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Biomedical Science Productivity in Artificial Intelligence Research on India: A Scientometric Study Evaluation

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Abstract- — This Scientometric research study evaluates India's research landscape in Biomedical within Science Artificial Intelligence (AI) from 2015 to 2024 (10 years). Utilizing data from the Web of Science (WoS), Analyzing a corpus of 622 publications and 10,359 citations, the research tracks the transition from a developmental phase to a high-impact era. Results from the Relative Quality Index (RQI) identify 2015, 2017, 2021, and 2022 as peak years for research excellence, while a subsequent dip in citation rates for 2023-2024 suggests challenges in sustaining global influence despite rising publication volumes. Journal productivity analysis reveals Computers in Biology and Medicine as the field leader with an h-index of 36.3. While top-tier journals maintain strong impacts, a score convergence of 18.1 among specialized outlets indicates a stabilizing, competitive ecosystem. The findings underscore the need for enhanced interdisciplinary collaboration to bridge the gap between quantitative growth and clinical utility, ensuring Indian AI research maintains consistent international academic prestige.

KeyWords- Biomedical Science, Bio-Medical, Artificial Intelligence (AI), Relative Quality Index (RQI), H-Indices, Journals, Scientometric, Web of Science (WoS), India..

I. INTRODUCTION

The integration of Artificial Intelligence (AI) into biomedical science represents a transformative shift in modern healthcare. Traditionally, biomedical professionals relied on manual data analysis and standardized protocols; however, the advent of Artificial Intelligence, specifically machine learning and deep learning, has enabled the processing of vast, complex medical datasets with unprecedented speed (Abiodun, et al., 2025). In clinical settings, Artificial Intelligence enhances diagnostic precision across specialties like radiology and pathology by identifying subtle patterns in medical imaging that may elude human observation (Abiodun, et al., 2025). Beyond diagnostics, Artificial Intelligence facilitates precision medicine by tailoring treatment plans-particularly in oncology-based on a patient's unique genetic and molecular profile. Furthermore, the field of drug discovery has been accelerated through Artificial Intelligence-driven simulations, drastically reducing the time required to identify therapeutic candidates. Despite these advancements, the implementation of Artificial Intelligence in biomedical science faces critical challenges, including data privacy concerns, potential algorithmic bias, and the high cost of technology integration (Abiodun, et al., 2025). As the field matures, establishing ethical frameworks remains essential to ensure that Artificial Intelligence serves as a reliable, transparent partner in improving global patient outcomes (Hirani, et al., 2024).

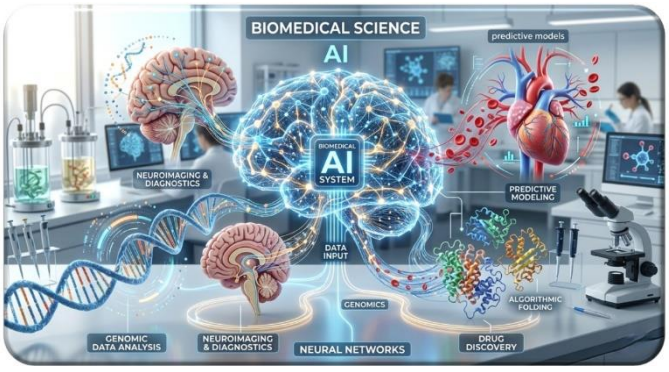

Figure-1: Biomedical Science in Health Care Artificial Intelligence

Scientometric deification refers to the excessive or uncritical reliance on quantitative metrics-such as the h-index, Journal Impact Factor (JIF), and citation counts-to determine the value, quality, and "truth" of scientific research (Academy, 2020). Originally developed as tools for librarians and sociologists of science to map the growth of knowledge, these indicators have increasingly become the important of academic evaluation (Ningayya & Kumar, 2025).

This "deification" creates a culture where the metric becomes the goal rather than a measure of excellence. Critics argue that this over-reliance fosters a "publish or perish" environment, incentivizing quantity over quality and discouraging high-risk,

innovative research that may not yield immediate citations. As the field of Scientometrics evolves, scholars advocate for a "science of science" that uses metrics as a balanced tool rather than an absolute authority, ensuring that the human element of peer review remains central to academic assessment (Ningayya & Kumar, 2025).

II. METHODOLOGY

In addition to the Biomedical sciences, the medical domains of Artificial Intelligence, Bio Medical, Bio-Medical, Biomedical Bioinformatic, Signal Transduction, Neuroimaging, and disease diagnosis currently employ this state-of-the-art technology. Artificial intelligence is already the basis of many surgical operations in the medical industry. Better results in diagnostics and medical care assistance will be achieved due to the more autonomous treatment approach. Used Query Design like: CU= INDIA AND (TS=Artificial Intelligence*) AND (TI=Bio Medical* OR TI=Bio-Medical* OR TI=Biomedical* OR TI=Bioinformatic* OR TI=Signal Transduction* OR TI=Neuroimaging*) Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=2015-2024.

Primary data sources have been collected and investigated in this study from the Web of Science (WoS). Numerous places in India country help to develop the artificial intelligence research in the bio medical industry. The study, which was conducted from 2015 to 2024 in a ten-year span, is available in the database. Using the "Histcite" software tool and tab-delimited in "Micro Soft Excel" 622 papers with 10,359 citations from India were downloaded and analyzed according to the goals in the study.

Objectives of the Study

- Year-wise Bio Biomedical Science in Artificial Intelligence Publication.
- Analysed Relative Quality Index Vs Year wise research productivity.
- Analysed Computed h-indices the top ten most productive journals.

III. RESULTS AND DISCUSSION

1. Year-wise Bio Biomedical Science in Artificial Intelligence Publication

The integration of Artificial Intelligence (AI) within the biomedical sector has emerged as a cornerstone of India's modern healthcare evolution. This Scientometric study evaluates the research productivity and citation impact of Indian scholars between 2015 and 2024, identifying a total of 622 publications. The data reveals a distinct "boom phase" in the latter half of the decade, signaling a strategic shift toward technology-driven medical solutions.

Table-1: Year-wise Biomedical Science in Artificial Intelligence Publication

Year	Papers	Percentage	Citations	Percentage
2015	5	0.80	103	0.99
2016	16	2.57	209	2.02
2017	9	1.45	252	2.43
2018	23	3.70	939	9.06
2019	23	3.70	571	5.51
2020	55	8.84	1767	17.06
2021	102	16.40	2826	27.28
2022	159	25.56	2900	27.99
2023	128	20.58	688	6.64
2024	102	16.40	104	1.00
Total	622		10,359	

While the decade shows an overall upward trajectory, the progression has been non-linear, characterized by fluctuating growth rates in 2015, 2017, and 2018. The quantitative peak occurred in 2022, contributing 159 publications (25.56%) and a staggering 2,900 citations (27.99%).

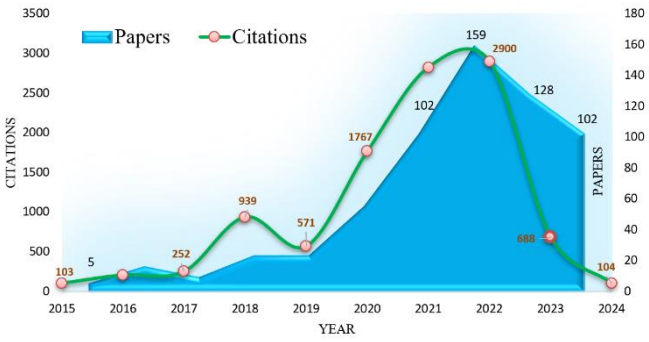

Figure-2: Year-wise Biomedical Science in Artificial Intelligence Publication

However, table-1 and figure-2 showing this progression a critical observation arises when comparing 2021 and 2023. Although 2023 produced more documents (128 papers), they garnered only 688 citations. In contrast, 2021 saw 102 publications but amassed 2,826 citations. This discrepancy highlights a high concentration of influential, high-quality research during the 2021 period, likely driven by the urgent global demand for AI-driven diagnostic tools during the mid-pandemic era.

2. Relative Quality Index Vs Year wise research productivity

A value of RQI> 1 indicates a quality higher than the average, while a value of RQI <1 indicates a quality lower than the average, The "Relative Quality Index (RQI) suggested" by (Nagpaul, 1985) is the "relationship between the proportion of high-quality articles (NHQ%) and the proportion of the number of articles (TNP%). RQI is used" by (Garg & Padhi, 2001) for quality inters comparison.

$$TNP\% = \frac{Number\ of\ High\ Quality\ Papers\ for\ a\ country\ or\ an\ Institution}{Total\ Number\ if\ Quality\ Papers}$$

$$TNP\% = \frac{Total\ Publications\ output\ of\ a\ country\ or\ an\ Institution}{Total\ Publications\ output\ of\ all\ country\ or\ Institution}$$

$$RQI = \frac{NHQ\%}{TNP\%}$$

The above table represents the distribution of citation analysis of ten years from 2015 to 2024. Total publications 622 and total citations 10,359 with an average of 16.65% citations per cited paper. The highest number of 939 citations were received for the 23 publications in the year from 2018 shows table - 2.

Table-2: Relative Quality Index Vs Year wise research productivity

YEAR	TNP	TNC	CPP	NHQ	TNP%	NHQ%	RQI	Average
2015	5	103	20.60	8	0.80	9.76	12.14	High Peak
2016	16	209	13.06	1	2.57	1.22	0.47	Below Avg
2017	9	252	28.00	2	1.45	2.44	1.69	Above Avg
2018	23	939	40.83	3	3.70	3.66	0.99	At Avg
2019	23	571	24.83	1	3.70	1.22	0.33	Below Avg
2020	55	1767	32.13	2	8.84	2.44	0.28	Below Avg
2021	102	2826	27.71	15	16.40	18.29	1.12	Above Avg
2022	159	2900	18.24	23	25.56	28.05	1.10	Above Avg
2023	128	688	5.38	14	20.58	17.07	0.83	Below Avg
2024	102	104	1.02	13	16.40	15.85	0.97	At Avg
Total	622	10359		82				

"TNP-Total No. of Papers, TNC-Total No. of Citation, CPP-Citations per Paper, NHQ-No. of High-Quality Papers, TNP%-Total No. of Paper Percentage, NHQ%- No. of High-Quality Paper Percentage, RQI-Relative Quality Index"

In the year 2022 high-quality papers 23 followed by the year 2021 high-quality papers 15 and Relative Quality Index results (RQI) 12.14 maximum in the year 2015 followed by in the year 1017 Relative Quality Index 1.69. In the year 2015, 2017, 2021 and 2022 Relative Quality Index higher than the average and in the year 2016, 2018, 2019, 2020, 2023 and 2024 Relative Quality Index lower than average that showing in figure-2.

Figure-3: Relative Quality Index Vs Year wise research productivity

total of 622 publications with 10,359 citations. While 2018 recorded the highest citations, the Relative Quality Index (RQI) identifies 2015, 2017, 2021, and 2022 as years of above-average research quality. Conversely, remaining years fell below the quality threshold, indicating fluctuating research impact over the decade.

3. Computed h-indices the top ten most productive journals

According to *h-index* quality research on the field of Biomedical Science Productivity in Artificial Intelligence study period of ten years from 2015 to 2024. The h-index is an author-level metric that attempts to measure both the productivity and impact of citations of a scientist's or academic's publications. The *h-index* was proposed by (Hirsch, 2005) "… published in the Proceedings of the National Academy of Sciences of the United States of America (https://beckerguides.wustl.edu/authors/hindex)". The *h-index* is a quantitative metric based on the analysis of publication data using publications and citations to provide "an estimate of the importance, importance and broad impact of a scientist's research accumulated contributions". According to Hirsch, the h index is defined as: - "… A scientist has index h if h of his or her *Np* papers have at least h citations each and the other *(Np – h)* papers have ≤*h* citations each".

(Hirsch, Jorge E 2025), proposed the mathematical model for the index h, in which the index h only links the total citations (*C*) and the measures with.

$$h=\sqrt{\frac{C}{a}} \qquad (1)$$

Where, a is a constant ranging between 3 and 5;
(Egghe & Rousseau, 2006), with the *h-index* linking only total source publications (*P*), using;

$$h=P^{1/a} \qquad (2)$$

(Glanzel, 2006) Used with the formula

$$h=cP^{1/3}{}_{(CPP)}{}^{2/3} \qquad (3)$$

In which CPP=C/P denotes citations per publication (for journals, C/P is associated with the Impact Factor); and *c* is a constant. Using each of these models, we can estimate the *index h* with the following formulas, when α = 2 and α = 5.

$$h_c=\sqrt{\frac{c}{5}} \qquad (4)$$

$$h_p=\sqrt{P} \qquad (5)$$

$$h_{cp}=c\,P^{1/3}{}_{(C/P)}{}^{2/3} \qquad (6)$$

We can compare the h-index in the year 2015 to 2024 publications search with the computation index h by means of formulas 4, 5 and 6, using data table - 3.

The results of the top ten total journals and listed according to their highly publication, with identical h-indexes, we classify according to h_{pc} in h_{pc} computing, we set $c = 0.9$ for the total country and we registered the corresponding h_{pc} as $0.9h_{pc}$ for journals. We see that the all country $0.9h_{pc}$ correlate with the searching h-indices better, while almost all year h_p form the all h_c result top. The above results support all year the Glanzel-Schubert model as a better estimation of the h-index at both journal levels.

(Fred & Ye, 2009) "… that all h_{pc} correlate with the searching h-indices better, while most all hp from the bottom and all h_c leap to the top...above results support the Glanzel-Schubert model as a better estimation of the h-index at both journal and institution level". (cited from p.495).

Table-3: Computed h-indices the top ten most productive journals

S.N.	Name of the Journal	*P*	*C*	*CPP*	*h*	h_p	h_c	$0.9h_{pc}$
1	Biomedical Signal Processing and Control	154	2003	13.01	23	12.4	20.0	26.7
2	Computers in Biology and Medicine	87	2385	27.41	31	9.3	21.8	36.3
3	Sensors	56	1162	20.75	20	7.5	15.2	26.0
4	Biocybernetics and Biomedical Engineering	29	788	27.17	16	5.4	12.6	25.0
5	BioMed Research International	25	559	22.36	9	5.0	10.6	20.9
6	Medical Engineering & Physics	15	128	8.53	7	3.9	5.1	9.3
7	Bioengineering-Basel	13	91	7.00	7	3.6	4.3	7.7
8	Proceedings of the Institution of Mechanical Engineers, Part H: Journal of Engineering in Medicine	13	97	7.46	4	3.6	4.4	8.1
9	Innovation and Research in BioMedical engineering (IRBM)	11	299	27.18	7	3.3	7.7	18.1
10	Physical and Engineering Sciences in Medicine	11	299	27.18	8	3.3	7.7	18.1

P:*Total Papers*, C:*Total Citations*, CPP:*Citation Per Papers*, h:*h Index*, hp:*√(Totoal Papers)*, hc:*√(Totoal Citation/5)*, 0.9hpc:*0.9*Total Papers^1/3*Citation per Papers^2/3*

In the journals title "Computers in Biology and Medicine" 0.9hpc result 36.3, second ranked "Biomedical Signal Processing and Control" 0.9hpc result 26.7 and third ranked journals title "Sensors" 0.9hpc result 26.0, fourth one journals title "Biocybernetics and Biomedical Engineering" 0.9hpc result 25. Reaming 0.9hpc result belove 21 and observed that

journals title "Innovation and Research in Biomedical engineering (IRBM)" and "Physical and Engineering Sciences in Medicine" 0.9hpc result get same as an 18.1.

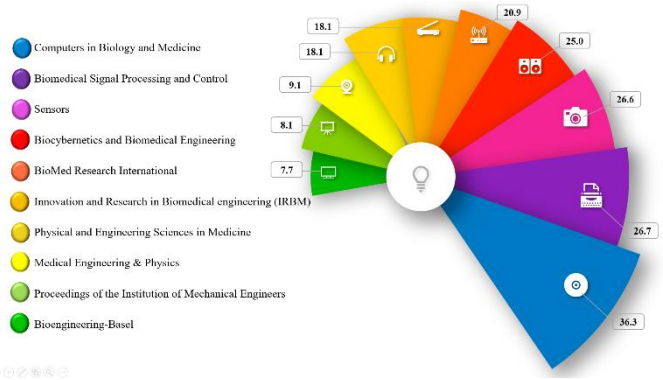

Figure-4: Computed h-indices the top ten most productive journals

The analysis of AI productivity in Biomedical Science 2015 to 2024 highlights "Computers in Biology and Medicine" as the dominant leader with an h-index of 36.3. While top-tier journals show strong citation impact, the convergence of scores around 18.1 for specialized publications suggests a competitive, stabilizing field of research excellence.

IV. Conclusion

The Scientometric data underscores that India's contribution to AI in Biomedical Science is moving from a steady developmental phase into a high-impact era. The surge in 2022 suggests a maturing research ecosystem; however, the dip in citation rates in 2023 and 2024 (preliminary data) suggests that while volume is increasing, maintaining the high-impact quality seen in 2021 remains a challenge. Future efforts should focus on fostering interdisciplinary collaborations to ensure that the quantity of Indian research is consistently matched by global academic influence and clinical utility. The Relative Quality Index analysis 2015–2024 reveals a total of 622 publications with 10,359 citations. While 2018 recorded the highest citations, the Relative Quality Index (RQI) identifies 2015, 2017, 2021, and 2022 as years of above-average research quality. Conversely, remaining years fell below the quality threshold, indicating fluctuating research impact over the decade. The analysis of AI productivity in Biomedical Science 2015 to 2024 highlights "*Computers in Biology and Medicine*" as the dominant leader with an h-index of 36.3. While top-tier journals show strong citation impact, the convergence of scores around 18.1 for specialized publications suggests a competitive, stabilizing field of research excellence.

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AUTHOR PROFILE

Dr.Praveen B. Hulloli is a distinguished academic and Librarian & HOD with 25 years of rich experience in various interdisciplinary fields. He holds an M. Lib & Info.Sci, M.Sc (Information Technology), M.A (Psychology), and M.A (Sociology) from Mysore and Dharwad University Karnataka and earned his Ph.D. from Rani Channamma University Belagavi, Karnataka, India. His extensive expertise spans multiple domains. In **Library Science** his interests encompass Scientometrics, Bibliometrics, Webmetrics, Informatics, Librametrics, Library Data Analytics, Citation Analysis, Digital Library, and User Study. Within **Psychology** he focuses on Organizational Psychology and Principles of Psychoanalysis. While his work in **Sociology** covers Rural Sociology, Urban Sociology, and Social Demography. Furthermore, his knowledge in **Information Technology** includes DBMS, Computer Networks, Multimedia Applications, Digital Libraries, Web Design, C++, and SQL Server. Dr.Praveen Hulloli contributions have been recognized through numerous accolades. He received the prestigious "Outstanding Librarian Award" across India for the year 2019 from Ulektz world Social Learning Platform for Higher Education. He is also an esteemed editorial board member for the International Journal of Psychological and Brain Sciences in the USA. A prolific researcher, he has published more than 30 research papers in national and international journals, and was honored with the Best Research Paper Awarded for his work titled "Research on Electric Vehicles a Scientometric study". Presently Dr.Praveen B. Hulloli serves as the Librarian & HOD at KLS Gogte College of Commerce in Belagavi Karnataka, India.