

# Research Output and Publications Impact of Postgraduate Institute of Medical Education and Research Chandigarh (1999-2008)

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## ABSTRACT

This paper attempts to analyze the research activities of the Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh as reflected in its 10 years cumulative (1999-2008) publications output covered in Scopus International multidisciplinary bibliographical database. The present study analyses the broad characteristics of 4,771 research papers published by the faculty members of PGIMER, Chandigarh by focusing on its publication growth characteristics, format and media of communication, research impact and quality, patterns of research collaboration, broad and narrow areas of research focus and characteristics of its high cited papers.

**Keywords:** PGIMER, Research output, Scientometrics.

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## INTRODUCTION

The Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh was conceived in 1960 as a center of excellence. The institute was started in 1962 and became an autonomous body under the Act of Parliament in 1967 functioning under the Ministry of Health and Family Welfare, Government of India. The main aim of PGIMER is to provide high quality patient care, attain self-sufficiency in postgraduate medical education and to meet the country's need for highly qualified medical professionals in all medical and surgical disciplines, provide educational facilities for the training of personnel in all important branches of health activity and undertake basic community-based research. The institute has 47 departments and 10 advanced care centers, like Advanced Pediatrics Center, Advanced Urology Centre, Bone Marrow Transplant Center, Advanced Eye Center, Advanced Cardiac Center, Oral Health Sciences Center, Renal Transplant Center, School of Public Health, Gastroenterology Center and Telemedicine Center. These 47 departments can further be classified as clinical, Paraclinical and nonclinical departments.

The PGIMER offers a variety of courses at undergraduate, graduate, postgraduate and doctoral levels.

The medical courses offered include MD/MS, in 20 disciplines Mch/DM, in 18 disciplines, MDS, Ph D and Post-MD certificate. The paramedical undergraduate courses undertaken at the institute include BSc (Med. Tech. Laboratory, X-ray, Audiology and Speech therapy, Radiotherapy, Physical Therapy, Operation Theater, Per-fusionist) and Paramedical Postgraduate courses include MSc (Pathology, Microbiology, Radiology, Pharmacology and Physiology, Biochemistry, Speech and Hearing, Pharmacology, Biochemistry and Biotechnology). In the year 2006, National Institute of Paramedical Sciences (NIPS) was established for the paramedical undergraduate courses. Beside these courses, full-fledged institute of nursing also provides nursing courses, called National Institute of Nursing Education (NINE), which imparts quality-nursing education. This institute also imparts short-term and elective training courses.

Research forms an integral part of the education program of the institute. Scientific inquiry includes basic research and clinic research. PGI has always made an endeavor to direct its various research activities to the relative needs of the society. The research work is carried out in accordance with nationally and internationally approved guidelines. All the departments undertake research in the area of national importance. 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, malabsorption, etc. WHO and various national agencies have designated a number of departments of PGIMER as research/collaborative centers. The research output has been incredible and has found recognition at the various national and international forums. A number of scientific conferences/workshops/seminars are held in the institute throughout the year. The faculty members of the PGIMER had received several awards and recognitions for their scientific contribution to the profession and research.

A number of similar studies have already been undertaken by one of the authors for evaluation of various Indian institutions on the basis of their research output in India, like Indian Institute of Technology, Kharagpur, Indian Institute of Technology, Roorkee, University of

Mysore, Government Medical College and Hospital, Chandigarh, etc.<sup>1-5</sup>

Dr Tulsi Das Library of PGIMER plays a very significant role in the patient care, research and academic activities of the institute. The main objectives of the present study are to analyze the broad characteristic features of the publications output of PGIMER, Chandigarh during 1999 to 2008. In particular, the study focuses on the growth, format and media of communication and impact of its research output; research output and impact under broad and narrow subject areas as well as by different subject departments; patterns of national and international collaboration and characteristics of highly cited papers and productive authors.

## METHODOLOGY AND DATABASE USED

The present study uses 10 years publications output data from 1999 to 2008 for understanding the broad characteristics and impact of research of PGIMER, Chandigarh. For this purpose, the study derives publications output of PGIMER, Chandigarh from the publications covered in the Scopus International multidisciplinary bibliographical database. For analyzing the subject scope, we have divided the total research output under 47 already established subject departments. The research output is also considered under different subject areas as defined in Scopus database classification. In Scopus database classification, the entire science and technology literature has been classified under 20 broad subjects and four broad subject areas of physical, engineering, life and health sciences. In this paper, PGIMER contribution is considered for eight broad subjects, which are related to health sciences and life sciences. For assessing the impact and quality of publications output, the citations received during first 3 years (i.e. 3 years fixed citation window) were considered. It means for citations of papers for the year 2000 are counted from 2001 to 2003 (3 years window) and for the year 2001 counted from 2002 to 2004 and so on.

## RESULTS/ANALYSIS

### Overall Research Profile

As reflected in Scopus International bibliographical database, PGIMER has published 4,771 papers during 1999

to 2008, with an average of 477.1 papers per annum. The publications output of the institute has increased from 1,901 papers in 1999 to 2003 and 2870 papers in 2004 to 2008, showing growth rate of about 51%. The institute achieved the average annual publication growth rate of 5.9 % during 1999 to 2008 (Table 1).

Considering the quality and impact of papers published (1999-2008) in terms of average citation per paper, PGIMER has recorded an average impact of 1.98 citations per paper, which decreased from 2.35 citations per paper in 1999 to 2003 to 1.74 citations per paper during 2004 to 2008 (Table 2).

### Research Contribution of PGIMER in Broad Subject Areas

The publication output of PGIMER under different subjects as defined by Scopus classification during 1999 to 2008, their percentage share, impact in terms of ACPP, share of international collaborative papers and H-index value have been growing as shown in Table 3. The cumulative contribution of PGIMER under eight broad subjects during 1999 to 2008 varies from 0.48 to 84.44%. According to Scopus database there is some overlapping in the coverage under different subject areas and as a result the total output, if added will become more than 100% (Table 3).

Considering the individual contribution of these eight broad subjects, it was observed that medicine contributed the highest number (4,036) of publications with 84.4% share in institute cumulative publication output during 1999 to

**Table 1:** Publications output of PGIMER (1999-2008)

Years	TP	TC	ACPP	ICP	ICP(%)
1999	372	888	2.39	22	5.91
2000	332	651	1.96	9	2.71
2001	376	900	2.39	15	3.99
2002	379	803	2.12	9	2.37
2003	442	1234	2.79	29	6.56
2004	507	1485	2.93	39	7.69
2005	553	1609	2.91	47	8.5
2006	623	1309	2.10	45	7.22
2007	585	489	0.84	35	5.98
2008	602	95	0.16	39	6.48
Total	4771	9463	1.98	289	6.06

TP: Total publications; TC: Total citations; ACPP: Average citation per publication; ICP: International collaborative publications

**Table 2:** Distribution of international collaborative publications of PGIMER (1999-2008)

Type of publications	Number of publications					
	TP (1999-2003)	TC (1999-2003)	TP (2004-2008)	TC (2004-2008)	TP (1999-2008)	TC (1999-2008)
Total publications	1,901	4,476	2,870	4,987	4,771	9,463
Total international Collaborative publications	84	595	205	682	289	1,277

TP: Total publications; TC: Total citations

2008, followed by biochemistry, genetics and molecular biology (562 papers and 11.76% share), immunology and microbiology (319 papers and 6.57% share), pharmacology, toxicology and pharmaceuticals (281 papers and 5.88% share), neurology (212 papers and 4.44% share) and public health (86 papers and 1.80% share; Table 4). Of these eight broad subjects, the five subjects witnessed the rise in its publication share from 1999 to 2003 and 2004 to 2008: Medicine from 82.9 to 85.5%, public health from 1.5 to 1.9%, dentistry from 0.6 to 0.8% and nursing from 0.2 to 0.7%. However, in three broad subjects, there was a decline in publication share from 1999 to 2003 and 2004 to 2008 biochemistry, genetics and molecular biology from 11.8 to 11.7%, immunology and microbiology from 6.8 to 6.6% and pharmacology, toxicology and pharmaceuticals from 7.87 to 4.46% (Table 4).

Among the eight broad subjects, the highest impact per paper (3.53) is scored by immunology and microbiology during 1999 to 2008, followed by biochemistry, genetics and molecular biology (2.53), pharmacology, toxicology and pharmaceuticals (2.49), public health (2.17), nursing

(1.96), medicine (1.88), neurology (1.66) and dentistry (0.62). The average impact factor per paper (ACPP) recorded by four subjects has increased from 1999 to 2003 and 2004 to 2008 as follows: Immunology and microbiology (3.44-3.60), pharmacology, toxicology and pharmaceuticals (2.34-2.67), dentistry (0.55-0.65) and nursing (1.0-2.1). In contrast, ACPP has decreased in four subjects: Medicine (2.33-1.59), biochemistry, genetics and molecular biology (3.15-2.11), neurology (1.73-1.57) and public health from 3.48 to 1.53 (Table 4).

On considering the international collaborative publication output under these broad subjects, it was observed that immunology and microbiology contributed the largest share of 11.9% share in its total research output during 1999 to 2008, followed by biochemistry, genetics and molecular biology (8.9%), neurology (7.1%), medicine (6.1%) and pharmacology, toxicology and pharmaceuticals (4.3%), public health (1.4%), dentistry (0.7%) and nursing (0.3%). Among these broad subjects, all other subjects (except public health and dentistry) showed increase in international collaborative publication share from 1999 to

**Table 3:** Subject-wise publication distribution of PGIMER (1999-2008)

Subjects (1999-2003)	TP	TC	TP	TC	TP	TC	H-index
	(1999-2003)	(2004-2008)	(2004-2008)	(1999-2008)	(1999-2008)	(1999-2008)	
Medicine	1,579	3,684	2,457	3,902	4,036	7,586	35
Biochemistry, genetics and molecular biology	225	708	337	712	562	1,420	19
Immunology and microbiology	130	447	189	680	319	1,127	21
Pharmacology, toxicology and pharmaceuticals	150	351	131	350	281	701	19
Public health	29	101	56	86	85	187	11
Neurology	119	206	93	146	212	352	14
Dentistry	11	6	23	15	34	21	5
Nursing	3	3	20	42	23	45	4

TP: Total publications; TC: Total citations; ACPP: Average citation per publication; H-index: Distribution of citation

**Table 4:** Research output, share and impact under broad subjects of PGIMER

Subjects	TP			TC			ACPP		
	1999-2003	2004-2008	Total	1999-2003	2004-2008	Total	1999-2003	2004-2008	Total
Medicine	1,579	2,457	4,036	3,684	3,902	7,586	2.33	1.59	1.88
Biochemistry, genetics and molecular biology	225	337	562	708	712	1,420	3.15	2.11	2.53
Immunology and microbiology	130	189	319	447	680	1127	3.44	3.60	3.53
Pharmacology, toxicology and pharmaceuticals	150	131	281	351	350	701	2.34	2.67	2.49
Public health	119	93	212	206	146	352	1.73	1.57	1.66
Neurology	29	56	86	101	86	187	3.48	1.53	2.17
Dentistry	11	23	34	6	15	21	0.55	0.65	0.62
Nursing	3	20	23	3	42	45	1.00	2.1	1.96

TP: Total publication; TC: Total citation; ACPP: Average citation per publication

2003 and 2004 to 2008: Medicine from 4.31 to 7.17%, biochemistry, genetics and molecular biology from 6.2 to 10.7%, immunology and microbiology from 11.5 to 12.2%, pharmacology, toxicology and pharmaceuticals from 1.3 to 7.6%, neurology from 3.4 to 11.8% and nursing from 0.0 to 0.5% from 1999 to 2003 and 2004 to 2008 (Table 5).

### Contribution to Various Diseases

In this section, the research output of PGIMER to various diseases has been analyzed during 1999-2008. The maximum research output has been in cancer with 430 papers, followed by cardiovascular disease (373 papers), tuberculosis (267 papers), diabetes (140 papers), pneumonia (119 papers), AIDS (94 papers), hepatitis (93 papers), diarrheal diseases (82 papers), asthma (79 papers), respiratory infection (69 papers), leprosy (47 papers), malaria (31 papers), typhoid (19 papers), kala azar (15 papers), polio (14 papers), dengue (10 papers), cholera (10 papers), Japanese encephalitis (10 papers), rabies (9 papers), vibrio cholera (7 papers), leptospirosis (6 papers), meningococcal meningitis (5 papers), west Nile virus (3 papers), chikungunya (2 papers), etc.

### Research Output under Different Departments

There are total 47 departments in PGIMER, of which 30 are classified as clinical departments, 12 as paraclinical and five as nonclinical departments. The research output and impact of PGIMER under these different departments during 1999 to 2008 is given in Table 6.

Among the clinical departments, the maximum research output comes from pulmonary medicine department with 564 papers, followed by gastroenterology (286 papers), internal medicine (282 papers), radiodiagnosis (265 papers), dermatology (248 papers), anesthesia (209 papers), etc. In terms of impact, nephrology department scored the

highest impact with 3.07 citations received per paper, followed by dermatology (2.40), hematology (2.34), pediatrics (2.12), etc. (Table 6).

Similarly, under paraclinical departments, the maximum research output comes from histopathology department with 353 papers, followed by pharmacology (198 papers), medical microbiology (171 papers), experimental medicine (148 papers), etc. Among these departments, medical microbiology scored highest average citations per paper (ACPP) with 3.07 citations, followed by experimental medicine (2.36), pharmacology (2.21), parasitology (2.17), etc. (Table 6).

Among nonclinical departments, biochemistry department published the highest number of papers (168), followed by biophysics (41), biostatistics (11) and anatomy (3 papers). In terms of impact, the highest impact per paper of 3.74 was scored by biochemistry, followed by biostatistics (3.64), biophysics (2.68) and anatomy (2.33; Table 6).

### International Collaborative Research Output of PGIMER with Major Collaborative Countries

Based on the publication data, it was observed that PGIMER has written collaborative papers with 20 partner countries during 1999 to 2008 (Table 7). The international collaborative papers of the institute contributed 6.1% share (with 289 papers) in the cumulative publications output of PGIMER during 1999 to 2008. The institute witnessed the increase in the share of international collaborative papers from 4.42% (84 papers) in 1999 to 2003 to 7.14% (205 papers) during 2004 to 2008.

Among the various collaborating countries, United States contributed the largest share of 38.4% share with 118 papers in cumulative output of PGIMER during 1999 to 2008, followed by United Kingdom (20.5% share, 63 papers), Canada (10.10% share, 31 papers), Australia (4.89% share,

**Table 5:** International collaborative publication output and H-index under broad subjects of PGIMER (1999-2008)

Subjects	ICP			Share of ICP (%)			H-index
	1999-2003	2004-2008	1999-2008	1999-2003	2004-2008	1999-2008	
Medicine	68	176	244	4.31	7.16	6.05	35
Biochemistry, genetics and molecular biology	14	36	50	6.22	10.68	8.90	19
Immunology and microbiology	15	23	38	11.54	12.17	11.91	21
Pharmacology, toxicology and pharmaceuticals	2	10	12	1.33	7.63	4.27	18
Neurology	4	11	15	3.36	11.83	7.08	14
Public health	29	56	86	2.38	0.65	1.39	11
Dentistry	11	23	34	1.19	0.48	0.69	4
Nursing	3	20	23	0.00	0.48	0.34	5
Total	84	206	290	4.31	7.07	5.96	38

ICP: International collaborative papers



15 papers), Germany (4.23% share, 13 papers), Italy (3.26% share, 10 papers), France (3.26% share, 10 papers), etc.

**Patterns of Research Communication**

The list of top 40 productive Indian and foreign journals in which the staff to PGIMER have published their research output during 1999 to 2008 is presented in Table 8. These 40 highly productive Indian and foreign journals together contributed 40% share in the cumulative publication output of PGIMER during 1999 to 2008. The cumulative output of these 40 productive journals in total publications output of PGIMER showed decline from 45.8% in 1999 to 2003 to 36.3% in 2004 to 2008. Of these 40 journals, 18 journals are domestic and 22 foreign. The Indian journals contributed

higher percentage share (23.9%) than the foreign journals (16.1%) in total productivity of PGIMER during 1999 to 2008. The dominant subject areas of productive journals were medicine, pediatrics, dermatology and pathology.

**High Cited Papers**

Out of 100 high cited papers, 90 appeared as articles, 5 as reviews, 4 as conference paper and 1 as letter. Out of 100 highcited papers, 12 papers involve international collaboration (8 multilateral and 4 bilateral), 6 national collaboration and 21 interdepartmental collaboration. Sixty-one papers involve zero collaboration. The high cited papers appeared in 79 Indian and foreign journals. The maximum number (6) papers were published in international journal

**Table 6:** Department-wise publication output of PGIMER (1999-2008)

Departments	TP	TC	ACPP
<b>Clinical departments</b>			
Department of pulmonary medicine	564	594	1.05
Department of gastroenterology	286	460	1.61
Department of internal medicine	282	578	2.05
Department of radiodiagnosis	265	489	1.85
Department of dermatology	248	595	2.4
Department of anesthesia	209	257	1.23
Department of psychiatry	168	289	1.72
Department of endocrinology	134	249	1.86
Department of cardiology	127	182	1.43
Department of nephrology	121	371	3.07
Department of neurosurgery	115	151	1.31
Department of hepatology	114	267	2.34
Department of otolaryngology	114	133	1.17
Department of pediatrics	97	206	2.12
Department of urology	87	177	2.03
Department of radiotherapy	77	105	1.36
Department of general surgery	76	158	2.08
Department of nuclear medicine	70	144	2.06
Department of community medicine	68	110	1.62
Department of plastic surgery	68	41	0.6
Department of orthopedics	49	36	0.73
Department of oral health sciences	32	19	0.59
Department of pediatric surgery	29	31	1.07
Department of cardiovascular and thoracic surgery	22	16	0.73
Department of cytology and gynehistopathology	11	21	1.91
Department of obstetric and gynecology	1	0	0
<b>Paraclinical departments</b>			
Department of histopathology	353	567	1.61
Department of pharmacology	198	437	2.21
Department of medical microbiology	171	520	3.04
Department of experimental medicine	148	349	2.36
Department of immunopathology	86	179	2.08
Department of parasitology	76	165	2.17
Department of hematology	49	101	2.06
Department of virology	38	60	1.58
Department of college of nursing	24	28	1.17
Department of forensic Medicine	18	30	1.67
Department of biostatistics	11	40	3.64
<b>Nonclinical departments</b>			
Department of biochemistry	168	628	3.74
Department of biophysics	41	110	2.68
Department of biostatistics	11	40	3.64
Department of anatomy	3	7	2.33

TP: Total publication; TC: Total citation; ACPP: Average citation per publication

of dermatology, followed by 3 papers each in acta radiologica, digestive diseases and sciences, journal of gastroenterology and hepatology, Lancet and 2 papers each in acta paediatrica, dermatology, FEMS microbiology, gastrointestinal endoscopy, international journal of antimicrobial agents, journal of child neurology, pediatric critical care medicine and tuberculosis, etc. Out of 100 high cited papers, one paper received citations above 100, 1 paper in citation range of 81 to 90, 2 papers in citation range of 61 to 70, 2 papers in citation range of 51 to 60, 4 papers in citation range of 41 to 50, 14 papers in citation range of 31 to 40, 23 papers in citation range of 21 to 30 and 53 papers in citation range of 11 to 20.

The high cited papers involve contribution from 27 departments and 229 authors. The maximum representation were from department of dermatology with 13 papers involving 17 authors, followed by pediatrics department (10 papers involving 21 authors), biochemistry department (10 papers involving 12 authors), hepatology department (9 papers involving 16 authors), radiodiagnosis department (8 papers involving 13 authors), internal medicine department (7 papers involving 13 authors), gastroenterology department (6 papers involving 17 authors), pulmonary medicine department (6 papers involving 13 authors), experimental medicine and biotechnology department (6 papers involving 10 authors), ophthalmology department (5 papers involving 8 authors), nephrology department (5 papers involving 6 authors), histopathology department (5 papers involving 8 authors), general surgery department

(4 papers involving 7 authors), pharmacology department (4 papers involving 9 authors), surgery department (3 papers involving 3 authors), cardiology department (3 papers involving 8 authors), medical microbiology department (3 papers involving 18 authors), psychiatry department (3 papers involving 7 authors), microbiology department (3 papers involving 2 authors), public health department (3 papers involving 1 author), nuclear medicine department (3 papers involving 3 authors), cytology department (3 papers involving 4 authors), obstetrics and gynecology department (2 papers involving 2 authors), parasitology department (2 papers involving 6 authors), pathology department (2 papers involving 1 author), anesthesiology department (2 papers involving 2 authors) and biophysics department (2 papers involving 2 authors).

A list of high cited paper in the Table 9.

## SUMMARY AND DISCUSSION

The PGIMER faculty published 4,771 papers during 1999 to 2008, with an average annual growth rate of 5.9%. Its publication output increased from 1,901 papers to 2,870 papers from 1999 to 2003 and 2004 to 2008, showing growth rate 51 %. Its faculty publications registered an average impact of 1.98 citations per paper during 1999 to 2008, which decreased from 2.35 to 1.74 citations per paper from 1999 to 2003 and 2004 to 2008.

The individual contribution from PGIMER to eight subjects during 1999 to 2008 varied from 0.5 to 84.4%, with highest contribution in medicine, followed by

**Table 7:** Collaborative papers with partner countries, PGIMER (1999-2008)

S. no.	Collaborating country	Number of international collaborative publications		
		1999-2008	2004-2008	Total
1	United States	43	75	118
2	United Kingdom	15	48	63
3	Canada	7	24	31
4	Australia	4	11	15
5	Germany	5	8	13
6	Italy	4	6	10
7	France	2	8	10
8	Spain	1	7	8
9	Israel	1	6	7
10	Sweden	3	3	6
11	Japan	3	2	5
12	Singapore	1	4	5
13	Switzerland	1	3	4
14	Columbia	1	2	3
15	China	1	1	2
16	Taiwan	1	1	2
17	Mexico	0	2	2
18	Russia	0	1	1
19	Poland	0	1	1
20	Hungary	0	1	1
Total ICP papers		93	214	307
PGIMER output		1,901	2,870	4,771
Share of ICP(%)		4.89%	7.46%	6.06%

biochemistry, genetics and molecular biology, immunology and microbiology, pharmacology, toxicology and pharmaceuticals, neurosciences, public health, dentistry and nursing. Among these eight subjects, the publication share of medicine, public health, dentistry and nursing has increased, while those of biochemistry, genetics and molecular biology, immunology and microbiology and pharmacology, toxicology and pharmaceuticals have decreased from 1999 to 2003 and 2004 to 08. The largest citation impact (3.53) has been registered by immunology and microbiology during 1999 to 2008, followed by biochemistry, genetics and molecular biology, pharmacology, toxicology and pharmaceuticals and public health (2.17-2.53), nursing, medicine and neurosciences (1.66-1.96) and dentistry (0.62). The average impact factor per paper recorded by immunology and microbiology, pharmacology, toxicology and pharmaceutical, dentistry and

nursing has increased, while those of medicine, biochemistry, genetics and molecular biology, neurology and public health has decreased from 1999 to 2003 and 2004 to 2008.

Among the contribution of PGIMER to various diseases during 1999 to 2008, the maximum research output has been in cancer with 430 papers, followed by cardiovascular disease (373 papers), tuberculosis (267 papers), diabetes (140 papers), pneumonia (119 papers), AIDS (94 papers), hepatitis (93 papers), diarrheal diseases (82 papers), asthma (79 papers), respiratory infection (69 papers), leprosy (47 papers), malaria (31 papers), etc.

Among the 47 departments of PGIMER, the maximum research output comes from pulmonary medicine department with 564 papers, followed by departments of histopathology gastroenterology, internal medicine, radiodiagnosis, dermatology, anesthesia (209-353 papers), pharmacology,

**Table 8:** Pattern of communication of PGIMER staff (1999-2008)

S. no.	Journals	Number of papers		
		1999-2003	2004-2008	1999-2008
1	Indian Pediatrics	100	90	190
2	Indian Journal of Pediatrics	68	74	142
3	Indian Journal of Pathology and Microbiology	38	62	100
4	Neurology India	77	19	96
5	Indian Journal of Medical Research	34	60	94
6	Indian Journal of Gastroenterology	37	41	78
7	Tropical Gastroenterology	44	31	75
8	Journal of Association of Physicians of India	45	29	74
9	Molecular and Cellular Biochemistry	19	45	64
10	Journal of Gastroenterology and Hepatology	24	32	56
11	Journal of Anesthesiology Clinical Pharmacology	29	27	56
12	Indian Journal of Chest Diseases and Allied Sciences	22	26	48
13	Indian Journal of Ophthalmology	17	26	43
14	Anesthesia and Analgesia	12	31	43
15	Diagnostic Cytopathology	26	16	42
16	Paediatric Anesthesia	2	39	41
17	Journal of Dermatology	8	30	38
18	Bulletin of Medical Education and Research	2	34	36
19	Methods and Findings in Experimental and Clinical Pharmacology	25	8	33
20	Indian Journal of Dermatology Venereology and Leprology	7	26	33
21	International Journal of Gynecology and Obstetrics	14	19	33
22	Analytical and Quantitative Cytology and Histology	9	22	31
23	Journal of the European Academy of Dermatology and Venereology	17	14	31
24	Journal of Postgraduate Medicine	9	20	29
25	Journal of Pediatric Surgery	17	12	29
26	International Journal of Dermatology	14	15	29
27	Acta Cytologica	17	12	29
28	Indian Heart Journal	15	13	28
29	Gastrointestinal Endoscopy	13	15	28
30	Postgraduate Medical Journal	18	10	28
31	Journal of Tropical Pediatrics	15	11	26
32	Digestive Diseases and Sciences	7	18	25
33	Indian Journal of Experimental Biology	14	10	24
34	Indian Journal of Medical Sciences	7	17	24
35	Indian Journal of Otolaryngology and Head and Neck Surgery	9	15	24
36	JK Science	8	15	23
37	Lancet	6	17	23
38	Cytopathology	8	15	23
39	Transplantation Proceedings	11	11	22
40	American Journal of Hematology	7	14	21

medical microbiology, psychiatry, biochemistry experimental medicine, endocrinology (134-198 papers), etc. In terms of citation impact, highest impact per paper of 3.74 was scored by biochemistry, followed by biostatistics, nephrology, medical microbiology (3.07-3.64) and biophysics, dermatology, experimental medicine), hepatology, anatomy, pharmacology, parasitology, pediatrics (2.12-2.68), etc.

The international collaborative papers of the institute contributed 6.1% share (with 289 papers) in the cumulative publication output of PGIMER during 1999 and 2008, which increased from 4.4 to 7.1% from 1999 to 2003 and 2004 to 2008. United States contributed the largest share of 38.4% international collaborative papers in the institute total publications output, followed by United Kingdom (20.52% share), Canada (10.1% share), Australia (4.9% share), Germany (4.2% share), Italy (3.3% share), France (3.3% share), etc.

Out of 100 high cited papers, 12 papers involve international collaboration (8 multilateral and 4 bilateral) and national collaboration. The high cited papers appeared in 79 Indian and foreign journals, with maximum number (6) papers were published in international journal of dermatology, followed by 3 papers each in acta radiologica, digestive diseases and sciences, journal of gastroenterology and hepatology, Lancet, etc. Out of 100 high cited papers, one paper received citations above 100, 1 paper in citation

range of 81 to 90, 2 papers in citation range of 61 to 70, 2 papers in citation range of 51 to 60, 4 papers in citation range of 41 to 50, 14 papers in citation range of 31 to 40, 23 papers in citation range of 21 to 30 and 53 papers in citation range of 11 to 20.

The high cited papers involve contribution from 27 departments and 229 authors. The maximum representation were from department of dermatology with 13 papers involving 17 authors, followed by pediatrics department (10 papers involving 21 authors), biochemistry department (10 papers involving 12 authors), hepatology department (9 papers involving 16 authors), radiodiagnosis department (8 papers involving 13 authors), internal medicine department (7 papers involving 13 authors), gastroenterology department (6 papers involving 17 authors), pulmonary medicine department (6 papers involving 13 authors), experimental medicine and biotechnology department (6 papers involving 10 authors), etc.

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**Table 9:** Department-wise high cited papers

Departments	Total papers	Total authors
Dermatology	13	17
Pediatrics	10	21
Biochemistry	10	12
Hepatology	9	16
Radiodiagnosis	8	13
Internal medicine	7	9
Gastroenterology	6	17
Pulmonary medicine	6	13
Experimental Medicine and biotechnology	6	10
Ophthalmology	5	8
Nephrology	5	6
Histopathology	5	8
General surgery	4	7
Pharmacology	4	9
Surgery	3	3
Cardiology	3	8
Medical microbiology	3	18
Psychiatry	3	7
Microbiology	3	2
Public health	3	1
Nuclear medicine	3	3
Cytology	3	4
Obstetrics and gynecology	2	2
Parasitology	2	6
Pathology	2	1
Anesthesiologist	2	2
Biophysics	2	6



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