Qualitative and Quantitative Methods in Libraries (QQML) 14,4:671-689, 2025

How Much Open is Cancer Research? Evaluating the Openness of Scholarly Publications in SAARC Countries: A Data Carpentry Approach

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ABSTRACT: This study presents a bibliometric and metadata analysis of research publications in cancer research from SAARC countries (Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka) over the period 2015 to 2024, with a particular focus on open access trends, collaboration networks, and thematic distributions. Data comprising 19,567 articles was retrieved from the Scopus database using affiliation-based filters and refined using OpenRefine to standardize open access status, licensing types, and publication attributes. VOSviewer was used to map co-authorship networks and examined keyword co-occurrence across countries, illustrating significant intra-regional collaboration patterns, with India emerging as the principal hub. The analysis also revealed common thematic areas of research emphasis, including public health, and digital innovation. The results highlight a growing but uneven adoption of open access practices across SAARC nations in cancer research, with disparities in licensing and accessibility. The study underscores the potential of bibliometric tools to uncover regional research dynamics and suggests pathways for enhancing scholarly visibility and cooperation within SAARC countries.

Keywords: Open access publishing, Licensing types, OpenRefine, VOSviewer, Bibliometrix, SAARC, Cancer research.

Received: 12.11.2025 Accepted: 4.12.2025 ISSN 2241-1925

1 INTRODUCTION

In recent years, the global academic landscape has witnessed a rapid transformation driven by the growing emphasis on open access publishing, cross-border research collaboration, and data-driven science policy. This shift is particularly important for developing regions such as South Asia, where knowledge accessibility and research equity remain pressing concerns. The South Asian Association for Regional Cooperation (SAARC), comprising eight nations Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka, the geopolitical, economic and regional intergovernmental organization union of nations in South Asia(Chinnaraj & Narzary, 2020),represents a diverse but interconnected region facing common developmental, environmental, and health-related challenges. Academic research, including cancer research, plays a critical role in addressing these challenges, yet the visibility, accessibility, and impact of scholarly work from this region often remain limited.

Open access (OA) publishing has emerged as a potential equalizer, enabling broader dissemination and use of research outputs, particularly in places with limited resources. However, the adoption of OA varies widely across countries, institutions, and disciplines. Similarly, collaboration whether through co-authorship or institutional networks is a key indicator of research integration, innovation, and policy relevance. Although the number of publications from SAARC countries is steadily rising, there is still a lack of in-depth analysis regarding their publishing trends, open access practices, collaboration networks, and key research themes such as cancer research.

The use of machine learning methods using many tools in cancer research has been increased by the scientific and research community. Along with research publication in related fields has been also grown(Lin et al., 2023). In this article, tools like VOSviewer, bibliometrix are used for bibliometric analysis. Bibliometric analysis, supported by tools such as VOSviewer and Biblioshiny, provides an effective framework for evaluating scholarly productivity, co-authorship networks, thematic concentration, and citation performance. By leveraging metadata from the Scopus database and applying a combination of data-cleaning and visualization techniques, this study aims to map the research landscape of SAARC countries from 2015 to 2024. The analysis emphasizes open access status, licensing types, publication trends, and co-occurrence of keywords, alongside journal impact and author productivity patterns based on Lotka's Law.

2 RELATED WORKS

Bibliometric methods have become central to mapping scholarly output, access patterns, and collaboration structures, particularly as open access publishing reshape how to be disseminated. Reviews of the bibliometric toolkits emphasize thepackages such as Bibliometrix/biblioshiny and visualization software like VOSviewer allows us to combine quantitative indicators (publication counts,

citations, h-index) with network mapping (co-authorship, co-citation, keyword co-occurrence) to produce the fields. These tools also provide bibliometric law (lotka's law) and compute source and author-level impact indicators. Previously, Sapkota et al. (2019) have studied on ovarian cancer management by doing survey from the South Asian Association for Regional Cooperation (SAARC) Nations and the survey highlighted that fertility-preserving surgery was considered as the option of choice in early-stage ovarian cancer(Sapkota et al., 2019). Ahmed et al. (2021) studied on bibliometric analysis on breast cancer using different bibliometric parameters like citation count, impact factor, h-index etc.(Ahmad, et al., 2021). Jain et al. (2024) highlighted South Asia's unique cancer landscape with CIR (crude incidence rate) and MIR (mortality-to-incidence ratio), but elevated MIR compared to global figures(Jain et al., 2024). Abid & Aziz (2021) revealed the contribution of BRCA1 gene among breast cancer patients in SAARC countries(Abid & Aziz, 2021). Parikh et al. (2021) presented survey data on molecular testing and its implications among lung cancer specialists in the South Asian Association for Regional Cooperation (SAARC) region in the article "*Advanced lung cancer and molecular testing in the middle of coronavirus disease 2019 second wave in the South Asian association for regional cooperation region"* (Parikh et al., 2021). Kundra & Srivastava (2020) found the pattern of publication of SAARC countries in area of medicine and collaboration among SAARC countries to show that studies reported from these countries are focused more towards the issues being discussed in developed countries (Kundra & Srivastava, 2020). In prior to, Awasthi et al. (2024) examined the impact of Gold Open Access in ASEAN countries, analyzing research output and OA publishing culture across all fields of knowledge. They investigated funding sources for APCs, average APCs in different fields and top journals for ASEAN researchers to provide valuable insights for policymakers, funding agencies and institutions, supporting evidence-based strategies for a more equitable and sustainable open access landscape in ASEAN(Awasthi et al., 2025). Lin et al. (2023) ontheir article "*A bibliometric analysis of worldwide cancer research using machine learning methods*" addressed that recent research status and trends, main research topics, topic evolutions, research collaborations, and potential directions of cancer research(Lin et al., 2023). Additionally, Nyahodza & Raju (2017) discussed three key issues, namely knowledge systems, sustainable development and open educational resources. They demanded that the open source systems, a significant component of the openness movement, are exploited by the openness movement to deliver open content via such channels as open access publishing of journals, monographs and OERs(Nyahodza & Raju, 2017).Chinnaraj and Narzary (2020) discussed about scientometric study on colorectal cancer research in SAARC and revealed that India is a leading country among the five SAARC Countries with major research contribution(Chinnaraj & Narzary, 2020).Uddin et al.(2013) highlighted the current scenario of cancer in Bangladesh and its management with brief history and combined effort of government and private sector with the gradual progress in management(Uddin

et al., 2013). Parikh et al. (2023) discussed in their paper on cervical cancer in SAARC countries(Parikh, et al., 2023). Jain et al. (2024)highlighted the cancer burden in South Asia for late diagnosis and poor outcomes for being deprived of advanced treatment facilities and targeted therapies, financial sequelae of care, and cultural stigmas and misconceptions(Jain et al., 2024). Moodly et al. (2015) identified the trends and extent in cancer research publication and pattern of collaboration amongst researchers in South Africa(Moodley et al., 2015). In the paper "*Bibliometric analysis of breast cancer research in the period 2009–2018*", Ozen Cinar showed a bibliometric study on breast cancer research(Özen Çınar, 2020). Sankaranarayanan et al.(2010) showed a population-based study on cancer survival in Africa, Asia, and Central America.(Sankaranarayanan et al., 2010). Acharya et al. (2025) did in depth bibliometric analysis of research output on Digital Libraries from Asian countries during 2014 to 2023 to explore the research activities on digital library as well as subject wise classification of papers, journal wise publication trend, institution and country wise distribution of contribution(Acharya et al., 2025). Based on these previous studies, this bibliometric and quantitative study analysed open access trends, collaboration networks, and thematic distributions about cancer research from SAARC countries.

3 OBJECTIVES

The principal objective of the study is to measure the openness of the scholarly publications of SAARC countries during 2015-2024. The sub-objectives are enumerated below:

- To assess the open-access status of cancer research within and across SAARC nations.
- To quantify openness based on open access models (Green, Gold, Bronze, Hybrid).
- To measure openness based on licensing types.
- To identify the most prolific institutions and authors based on openness of publications.
- To visualize collaboration patterns in cancer publications.

4 METHODS AND METERIALS

In this study we collected all scholarly publications during 2015-2024 published from SAARC countries using search query from SCOPUS database. The details of search query, data collection, and data cleaning are stated below:

4.1 Selection of Region and Data Source

The research focuses on the member countries of the South Asian Association for Regional Cooperation (SAARC), which includes Afghanistan, Bangladesh,

Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka. The Scopus database was chosen as the primary source of bibliographic data due to its comprehensive coverage of peer-reviewed literature, including cancer research. It is important to explore and understand how open access has affected scholarly communication across the different fields of knowledge during the last 10 years, 2015-2024.

4.2 Data Collection

A systematic search was conducted on Scopus using country-based filters corresponding to SAARC member nations. Additional filters such as document type (e.g., articles), subject area, and publication year were applied where necessary. Initially, a total of **33,000 records** were retrieved. After applying filters and cleaning out irrelevant datasets the final dataset comprised **19,567 records**. The resulting metadata, including information on open access, licensing, publication status, and journal details, was exported in CSV format for further processing. The search string was as follows:

TITLE-ABS-KEY (oncology OR carcinoma OR cancer AND cell) AND PUBYEAR > 2014 AND PUBYEAR < 2025 AND (LIMIT-TO (SUBJAREA , "MEDI")) AND (LIMIT-TO (AFFILCOUNTRY , "Afghanistan") OR LIMIT-TO (AFFILCOUNTRY , "Bangladesh") OR LIMIT-TO (AFFILCOUNTRY , "Bhutan") OR LIMIT-TO (AFFILCOUNTRY , "India") OR LIMIT-TO (AFFILCOUNTRY , "Nepal") OR LIMIT-TO (AFFILCOUNTRY , "Pakistan") OR LIMIT-TO (AFFILCOUNTRY , "Sri Lanka") OR LIMIT-TO (AFFILCOUNTRY , "Maldives")) AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "ch") OR LIMIT-TO (DOCTYPE , "cp")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (LANGUAGE , "English"))

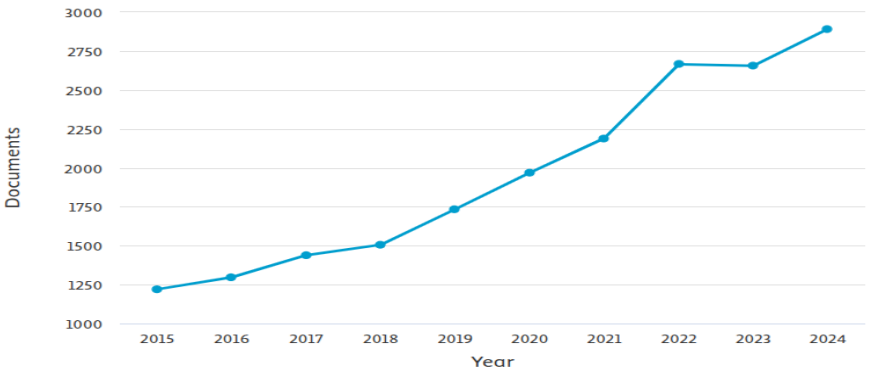

Figure1: Documents by year

4.3 Data Cleaning and Refinement

The exported CSV file was imported into OpenRefine, a powerful open-source data cleaning tool. Through OpenRefine:

- Data inconsistencies and duplicates were removed.
- Fields related to **open access type (e.g., Gold, Green, Hybrid, Closed)**, **license type (e.g., CC BY, CC BY-NC, etc.)**, and **publication status (true,false)** were standardized.

After cleaning and refinement of the dataset, using OpenRefine, was subjected to multiple layers of analysis using VOSviewer and Bibliometrix package in R.

5 RESULT AND DISCUSSION

The analysis of 19,567 research articles published between 2015 and 2024 across SAARC countries revealsseveral important trends in terms of open access, collaboration, thematic focus, and scholarly impact.

Table 1 shows that only 9744 articles are available to show their status, open or close access, and remaining 8628 articles are not showing their status.

Open Access Status	No. of articles
True	9744
False	8628

Table 1: No. of articles as per OA status

The dataset was analysed to determine the distribution of open access (OA) publishing types across the collected records. Based on the findings in the OA colour facet, Gold OA made up for a large proportion of dataset (n = 6,337), showing that many papers were published in fully open access journals. Green OA (n = 1,173) which is available in an open repository and Hybrid OA (n = 1,234) where authors paid to make their article open in a subscription journal. A smaller segment of the dataset fell under the Bronze OA category (n = 1,000), where freely available on the publisher's site, but without an open license. The citation density with respect to no. of articles under respective OA status of articles are given below in table 2. Bronze open access category gives the highest citation density per paper and Gold open access category possessed the lowest position as per citation density.

Open Access color	No. of Articles	No. of Citations	Citation Density
Green	1173	16336	13.927
Gold	6337	60207	09.501
Bronze	1000	27762	27.762
Hybrid	1234	30419	24.651

Table 2: Citation density as per OA Color

An analysis of Table 3 highlights that India leads in open access publishing among SAARC countries, with the highest number of articles across all OA types: Gold, Green, Hybrid, and Bronze. Specifically, India has 942 articles under Green OA, 4367 under Gold OA, 719 under Bronze OA, and 712 under Hybrid OA.

Pakistan also contributes significantly, especially in Gold OA with 559 articles and in Hybrid OA with 64 articles. Sri Lanka follows with 75 articles in Gold OA and 7 in Hybrid OA, Green and Bronze OA have seen less representation from this country. Nepal has 110 articles in Gold OA, and very few articles shows in Bronze and Hybrid OA. While Bangladesh shows some activity in all categories, particularly with 130 articles under Gold OA and 17 in Hybrid OA.

Afghanistan, and Bhutan, show limited participation in open access publishing. Afghanistan has a small number of articles in each category, with 17 in Gold OA and very few in others. Bhutan has 5 articles in Gold OA and only 1 in Hybrid category. There are no records found from Maldives.

Overall, the total number of open access articles across all SAARC countries amounts to 980 for Green OA, 5263 for Gold OA, 768 for Bronze OA, and 807 for Hybrid OA. This indicates that Gold OA is the most preferred model among SAARC countries, followed by Hybrid and Bronze OA, with Green OA having comparatively fewer publications except for India.

Name of Country	Green OA	Gold OA	Bronze OA	Hybrid OA
Afghanistan	01	17	-	02
Bangladesh	05	130	04	17
Bhutan	-	05	-	01
India	942	4367	719	712
Maldives	-	-	-	-
Nepal	-	110	03	04
Pakistan	31	559	41	64
Sri Lanka	01	75	01	07
Total	980	5263	768	807

Table 3: Country-wise open access articles

Table 4 presents the distribution of Creative Commons (CC) licenses used in scholarly publications across SAARC countries in open access publishing. Six license types are considered: CC-BY, CC-BY-NC, CC-BY-NC-ND, CC-BY-NC-SA, CC-BY-ND, and CC-BY-SA. The CC-BY license emerged as the most

widely used, accounting for a total of 2070 publications across all countries. India demonstrates a strong presence in open access publications than its other countries in the region, with 1612 documents under CC-BY alone, followed by significant numbers under CC-BY-NC (358), CC-BY-NC-ND (921), and CC-BY-NC-SA (502). This shows that India plays an important role in research in the region and is actively involved in publishing research with different types of open access licenses.

Pakistan and Bangladesh come next; Pakistan has 264 articles under the CC-BY license and also shows a fairly even use of other license types. Bangladesh, on the other hand, mainly prefers the CC-BY license (88 articles) and CC-BY-NC-ND (41 articles). Nepal and Sri Lanka also participate in open licensing, though at a smaller scale. Nepal reports CC-BY(58) publications, as well as using CC-BY-NC (14) and CC-BY-NC-ND (26). Sri Lanka's contribution to open access publishing is relatively low, led by CC-BY (34) and CC-BY-NC-ND (19) documents and limited publications under other licenses types. Afghanistan, Bhutan, and Maldives demonstrate minimal activity in the open access landscape. Afghanistan shows 12 publications under CC-BY and a few under CC-BY-NC and CC-BY-NC-ND, while Bhutan has only 2 records under CC-BY, and Maldives has not contributed any publications under open access licenses. The least used licenses across all countries are CC-BY-ND and CC-BY-SA, with total numbers of only 15 and 3 publications, respectively.

As shown in the table below, the overall number of open access articles varies widely across the SAARC countries. India accounts for the highest contribution with 3,408 licensing articles, indicating its leading role in promoting open access publishing in the region. Pakistan has 410 and Bangladesh has 133 licensing articles, also show a considerable level of participation, while Nepal (99) and Sri Lanka (61) contribute a moderate number of publications. In contrast, Afghanistan (17) and Bhutan (2) display very limited engagement, and Maldives records no open access articles. The total count of 4,130 articles reflects a noticeable imbalance in open access activity among the SAARC member countries, highlighting India's dominant position and the need for greater awareness and policy support in other nations.

Overall, the data shows that SAARC countries tend to prefer more flexible open access licenses, particularly CC-BY. However, there is a clear difference in how actively each country contributes to open access publishing. Some countries are highly involved and use a variety of licenses, while others have very little participation. This gap suggests a need to raise awareness and strengthen support for open access publishing across the region.

Name of Country	**CC-BY**	**CC-BY-NC**	**CC-BY-NC-ND**	**CC-BY-NC-SA**	**CC-BY-ND**	**CC-BY-SA**	**Total**
Afghanistan	12	04	01	-	-	-	17
Bangladesh	88	03	41	01	-	-	133
Bhutan	02	-	-	-	-	-	02
India	1612	358	921	502	12	03	3408
Maldives	-	-	-	-	-	-	00
Nepal	58	14	26	01	-	-	99
Pakistan	264	70	66	07	03	-	410

Sri Lanka	34	07	19	01	-	-	61
Total	2070	456	1074	512	15	03	4130

Table 4: Country-wise articles based on licensing types

Table 5 presents the distribution of different Creative Commons (CC) licenses across four types of Open Access (OA) publishing models: Gold, Green, Bronze, and Hybrid. The data clearly shows that the CC-BY license is the most widely used, with a significant number of publications under Gold OA (2309), Hybrid OA (743) and Green OA (25). This license provides the highest level of openness, it allows anyone to use and share the content for free.

The CC-BY-NC license, is similarly popular, especially under Gold OA (426) and Hybrid OA (128). Also, CC-BY-NC-ND, has 1105 publications under Gold OA, 126 under Hybrid OA and 29 under Green OA. The CC-BY-NC-SA license, has 377 publications under Gold OA, and 159 publications under Hybrid OA.

Other licenses like CC-BY-ND and CC-BY-SA are used only in a small number of cases, with very few publications found under Gold and Hybrid Open Access. There are no entries for Bronze OA in the table, which indicates that the publications under this open access model do not use these specific licenses.

Types of Licensing	Green OA	Gold OA	Bronze OA	Hybrid OA
CC-BY	25	2309	-	743
CC-BY-NC	3	426	-	128
CC-BY-NC-ND	29	1105	-	126
CC-BY-NC-SA	2	377	-	159
CC-BY-ND	-	10	-	6
CC-BY-SA	-	3	-	-

Table 5: Distribution of licensing types according to OA colors

6 DATA ANALYSIS AND VISUALIZATION

The data was analyzed using a combination of VOSviewer and R-based Biblioshiny. VOSviewer was employed for mapping co-authorship networks and keyword co-occurrence patterns, with special attention was given to cancer research keywords by country, enabling a clearer understanding of thematic focuses and collaborative strengths among SAARC nations. The resulting network visualizations from VOSviewer were shared to illustrate these intellectual and social linkages. Advanced bibliometric analysis was conducted using the Bibliometrix package in R through its web-based interface, Biblioshiny. This included the identification of leading journals and their impact factors, author productivity analysis based on Lotka's Law, and a review of the most cited countries and institutions. Biblioshiny also facilitated the examination of cancer research production trends, source impact, and citation performance through various indicators.

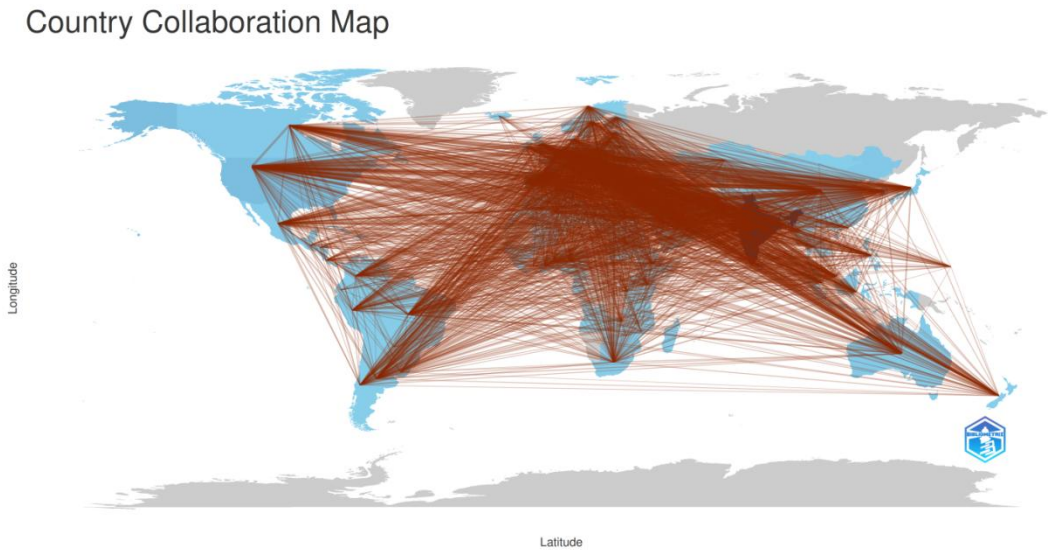

Figure 2: Collaboration within SAARC countries and with other countries

6.1 Open Access Trends

Among the analyzed publications, a notable proportion was found to be published under open access models. Gold open access articles constituted the highest share, followed by green, and hybrid access types. A significant number of articles, however, remain closed, indicating persisting access barriers. Licensing data, standardized during OpenRefine processing, showed a strong preference for permissive Creative Commons licenses such as CC BY and CC BY-NC. These trends suggest a gradual shift toward open science, although unevenly distributed across SAARC nations. Pie charts, bar diagrams and other graphical visualizations were generated to present the distribution and share of each category within the dataset, providing clear insights into the accessibility and licensing patterns of research outputs from SAARC countries.

In figure 3, it can be shown that the number of articles with closed status is higher and among the article with open access status, number of Gold OA papers are higher than the following others green, bronze and hybrid open access.

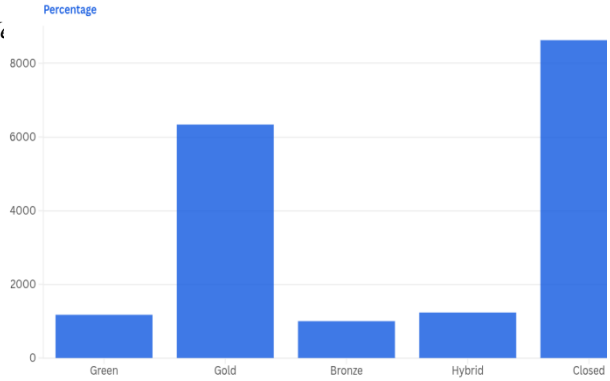

Figure 3: Bar diagram of articles as per OA Colour

The following figure represents the accumulation of no. of articles with different licenses, such as CC-BY, CC-BY-NC, CC-BY-NC-ND, CC-BY-NC-SA, CC-BY-ND, AND CC-BY-SA. CC-BY article is of larger number i.e. 57%, followed by CC-BY-NC-ND with 23% and CC-BY-NC and CC-BY-NC-SA with 10% only.

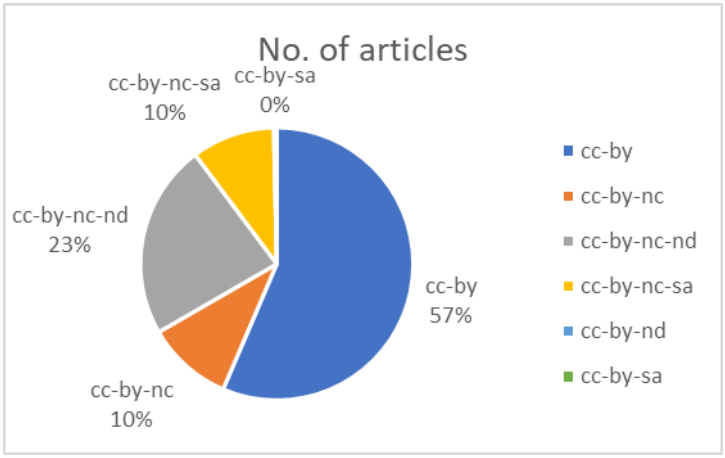

Figure 4: Pie chart of Licensing

Figure 5 demonstrates that a noticeable number of articles are with CC-BY licensing and available as green, followed by hybrid OA. Very few numbers of articles are containing other types of license with green and bronze OA.

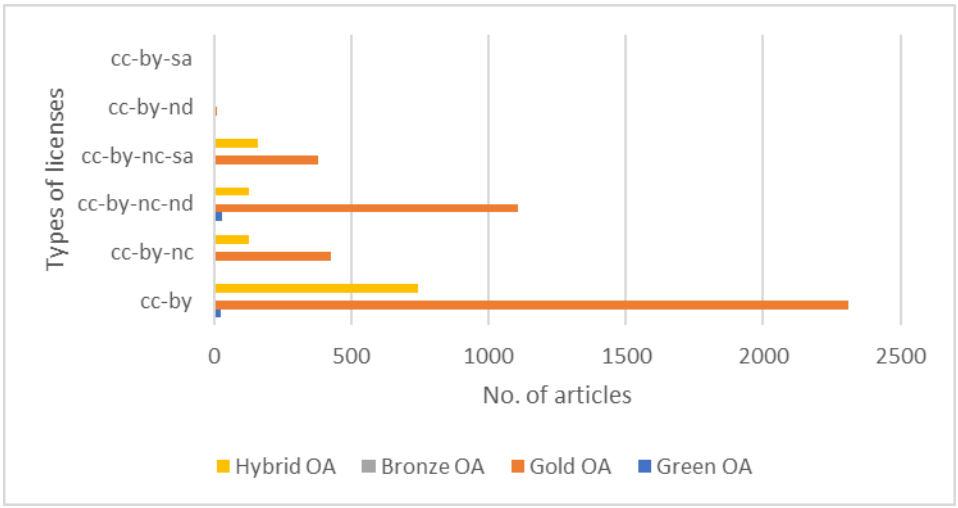

Figure 5: Bar chart of licensing as per OA color

6.2 Collaboration and Co-authorship Analysis

Using VOSviewer, co-authorship patterns were visualized to identify collaborative networks within and across SAARC countries. The resulting network map displayed several densely interconnected clusters, with India emerging as the dominant contributor and central hub in the regional collaboration network. Cross-national linkages were observed between India and Bangladesh, as well as between Pakistan and Sri Lanka, indicating active regional partnerships. However, smaller nations such as Bhutan and Maldives showed limited international collaboration, likely reflecting their lower overall research output.

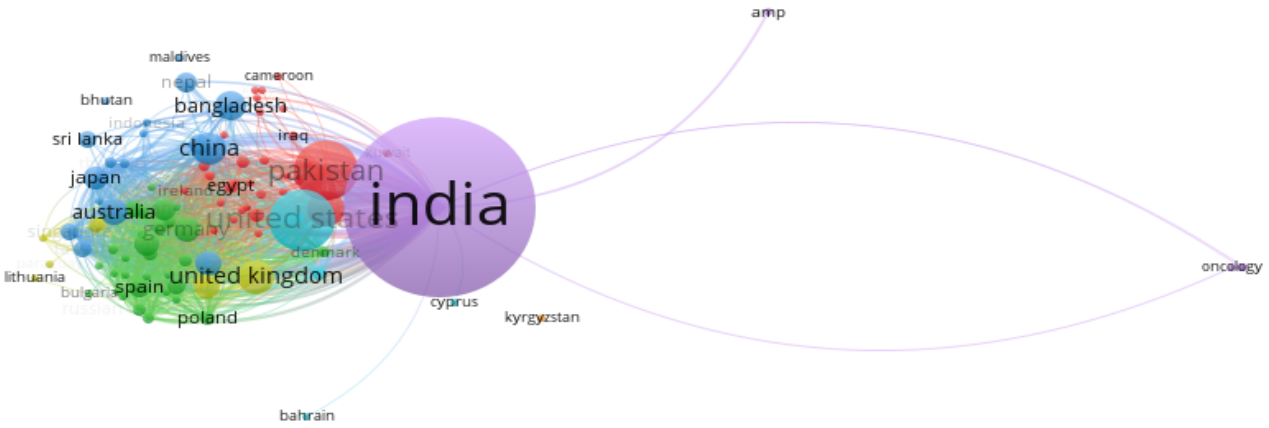

Figure 6: Collaboration Network of Co-authorship patterns within countries

6.3 Keyword Co-occurrence and Thematic Focus

The keyword co-occurrence analysis by country revealed both shared and country-specific research priorities. Common themes across SAARC nations included climate change, public health, agriculture, and digital technology. Country-specific clusters showed large number of unique thematic concentrations like “human”, “human cell”, “pathology”, “human tissue”, “chemotherapy”, “cancer staging”, “cancer surgery” etc. These insights suggest both regional coherence and national differentiation in research agendas. The visualization maps generated through VOSviewer provided a clear thematic landscape of the research focus in the region.

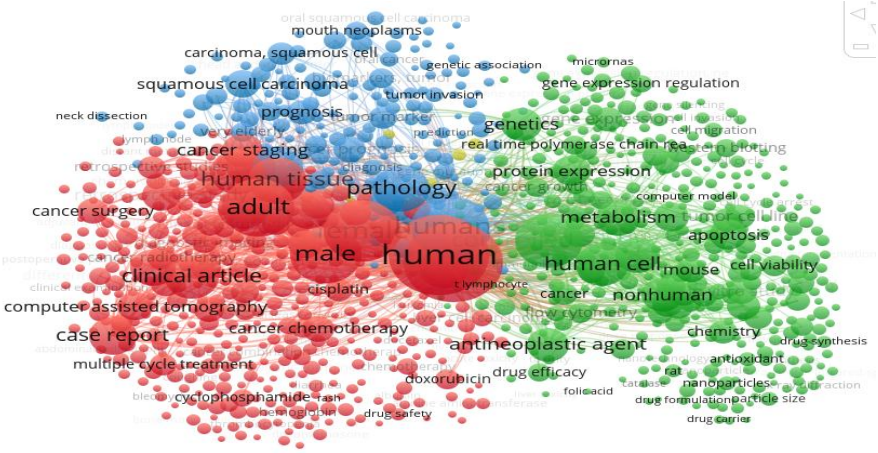

Figure 7: Keyword co-occurrences

i.e. most used keywords in research

6.4 Bibliometric Indicators

Advanced bibliometric insights were obtained using Biblioshiny. Prominent journals contributing to SAARC-affiliated research included **All India Institute of Medical Sciences** *(AIIMS)*, *Homi Bhabha National Institute (HBNI)*, and Postgraduate Institute of Medical Education and Research (*PIMER*). High-impact journals were primarily associated with fields such as medicine, environmental studies, and interdisciplinary research, reflecting the region's growing engagement with global health and sustainability issues.

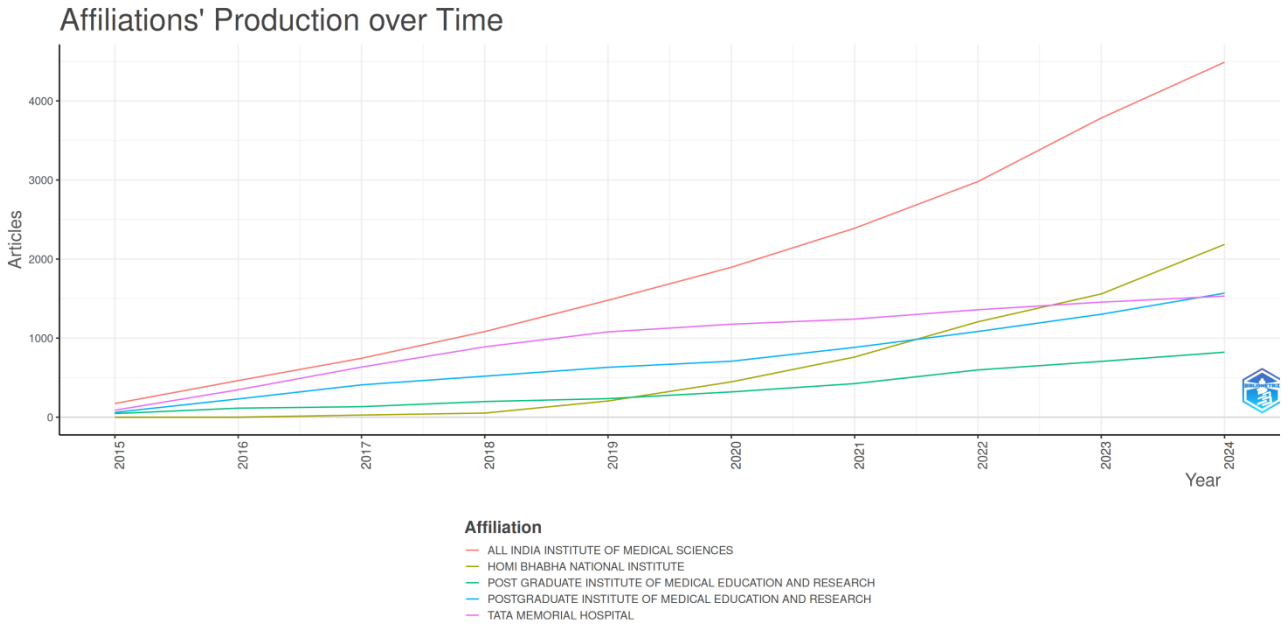

Figure 8: Affiliations' production over time within 2015-2024

Among those institutions, *All India Institute of Medical sciences (AIIMS)* published the highest number of scholarly publications with a significant number of, followed by Homi Bhabha National Institute *(HBNI)*, Postgraduate Institute of Medical Education and Research (*PIMER*) and others.

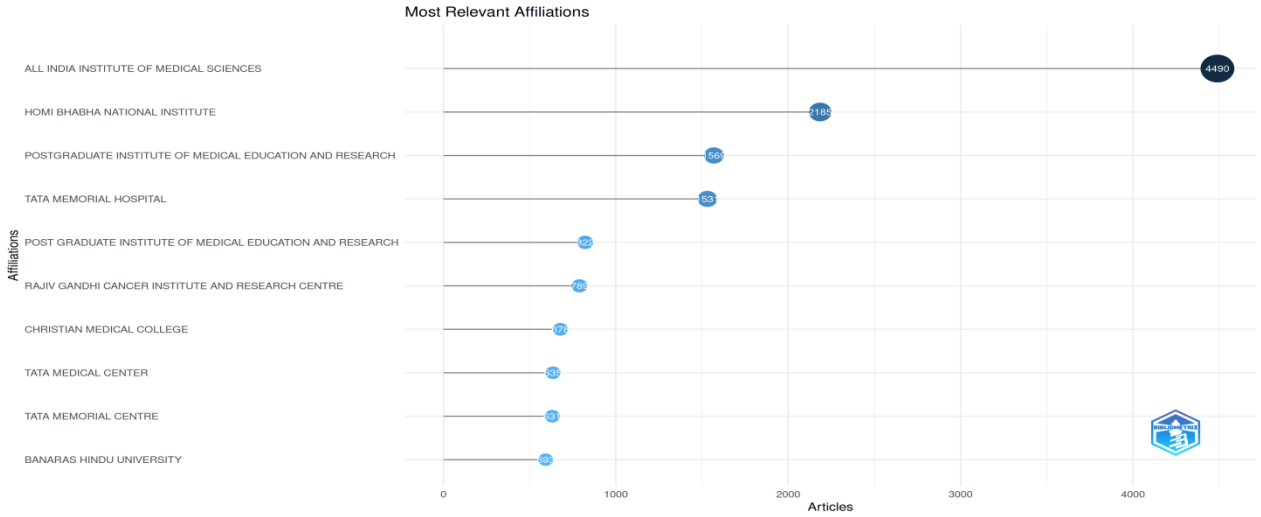

Figure 9: Most relevant affiliations within 2015-2024

From figure 10 represents that Kumar R and Kumar S made contribution with noticeable number of scholarly publications with number of 357 and 354 respectively. Other authors, such as Sharma A, Kumar A, Gupta S and Singh S contributes more than 300 articles.

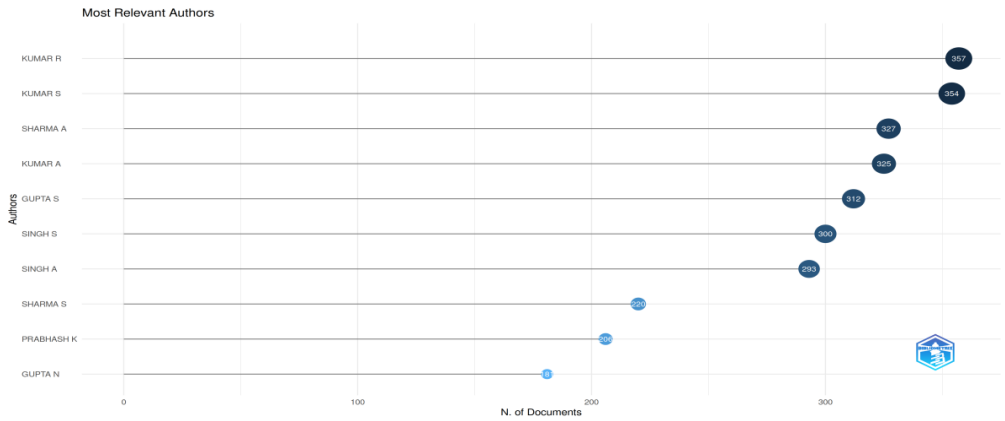

Figure 10: Most relevant authors within 2015-2024

According to Lotka's Law analysis, a large number of authors published only a single paper during the study period, which is consistent with the classical author productivity distribution. A disproportionately high number of publications were produced by a small group of highly productive researchers. Citation analysis showed that India received the highest number of citations overall, followed by Pakistan and Bangladesh. The most cited cancer research articles focused on treatment strategies, survival outcomes, tumor biology and

regional cancer epidemiology, highlighting shared research priorities across SAARC countries.

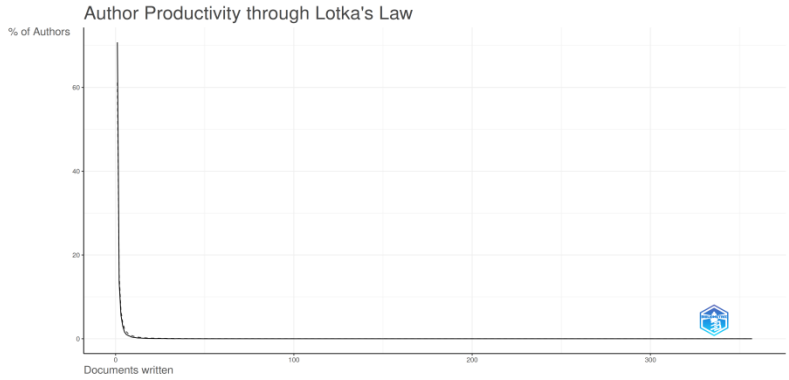

Figure 11: Author Productivity by Lotka's law

Figure 12 demonstrates that Singh A published average 40 articles in each year with total citation 500 in 2016 and 2017 and Gupta N published 20 articles in each year in 2018 and 2023 with total citation 100. Similarly, Kumar R and Kumar S have contributed average 60 article consecutive 3 and 5 years respectively.

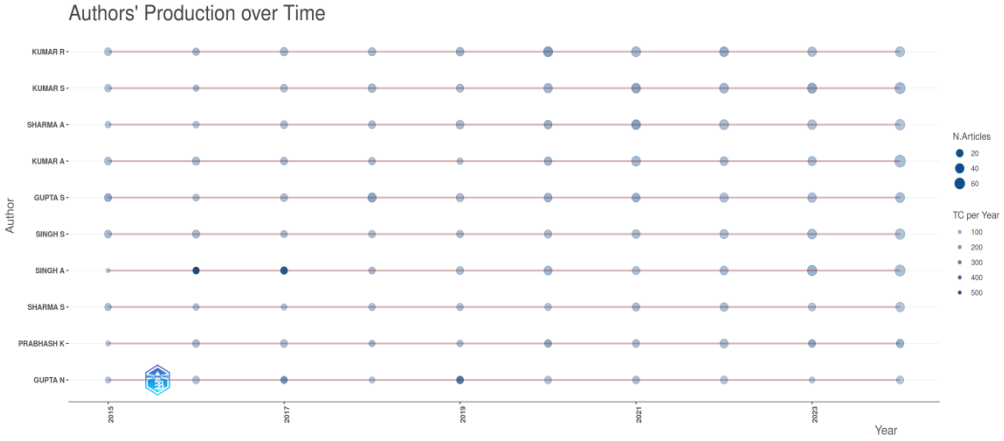

Figure 12: Authors' production over time (2015-2024)

7 DISCUSSION

This study examined the openness of cancer research from SAARC countries over a ten-year period and found clear differences in how countries adopt open access models, use licenses, and collaborate. Although the volume of cancer research has increased across the region, open access practices are not uniform.

India stands out clearly in the data, with the highest number of publications across all open access categories, particularly Gold OA. This pattern has also been noted in earlier studies, and it likely reflects a combination of factors: India's comparatively stronger research infrastructure, the presence of major cancer hospitals, and a growing policy interest in open science. The citation data also suggests that Indian research is reaching a wider audience, as these articles

are cited more often and appear in broader international networks of collaboration.

Nepal, Sri Lanka and Pakistan publish fewer papers overall, but they still show meaningful engagement with open access publishing. In Pakistan and Bangladesh, the stronger preference for Gold OA suggests that researchers rely more on publisher-supported access than on institutional repositories, a trend noted in earlier bibliometric studies. By contrast, Bhutan, Maldives and Afghanistan have much lower levels of OA output.

Collaboration networks are also uneven. India appears at the centre of most co-authorship links, forming bilateral partnerships with Bangladesh, Pakistan and Sri Lanka. Instead of a strong regional network, the pattern shows fragmented collaboration. Previous research has noted that scientific partnerships in South Asia often reflect historical or institutional ties rather than a shared regional research agenda. Stronger regional cooperation could help smaller countries build capacity and share clinical knowledge.

Keyword analysis highlights shared research interests, especially in practical areas such as chemotherapy outcomes, tumour biology, cancer staging and regional epidemiology. These themes reflect the clinical challenges that SAARC countries face and show that cancer research is closely tied to national health needs.

Overall, the findings suggest that open access in cancer research is increasing across SAARC countries, although not at the same pace. India is clearly ahead, while other countries still need stronger institutional support and greater awareness of open science practices. Building closer regional collaborations and improving access to research could help scientists and health authorities deal with shared challenges more effectively. Looking ahead, it would be useful to study how open access policies shape clinical outcomes, and to explore how international partnerships might help strengthen open science efforts in South Asia.

8 CONCLUSION

Open access initiative in cancer research provides researchers free and unrestricted online access to scholarly publications and information free from cost and licensing barriers to access. Assessing the openness of scholarly publications is actually evaluating how freely accessible and reusable academic research is. This is crucial for promoting transparency, equity and broad dissemination of knowledge. In this paper, the combined analyses reveal a steadily growing scholarly output from SAARC countries, though asymmetrical in nature. India publishes the most research and is at the centre of collaborations, but smaller countries such as Nepal, Bhutan and Maldives contribute fewer publications, their work often focuses on very specific cancer-related topics, including local cancer epidemiology and regional treatment challenges, which are important for national health decisions. Open access publishing in cancer researchis growing in SAARC countries, but it is not the

same everywhere. Research collaboration exists, but mostly between two countries at a time not involving the whole region together. The use of modern bibliometric tools and network visualization platforms enhances understanding of these patterns, offering a foundation for promoting regional research integration, access equity, and thematic convergence.

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