

## Status of Indian States and Union Territories in PubMed Central

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### Abstract

**Introduction:** The PubMed Central (PMC) is a free digital repository of archived open access full-text scholarly articles published in biomedical and life sciences journals. It was developed by the National Center for Biotechnology Information (NCBI) PMC is a free digital archive of full articles, that can be accessed by anyone from anywhere via a web browser.

**Methodology:** The name of each of the Indian state and union territory was put in the search box on the webpage of PubMed Central (<https://www.ncbi.nlm.nih.gov/pmc/>) on 11 May 2021 and the total number of publications that were reflected was noted.

**Observations:** The data presents the ranking of various States and Union territories (UT) of India on the basis of number of PMC published articles. All the PMC publications since the launch of PMC in February 2000, till May 2021 have been included in this study. So, the data reflects an aspect of advancement made by different states/ UT in last two decades, in field of biomedical and life science research. The capital city of the country holds the first position in the list with the highest number of total publications (over 74,000), Ladakh acquires lowest position with only 4 PMC articles.

**Conclusion:** There is a need of attention to be paid by the Central as well as respective State Governments for introducing such policies that may uplift the research environment in the States/UTs which are lagging behind in contribution so that the variations are reduced.

**Keywords:** PubMed Central; NCBI; Indian states; Union territories.

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### Introduction

The PubMed Central (PMC) is a free digital repository of archived open access full text scholarly articles published in biomedical and life sciences journals. It was developed by the National Center for Biotechnology Information (NCBI).<sup>1</sup> PMC was launched in February 2000, and has grown rapidly as the NIH Public Access Policy is designed to make all research funded by the National Institutes of Health (NIH) freely accessible to anyone.<sup>2</sup> The

contents are linked to other NCBI databases this enhances the public's ability to discover, read and build upon biomedical knowledge.<sup>3</sup>

PMC is distinct from PubMed. As PMC is a free digital archive of full articles, that can be accessed by anyone from anywhere via a web browser. While PubMed is a searchable database of biomedical citations and abstracts where the full text article resides elsewhere (in print or online, free or behind a subscriber paywall).<sup>4</sup>

As of December 2018, the PMC archive contained

over 5.2 million articles,<sup>5</sup> with annual deposit of more than 103,000 papers.<sup>6</sup> PMC identifies about 4,000 journals which deposit their published content into the PMC repository.<sup>7</sup>

## Methodology

The name of each of the Indian state and union territory was put in the search box on the webpage of PubMed Central (<https://www.ncbi.nlm.nih.gov/pmc/>) on 11 May 2021 and the total number of publications that were reflected was noted.

## Observations

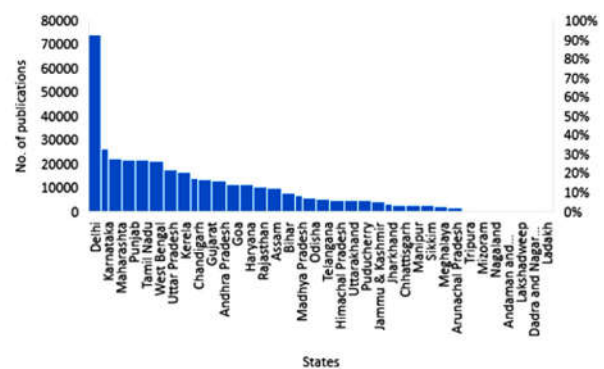
The data presents the ranking of various States and Union territories (UT) of India on the basis of number of PMC published articles. All the PMC publications since the launch of PMC in February 2000, till May 2021 have been included in this study. So, the data reflects an aspect of advancement made by different states/ UT in last two decades, in field of biomedical and life science research.

While the capital city of the country holds the first position in the list with the highest number of total publications (over 74,000), Ladakh acquires lowest position with only 4 PMC articles. Despite the fact that the mean±SEM number of publications per unit (state/UT) is 10,124±2215, the number is highly variable from unit to unit. Other than holding the first place, Delhi, has shown an exclusive position in the list by succeeding the unit with second highest ranking (Karnataka) with a huge gap. (Table 1, Fig. 1)

**Table 1:** Ranking of States and Union Territories as per number of PubMed Central Publications.

Ranking	State	Number of PubMed Central publications
1.	Delhi	74115
2.	Karnataka	26205
3.	Maharashtra	21980
4.	Punjab	21702
5.	Tamil Nadu	21644
6.	West Bengal	21077
7.	Uttar Pradesh	17263
8.	Kerala	16268
9.	Chandigarh	14016
10.	Gujarat	13442
11.	Andhra Pradesh	12608
12.	Goa	11329
13.	Haryana	11050
14.	Rajasthan	10190
15.	Assam	9891

16.	Bihar	7428
17.	Madhya Pradesh	6889
18.	Odisha	5624
19.	Telangana	5085
20.	Himachal Pradesh	4478
21.	Uttarakhand	4419
22.	Puducherry	4358
23.	Jammu & Kashmir	3824
24.	Jharkhand	3064
25.	Chhattisgarh	2674
26.	Manipur	2409
27.	Sikkim	2365
28.	Meghalaya	1959
29.	Arunachal Pradesh	1494
30.	Tripura	1355
31.	Mizoram	1272
32.	Nagaland	1243
33.	Andaman and Nicobar Islands	1158
34.	Lakshadweep	414
35.	Dadra and Nagar Haveli and Daman & Diu	165
36.	Ladakh	4



**Fig. 1:** State/ UTs- wise PubMed Central Publications.

Variations in the number of PMC may be due to a number of factors which are highly variable from unit to unit. Some of these could be per capita income, number of research institutes and/or medical colleges in government and private sector and availability of research funds. Additionally the state/UT wise local factors may also have an impact on contribution of that unit in the field of research. For instance climatic and geographical aspects influence the priorities of the local government or authorities to allocate finances for research or other concerns. Cultural and social norms affect research interests of the faculty and their keenness for training in research and competitive approach.

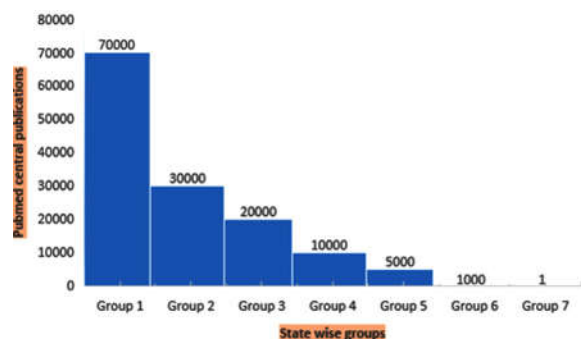
Another aspect of our findings is that it includes

numbers of only PMC articles. If otherwise published articles are also included the total number of publications and status of states/ UT in the prepared list may be different. Noteworthy is that PMC is a platform for only valuable authentic and reliable research, which is recognized internationally.

Our data presents that there is much scope and need of quality research advancement in some units as compared to others. For example, Lakshadweep, Dadra and Nagar Haveli and Daman and Diu having less than 500 PMC published in last two decades and Ladakh is with just 4 PMC articles. (Table 2, Fig. 2)

**Table 2:** States and Union Territories as per Range of Number of PubMed Central Publications.

Group	Range of no of publications	No of states	State
Group 1	70000	1	Delhi
Group 2	30000-70000	0	No State
Group 3	20000-30000	5	Karnataka, Punjab, Maharashtra, Tamil Nadu, West Bengal
Group 4	10000- 20000	8	Uttar Pradesh, Kerala, Chandigrah, Gujarat, Andhra Pradesh, Goa, Haryana, Rajasthan
Group 5	5000- 10000	5	Assam, Bihar, Madhya Pradesh, Odisha, Telangana
Group 6	1000-5000	14	Himachal Pradesh, Uttarakhand, Puducherry, Jammu & Kashmir, Jharkhand, Chattisgarh, Manipur, Sikkim, Meghalaya, Arunachal Pradesh, Tripura, Mizoram, Nagaland, Andaman-Nikobar Island
Group 7	1-1000	3	Lakshadweep, Dadra and Nagar Haveli and Daman & Diu, Ladakh



**Fig. 2:** Groupwise distribution of PubMed Central Publications.

## Conclusions

There is a need of attention to be paid by the Central as well as respective State Governments for introducing such policies that may uplift the research environment in the States/UTs which are lagging behind in contribution so that the variations are reduced. Also, the factors associated with better representation of some states than others in regards to number of PMC articles may be explored. This understanding may be incorporated for evolving a better research environment for the States/UTs which are lagging behind.

Although this is a cross sectional observational study, it also opens the door for an elaborate study exploring the growth of the States/UTs in respect to research, prospectively, in retrospect to corelative how the research growth varied with variations in external factors. This may also serve as tool for uplift of the units reluctant in terms of research contribution.

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