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Research on Artificial Intelligence of Medical Realm: A Scientometric Study

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Abstract **- Technology has a significant influence on our way of life, and since it can influence how science and technology are applied in the future, research on artificial intelligence is crucial for human potential and health in the medical field. This article examines the research output in the field of artificial intelligence in the medical field. According to the Web of Science (WoS) database, 9,774 articles with 123,043 citations were published in India and around the world between 2005 and 2024, out of a total of 123,007 publications. The USA topped the list of the top 20 nations in the world for artificial intelligence research in the medical field with 28,124 (22.86%) published papers, followed by China with 19,122 (15.55%) and India with 9,774 (7.95%), which together account for nearly 8% of the global total. A total of 2,104 (21.53%) papers were published in 2023, the most in the Indian nation; 1,309 (13.39%) articles were published in 2021, but 26,356 (21.42%) citations with 20.13 ACPP were the highest. During the study period from 2005 to 2024, all six years had an RQI greater than 1, with the greatest RQI of 3.75 in 2005 and the lowest RQI of 1.55 in 2007. The analysis found that between 2005 and 2024, there was a steady rise in the quantity of publications on medical science research on artificial intelligence.**

Keywords: **Artificial Intelligence, H-Index, Growth, Highly Cited, Relative Quality Index (RQI), Scientometric, Web of Science, (*WoS*), Country, India, Global**

I. INTRODUCTION

Scientometrics is an important statistic for evaluating scientific performance, and analyzing scientific publications is the most reliable way to keep an eye on science and technology activities. Throughout the past fifteen years, scientometric analysis has been widely used to assess both the academic achievements of researchers and the progress of many scientific subjects. The idea of artificial intelligence (AI) in the medical field is not new, as its applications in biomedical research date back to the 1970s. Since then, applications driven by artificial intelligence have grown and evolved to revolutionize the medical field by cutting costs, enhancing patient outcomes, and raising overall productivity.

According to Jimma (2023), "The use of artificial intelligence (AI) in the medical profession refers to the analysis and comprehension of intricate medical and healthcare data. In certain instances, it can surpass or enhance human abilities by offering quicker or more accurate methods for illness diagnosis, treatment, or prevention. Research on the application of artificial intelligence in many medical subfields and allied businesses is still ongoing because its extensive use in the medical field is still relatively young. Applications of artificial intelligence programs include personalized medicine, medication discovery, diagnostics, treatment protocol development, and patient monitoring and care."

Fig.1 Artificial Intelligence in Medical Fields

Source: https://www.freepik.com, Where is artificial intelligence now? Machine learning and AI technologies have advanced significantly, impacting healthcare delivery. Beyond the biological sciences, this cutting-edge technology is currently used in the medical fields of Cardiovascular, Neurology, Oncology, Ophthalmology, Gastroenterology, Obstetrics and Gynecology (OBG), Psychiatry, Dermatology (Skin & VD), Radiology, and Disease Diagnosis. In the medical field, artificial intelligence is already the basis for many surgical procedures. It will be crucial in improving the treatment process more autonomously, with better outcomes in diagnostics and medical care support.

II. METHODOLOGY

This study used primary data sources collected directly from the Web of Science and analyzed them. In India and around the world, a number of outlets contribute to research production in the field of artificial intelligence in the medical profession. The available database covers the study conducted over a twenty (20) year period from 2005 to 2024. According to the objectives of the study, 9,774 papers with 123,043 citations from India and 123,007 papers worldwide were obtained and examined using the "*HistCite*" software tool and tab-delimited in "*Microsoft Excel*."

III. OBJECTIVES OF THE STUDY

1. To find out the country-wise growth of publications globally.
2. To find out the year-wise growth of papers and citation publications in India.
3. To analyze the year-wise relative quality index.

IV. RESULTS AND DISCUSSION

A. Top Twenty Most Productive World Level Publications

A total of 123,007 research papers in the field of artificial intelligence in medicine were published globally during the twenty-year period from 2005 to 2024, and we selected only the top 20 countries with the highest number of published papers. From the above research, we identified the publication output in the field of artificial intelligence in medicine. The top twenty countries are listed in Table I, with the USA ranking first with 28,124 (22.86%) papers published, followed by China in second place with 19,122 (15.55%) papers published, India in third place with 9,774 (7.95%) papers published and nearly an 8% share globally, and England in fourth place with 8,126 (6.61%) papers published. It was observed that, at the global level, the USA accounted for approximately one-fourth (22.86%) of the papers produced during the research period from 2005 to 2024, while the remaining nations contributed less than 1% of the papers, as shown in Figure 2.

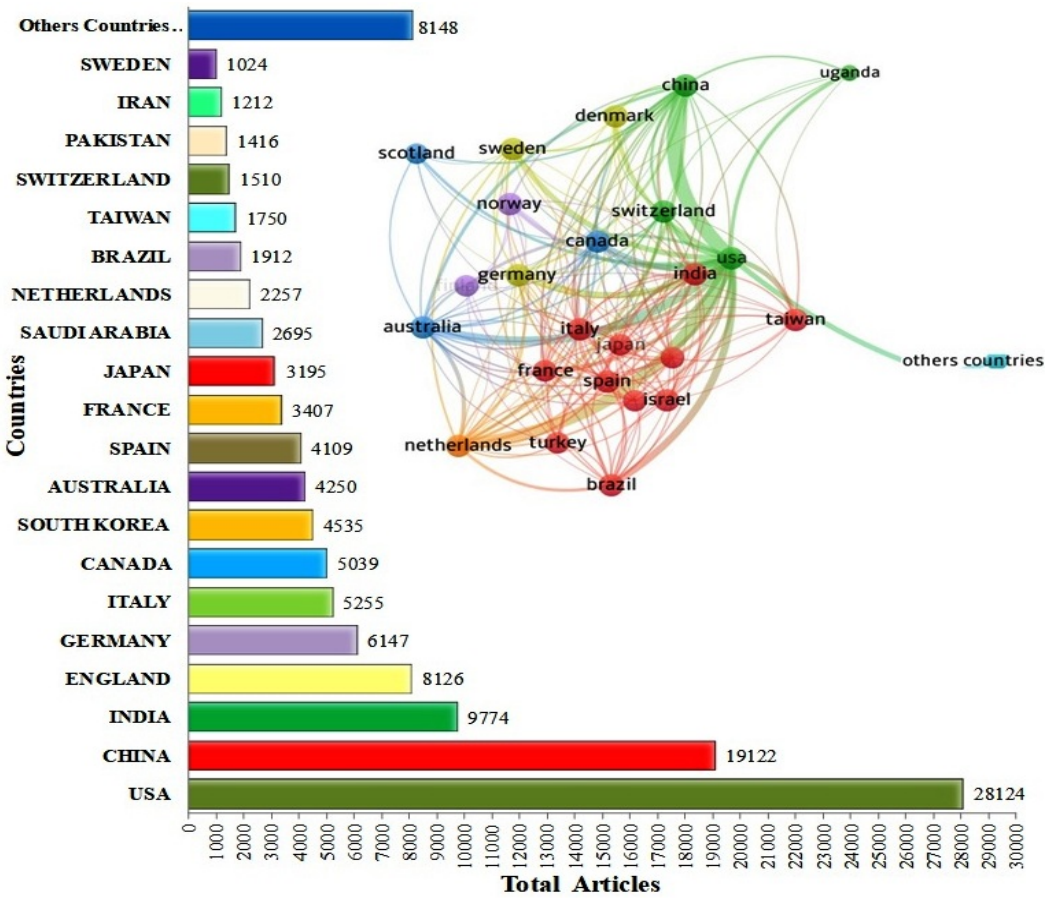

Fig.2 Countries Wise Contributing Network Mapping

TABLE I TOP TWENTY MOST PRODUCTIVE WORLD LEVEL PUBLICATIONS OF ARTIFICIAL INTELLIGENCE

Ranked	Countries	Papers	Percentage
1	USA	28124	22.86
2	China	19122	15.55
3	India	9774	7.95
4	England	8126	6.61
5	Germany	6147	5.00
6	Italy	5255	4.27
7	Canada	5039	4.10
8	South Korea	4535	3.69
9	Australia	4250	3.46
10	Spain	4109	3.34
11	France	3407	2.77
12	Japan	3195	2.60
13	Saudi Arabia	2695	2.19
14	Netherlands	2257	1.83
15	Brazil	1912	1.55
16	Taiwan	1750	1.42
17	Switzerland	1510	1.23
18	Pakistan	1416	1.15
19	Iran	1212	0.99
20	Sweden	1024	0.83
21	Others Countries (165)	8148	6.61
Total		123007	

B. Year Wise Growth of Papers and Citation Publication in India

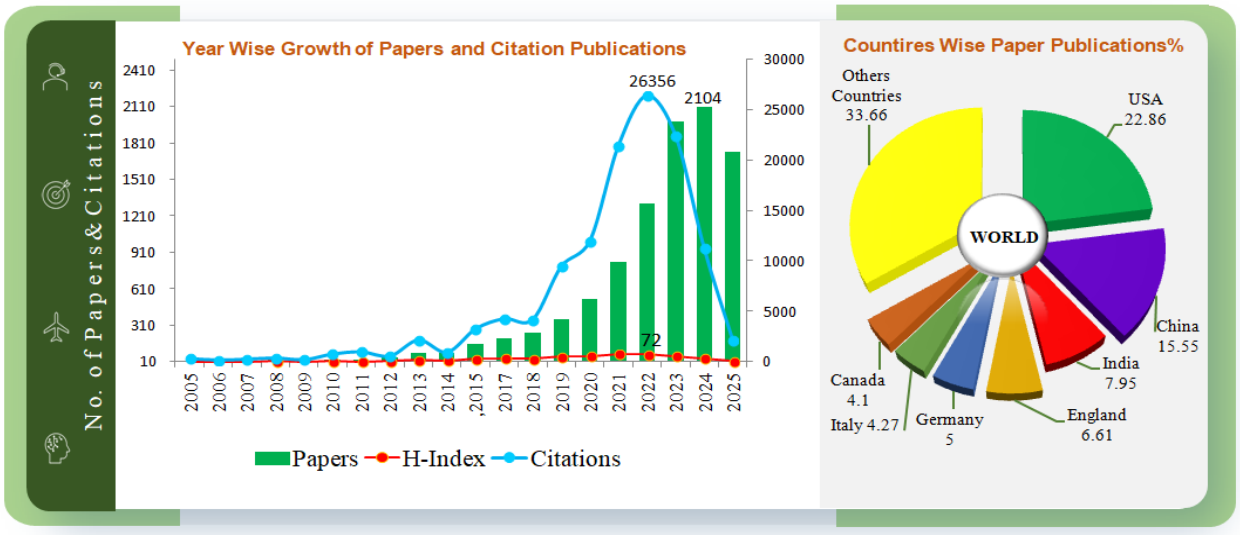

Fig.3 Year Wise Growth of Papers and Citation

TABLE II YEAR WISE GROWTH OF PAPERS AND CITATION

Year	Papers	Papers %	Citations	Citations %	ACPP	H-Index
2005	11	0.11	295	0.24	26.82	8
2006	8	0.08	137	0.11	17.13	5
2007	12	0.12	238	0.19	19.83	5
2008	25	0.26	345	0.28	13.80	11
2009	26	0.27	181	0.15	6.96	8
2010	25	0.26	742	0.60	29.68	13
2011	24	0.25	955	0.78	39.79	10
2012	40	0.41	540	0.44	13.50	15
2013	78	0.80	2128	1.73	27.28	23
2014	79	0.81	918	0.75	11.62	18
2015	154	1.58	3235	2.63	21.01	32
2016	204	2.09	4238	3.44	20.77	36
2017	246	2.52	4169	3.39	16.95	33
2018	361	3.69	9444	7.68	26.16	50
2019	526	5.38	11961	9.72	22.74	54
2020	826	8.45	21408	17.40	25.92	72
2021	1309	13.39	26356	21.42	20.13	69
2022	1983	20.29	22382	18.19	11.29	55
2023	2104	21.53	11228	9.13	5.34	38
2024	1733	17.73	2143	1.74	1.24	16
Total	9774		123043		12.59	118
CAGR	30.51		11.00			
Compound Annual Growth Rate						

A total of 9,774 papers with 123,043 citations were published over a period of 20 years from 2005 to 2024 in India, with an average of 12.59 citations per paper (ACPP) and a total h-index of 118. The highest number of papers was published in the year 2023, with a total of 2,104 (21.53%) papers contributing 11,228 (9.13%) citations and an ACPP of 5.34, with an h-index of 38. This was followed by the year 2022, which had the second-highest number of papers published, totalling 1,983 (20.29%) papers with 22,382 (18.19%) citations and an ACPP of 11.29, with an h-index of 55. The third-ranked year was 2024, with a total of 1,733 (17.73%) papers, 2,143 (1.74%) citations, an ACPP of 1.24, and an h-index of 16. According to Begum (2022), "Artificial Intelligence research during the ten-year period from 2011 to 2020 noted that the number of publications was increasing, with the maximum number of articles published in 2020 with 10,712 (39.94%) records, followed by 2019 with 6,039 (22.51%) records" (p. 57). It was noticed that in the year 2021, only 1,309 (13.39%) papers were published but received the highest 26,356 (21.42%) citations with an ACPP of 20.13. In the year 2020, only 826 (8.45%) papers were published, along with 21,408 (25.92%) citations and the highest ACPP of 25.92, with an h-index of 72. Observing the study period from 2005 to 2024, the field of medical science on artificial intelligence research showed a gradual increase in the growth of publications year by year. It was found that the CAGR value was 30.51 for the study period from 2005 to 2024, as shown in Figure 3.

C. Year Wise Relative Quality Index

A quality that is better than average is indicated by a Relative Quality Index (RQI) value greater than 1, and a quality that is lower than average is indicated by a value less than 1. "The Relative Quality Index (RQI)," suggested by Nagpaul (1985), represents the relationship between the proportion of high-quality articles (NHQ%) and the total number of articles (TNP%). "RQI was used by Garg and Padhi (2001) for quality inter-comparison." The formula used is the RQI indicator. The twenty years are used to calculate the NHQ, NHQ%, and RQI listed in Table No. 3. The first-ranked year, 2005, has the highest RQI of 3.75, followed by the year 2007 with an RQI value of 1.55 and the year 2024 with an RQI of 1.39. During the study period from 2005 to 2024, a total of six years had an RQI greater than 1 - specifically, the years 2005, 2007, 2009, 2011, 2012, and 2024. The following 14 years have RQI value less than 1 in the year 2006, 2008, 2010, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022 and 2023 and observed in the year 2014 and 2015 is almost close to 1 i.e. near 0.96 and 0.98 showing in Figure.4.

$$NHQ\% = \frac{Number\ of\ High\ Quality\ papers\ for\ a\ \ Country\ or\ Year\ or\ an\ Institution}{Total\ Number\ of\ Quality\ Papers} x\ 100$$

$$TNP\% = \frac{Total\ Publications\ output\ of\ a\ Country\ or\ Year\ or\ an\ Institution}{Total\ Publications\ output\ of\ all\ Year\ or\ Country\ or\ Institution} x\ 100$$

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

TABLE III YEAR WISE RELATIVE QUALITY INDEX

YEAR	TNP	TNC	CPP	NHQ	TNP%	NHQ%	RQI
2005	11	295	26.82	6.00	0.11	0.42	3.75
2006	8	137	17.13	1.00	0.08	0.07	0.86
2007	12	238	19.83	2.00	0.12	0.14	1.15
2008	25	345	13.80	3.00	0.26	0.21	0.82
2009	26	181	6.96	4.00	0.27	0.28	1.06
2010	25	742	29.68	3.00	0.26	0.21	0.82
2011	24	955	39.79	4.00	0.25	0.28	1.15
2012	40	540	13.50	9.00	0.41	0.63	1.55
2013	78	2128	27.28	4.00	0.80	0.28	0.35
2014	79	918	11.62	11.00	0.81	0.77	0.96
2015	154	3235	21.01	22.00	1.58	1.55	0.98
2016	204	4238	20.77	25.00	2.09	1.76	0.84
2017	246	4169	16.95	32.00	2.52	2.25	0.89
2018	361	9444	26.16	49.00	3.69	3.45	0.93
2019	526	11961	22.74	72.00	5.38	5.06	0.94
2020	826	21408	25.92	110.00	8.45	7.74	0.92
2021	1309	26356	20.13	176.00	13.39	12.38	0.92
2022	1983	22382	11.29	256.00	20.29	18.00	0.89
2023	2104	11228	5.34	282.00	21.53	19.83	0.92
2024	1733	2143	1.24	351.00	17.73	24.68	1.39
Total	9774	123042		6490			

"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"

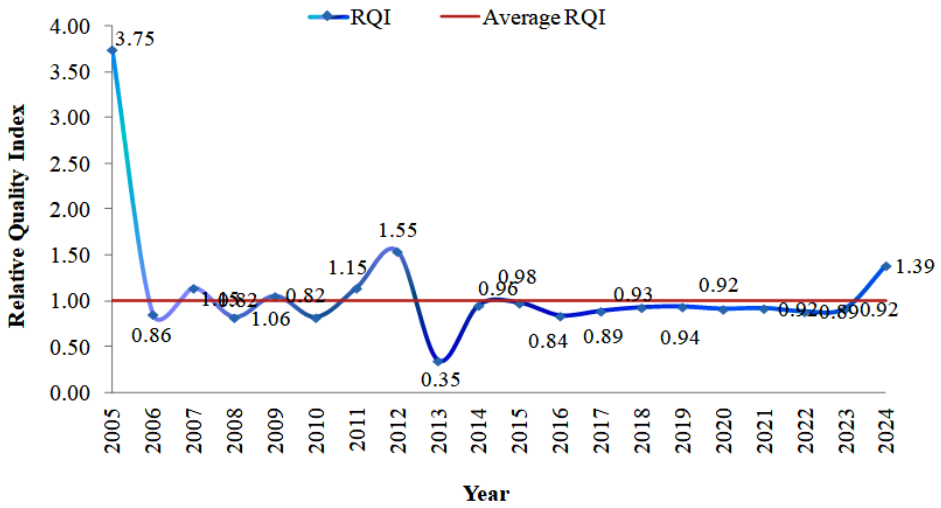

Fig.4 Year Wise Relative Quality Index

V. CONCLUSION

Technology has a huge influence on our way of life since it can predict how science and technology will be applied in the future. Research on artificial intelligence is crucial for human potential and health in the medical field. In India, 9,774 articles with 123,043 citations were published, and globally a total of 123,007 publications were recorded according to the Web of Science (WoS) database during 2005 to 2024. Among the top 20 countries, first place went to the USA with 28,124 (s22.86%) published papers, followed by China with 19,122 (15.55%) and India in third place with 9,774 (7.95%), representing nearly an 8% global share. In India, the maximum number of papers, 2,104 (21.53%), was published in 2023, while in 2021, a total of 1,309 (13.39%) papers were published, receiving the highest 26,356 (21.42%) citations with an ACPP of 20.13. During the study period from 2005 to 2024, six years had an RQI greater than 1, while the remaining fourteen years had RQIs less than 1, with the year 2005 having the highest RQI of 3.75. The analysis found that between 2005 and 2024, there was a steady rise in the quantity of publications on medical science research in artificial intelligence.

Declaration of Conflicting Interests

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Use of Artificial Intelligence (AI)-Assisted Technology for Manuscript Preparation

The authors confirm that no AI-assisted technologies were used in the preparation or writing of the manuscript, and no images were altered using AI.

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