of Dermatology and Venereology	298
18	Department of Cardiology	284
19	Department of Endocrinology & Metabolism	264
20	Department of Surgical Discipline	247

Hypothesis: *The research productivity of educational departments are most productive than the productivity of Hospitals / Specialty Centers of AIIMS*

Inferences: table 6 proves that 79.87 % of research output is published by the teaching faculties; the remaining 20.12 % are contributed from the hospital and specialty centers. The hypothesis has been accepted for the study.

Table 7 illustrates the top 20 most preferred journals by the faculties of AIIMS along with their origin of publication and H index of the journal obtained from the SCJ Journal ranking. 53 countries are represented in the sample of study and India is the predominant country for the faculties of AIIMS to publish their research output. The research publication output was published in 2585 journals. Three most productive preferred journals were Indian Journal of Pediatrics (n= 364), Indian Journal of Medical Research (n=243) and Indian Pediatrics (n=219). In house publication of AIIMS “National Medical Journal of India (n=183) has secured 5th place.

Table 7: Top 20 Most Preferred Journals by the Faculties of AIIMS

Rank	Journal	Productivity	H Index	Country
1	Indian Journal of Pediatrics	364	40	India
2	Indian Journal of Medical Research	243	68	India
3	Indian Pediatrics	219	41	India
4	Neurology India	195	39	India
5	National Medical Journal of India	183	35	India
6	BMJ Case Reports	168	11	UK
7	Journal of Anaesthesiology Clinical Pharmacology	148	19	India
8	PLoS ONE	141	218	USA
9	Indian Journal of Ophthalmology	128	39	India
10	Annals of Cardiac Anaesthesia	119	18	India
11	Journal of Clinical and Diagnostic Research	116	18	India
12	Indian Journal of Pathology and Microbiology	112	25	India
13	Indian Journal of Dermatology, Venereology and Leprology	107	34	India
14	Saudi Journal of Anaesthesia	87	15	India
14	Indian Heart Journal	87	32	India
15	Clinical Nuclear Medicine	84	48	USA
16	Indian Journal of Anaesthesia	82	17	India
17	Archives of Gynecology and Obstetrics	79	52	Germany
18	Indian Journal of Medical Microbiology	76	38	India
19	Indian Journal of Cancer	73	28	India
20	Indian Journal of Nuclear Medicine	72	7	India

Hypothesis: *The faculty members preferred to publish their research output significantly in the Indian journals.*

Inferences: From the table 7, 85% of the top 20 journal titles are preferred by the faculties of AIIMS are published from India; the remaining 15% are from USA, UK, and Germany respectively. Hence the above hypothesis confirms to the study.

Table 8 ascribes the top 20 prolific authors of AIIMS during the year 2007 – 2016 along with their citation counts, average citation per paper (ACPP). A quantitative analysis of research output published by the faculties found the top most prolific authors as Kumar, R (840), Kumar, A (619), Sharma, S (462). On the contrary a qualitative citation count has evinced that Gupta, S (8th rank), Sharma, S K (19th rank), and Gupta, N (8th rank) has acquired highest ACPP. The total citation obtained by the 20 most prolific authors for their cumulative number of papers during 2007 – 2016 is 70013 with an average of 9.74 citations per paper.

Table 8: Most Prolific Authors of AIIMS

Rank	Author	Productivity	Citation Counts	Average Citation Per Paper
1	Kumar R	840	6031	7.18
2	Kumar A	619	6591	10.65
3	Sharma S	462	4029	8.72
4	Kumar S	456	3679	8.07
5	Singh S	422	5196	12.31
6	Sharma A	397	3385	8.53
7	Gupta R	334	3717	11.13
8	Gupta S	309	6115	19.79
8	Gupta N	309	4182	13.53
9	Sharma P	298	2489	8.35
10	Saxena R	279	1877	6.73
11	Sharma R	263	2521	9.59
12	Gupta A	259	2602	10.05
13	Sharma MC	243	1716	7.06
14	Sharma BS	237	1777	7.50
15	Bakhshi S	235	1405	5.98
16	Tripathi M	223	1764	7.91
17	Lodha R	218	1353	6.21

18	Singh A	214	2252	10.52
18	Singh N	214	2479	11.58
19	Sharma SK	213	3006	14.11
20	Sharma N	211	1847	8.75

Table 9 provides details about the descriptive statistics for authorship pattern. Totally 24568 authors produced 14410 research publication of whom 5.16% (n = 774) published single work. The degree of collaboration (0.95) shows that faculties of AIIMS are tending to collaborate in the research activities. Hence the hypothesis “faculties of AIIMS are tend to collaborate the research activities” is accepted for the study.

Table 9: Descriptive Statistics for Authorship Pattern

Sl. no	Authorship Pattern	No. of Publications
1.	Single Authored Paper	774
2.	Multi authored Paper	13636
3.	Total No. of Authors	24568
4.	Total No. of Papers	14410
5.	Mean Paper Per Author	0.59
6.	Mean Authors Per Paper	1.7
7.	Degree of Collaboration	0.95
8.	Co Author Mean	6.56

7. FINDINGS AND DISCUSSIONS

- Bala and Gupta (2009) perceived AIIMS as the most productive medical college during the year 1996-2007 with 7850 publication. In continuous, this study revealed 54.47% growth in the publication for the year 2007- 2016. This proves the research publication output of AIIMS grows exponentially.
- During 10 years of study period 2016 is the most productive year with 2141 publications and 2007 is the least productive year with 1087 publication.
- The predicted research publication output of faculties of AIIMS for the year 2020 is computed as 2808 and for the year 2025 are 3682.
- A tremendous increase in the publication output has been identified from the year 2012 to 2016. Establishment of six new AIIMS across India during the year 2012 may result in burgeoning research publication by the faculties of AIIMS.

- Journal articles (69.42%) have been observed as most preferred publication pattern among the faculties of AIIMS during 2007-2016. When compared to previous study (ZahidAsharafWaniet..al (2013)), the calculated value for journal articles has been reduced to 5.19 % , on the contrary letters and reviews has increasing continuously as the most preferred publication pattern in second and third place.
- Department of Pathology has been identified as most productive department(892), next to Department of Nuclear Medicine (667).
- Faculties from hospital (Dr. Rajendra Prasad Centre for Ophthalmic Sciences) are also published their research output and occupies third place.
- Top 20 most preferred journals aggregates to 20% (n=2883) of the overall research publication output of AIIMS.
- During 1999 – 2008 Kumar. A of AIIMS has published 161 articles with 391 citation counts and occupied seventh place in the 15 most productive Indian authors in medicine(Bala and Gupta). In the present study, his productivity has increased to 619 with 6591 citation counts at 10.65 average citations per paper.
- The average H-index of the top most preferred journals by the faculties of AIIMS is 40.09. There were 95.47% (n=2468) journals least preferred by the faculties which published research output between 1 – 20 articles. 2.90% published between 21 – 50 research output and 1.12% journal published between 50 – 100 research output. Thus the faculties of AIIMS are preferred to publish their research output in most renowned journals with high H-index.
- Two journals in the top three position of most preferred journals are specialized in Pediatrics with the productivity of 583, but productivity of Department of Pediatrics is 371 shows that multi-disciplinary and inter-disciplinary research activities of the faculties.
- The journals identified for the top 20 most preferred are although somewhat similar ranking observed by Bala, Gupta (2009). Indian Pediatrics (37) in first and Indian Journals of Pediatrics (36) in second place. Very similar to that observed by ZahidAsharafWaniet..al(2013) Indian Journal of Pediatrics in first, Indian Journal of Medical Research in second and Indian Pediatrics in third place

were identified as most preferred journal title among the researchers of AIIMS during the year 1959 – 2011. The above three journals still occupy the top 3 position respectively (364,243,219) without any change in their order.

- Kumar, R has been identified as most productive author in terms of publication quantitative next to Kumar, A (840,619)
- Gupta, S has published 209 articles with 6115 citation counts and secured 8th place and was shared with Gupta N (309, 4182). Sharma, SK occupied 19th place with 213 articles but the citation count is 3006. In this sense, the three authors have produced qualitative research output measured in terms of citation counts.

8. CONCLUSION

This study adopted statistical methodology along with bibliometric indicators for drawing inferences from the core aspects of the study. Hypotheses are formulated and tested to validate the objectives of the study. There has been consistency in terms of growth of research publication, preferred publication pattern, and most productive journals and authors when compared to the earlier studies. Establishment of additional AIIMS has great impact on the growth of publication. Hence the Government of India should take necessary action to establish more AIIMS across the country to reduce the disease burden of the country and ensure public health.

The conclusion drawn from the study is limited to the data extracted from Scopus for 10 years of span period. Databases PubMed and MedInd for more than 20 years of study would have been more appropriate source of data for the study. Scientometrics indicators such as citation analysis, activity index, research priority index and statistical analysis of multivariable regression of departmental and faculty strength, sanctioned fund for research, application of growth models to the literatures could be the future of research to reveal the role of AIIMS in medical education.

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