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A Bio-Bibliometric Analysis of Dr. Suprabhat Mukherjee, a Pioneer of Innovative Approach for Colon Cancer Treatment Using Fluids of Custard Apple (Annona Reticulata) Seeds

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Abstract

Dr. Suprabhat Mukherjee, associated with Kazi Nazrul University (KNU), West Bengal, India, is a globally recognized immunobiologist, and a celebrated Indian scientist cum researcher for his contributions in Corona Vaccine, and Colon Cancer. This study covers his 154 research publications in various forms of published documents during 2010–2024. Personal information and data about research contributions, have been collected from the bibliographic databases like Google Scholar (GS), Research Gate (RG), and scientist's profile from the web sites of Kazi Nazrul University, West Bengal, and other various sources. Then the collected data are analyzed following standard bibliometric procedures for preparing scientific portrait. Dr. Mukherjee has contributed 153 research papers in 37 years (year of publication of one paper not identified) in his ongoing research career. His first paper appeared in 2010, when he was 23 years old, too young. His integrity and hard working have brought him several great achievements in research within a short span of time. During his productive age, 2015, 2018 to 2023 were high yielding years while his age was 28, and 31–36 years respectively. Most of his papers are journal articles, and maximum number of his papers has been published in the journals Future Virology (N5), and RSC Adv (N5). Individual name wise, 161 co-authors have been involved in his research team, out of which Santi P. Sinha Babu (N51) is his much-close collaborator. Over all DC value is 0.94. Present study also counts annual growth rate, citation growth rate, and finally examines validation of Lotka's and Bradford's law for the data set of this study.

Keywords: Suprabhat Mukherjee, S. Mukherjee, immunobiologist, *AbhiSCoVac*, *colon cancer*, custard apple seeds, *Annona reticulata* seeds, Kazi Nazrul University, Rasulpur, Purba Bardhaman, West Bengal, University of Maryland School of Medicine (Baltimore, UK)

INTRODUCTION

Dr. Suprabhat Mukherjee, the designer of single vaccine "*AbhiSCoVac"* for any type of coronas, is considered to be a globally celebrated scientist for his recent discoveries including new approach to the treatment of colon cancer form the fluids of Custard Apple (*Annona reticulata*) seeds. After Dr. Tony Dhillon, inventor of colon cancer vaccine (2024), Dr. Mukherjee also finds a new way of treatment for colon cancer from the custard apple seeds.

It has already been applied for pre-clinic trial in colon cells of colon cancer patients among people and positive response is received successfully. Hope that thus, one day the persons who are fighting with cancer may live a long and healthy life. About the colon cancers including history, statistics of colon

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cancer cases and mortality rate due to it globally as well as India has been elaborately described in a paper of the author on Dr. Tony Dhillon, a colon cancer vaccine inventor [1].

Early Life and Academic Pursuits

Dr. Suprabhat Mukherjee was born in Rasulpur, Purba Bardhaman**,** West Bengal, India in 1987. He completed his Bachelor Degree (B.Sc.) in Biochemistry from Department of Biochemistry, Burdwan Institute of Management & Computer Science (BIMS), Dewan Dighi, Katwa Road, Mirzapur, Purba Bardhaman, West Bengal, in 2007 and Master's Degree (M.Sc.) in 2009 from the University of Burdwan. He received his Ph.D Degree in 2017 from Visva-Bharati, a Central University in India [2, 3]. He also attended different courses like Refresher Course in Natural and biosciences, UGC-HRDC, at University of Burdwan, Bhardhaman, West Bengal, India from 24.11.20 to 07.12.2020, organized by Academic Staff College, B.U.; Online learning workshop for faculty, Webinar, QASPIR, UK, April 1–3, 2020.

Professional Journey

Dr. Suprabhat Mukherjee is currently working as an Assistant Professor at Department of Animal Science at Kazi Nazrul University, India from 2018. Prior to that, he was a Post-Doctoral Fellow at North-Eastern Hill University, East Khasi Hills, Shillong, India. Dr. Mukherjee worked as Research Associate in Visva-Bharati University, Department of Zoology, Bolpur, India from 2017 to 2018; as a fellow in French Institute of Health and Medical Research, Centre de Recherche des Cordeliers U872, Paris, France from April 2017 to July 2017, and in Visva Bharati University, Parasitology Laboratory, Bolpur, India from 2012 to 2017; and as a project Fellow in Central Mechanical Engineering Research Institute, Center for Advanced Materials Processing (CMERI), Durgapur, India from 2009 to 2011. Currently, he is mentoring doctoral research scholars, several M.Sc. students and summer interns as a guide and supervisor [2–5].

HONORS, AWARDS AND ACHIEVEMENTS

He was awarded from several academic organizations [2–6]:

- 2014: ICMR Travel Grants for Non-ICMR Scientists, Indian Council of Medical Research.
- 2015–2016: "Prize for the Best Oral Presentation" in the Young Scientist Award at the International Conference on Molecular Signaling: Recent Trends in Biosciences, 20–22 November, 2015, Department of Zoology, North Eastern Hill University, Shillong.
- 2016–2017: "Zydus Lipaglyn second prize" for poster presentation at the International Conference on Molecular Signaling: Basics to Applications, 10–12 January, 2017, Anna University KBC Research Centre, Chennai, India.
- 2017: EMBO Visiting Fellow, European Molecular Biology Organization, Germany.
- 2018: ICMR Travel Grant for Non-ICMR Scientists, Indian Council of Medical Research.
- 2018: International Travel Support, Science and Engineering Research Board (SERB), Department of Science and Technology, Government of India.
- 2018: Dr. D S Kothari Postdoctoral Fellowship, University Grants Commission (UGC), New Delhi.
- 2020: INSA Visiting Scientist, Indian National Science Academy (INSA), Bahadur Shah Zafar Marg, New Delhi.
- 2021: KNU-Best faculty award (Faculty of Science), Kazi Nazrul University.
- 2022: DST-SERB ITS awards.
- 2022: Ranked in Top 2% Global Scientist.
- 2023: Asok Ghosh Memorial Award.
- 2015: National Post-Doctoral Fellowship.
- 2022: DST-SERB, Govt. of India

RESEARCH ACHIEVEMENTS

Dr. Suprabhat Mukherjee, Assistant Professor at Department of Animal Science is a young researcher of Biochemistry and Immunology at Kazi Nazrul University (KNU), India. He did his Ph.D. from Visva-Bharati University, India, and pursued further research at *Institut national de la santé et de la recherche médicale* (National Institute of Health and Medical Research) i.e. INSERM, Paris and Noth Eastern Hill University (NEHU), Pizza Barn, Shillong, India. Dr. Mukherjee's research interest is immunobiology of inflammation, drug development and *in-silico* biology [7]. Broadly, he is a researcher of biochemistry with immense interests in immunology, microbiology, parasitology and nanobiotechnology. At present he has been working in natural product based therapeutic immuno-intervention of ulcerative colitis, and development of anti-inflammatory molecules through biochemical or medicinal chemistry approaches [5]. He already received a patent for single potential vaccine *AbhiSCoVac* [8].

Dr. Mukherjee has recently developed a new treatment approach for colon cancer using the fluids from *Annona reticulata* seeds, a unique variety of custard apple. His research team has observed a rise in *colon cancer and ulcerative colitis* in the Asansol colliery areas and its surroundings, largely due to the uncontrolled lifestyles of the population. Ulcerative colitis is a disease marked by the inflammation of the intestinal lining in the colon and rectum [9]. To offer affordable cancer treatment to people in those areas, he and his team began experiments on use of Custard Apple (*Annona reticulata*) seed fluids. After discovering the potential of custard apple seed fluids in treating colon cancer, Dr. Mukherjee successfully conducted initial trials on mice. The treatment was then applied to humans with equally positive results. On behalf of *University of Maryland School of Medicine* (UMSM), the Indian origin scientist Associate Professor Dr. Aditi Banerjee, Department of Pediatrics, was encouraged to see their research work, and her team was involved in this study. Following this, Dr. Mukherjee's team, in collaboration with the UMSM and KNU's Department of Animal Science, West Bengal, India, continued their research. The fluids were tested on colon cancer cells of people with colon cancer in the United States, where they also achieved remarkable success. Encouraged by these results, they applied for a patent in India for their groundbreaking research. According to Dr. Mukherjee, samples of Custard Apple (*Annona reticulata*) seed fluids are responding positively in cancer affected cells, and it has no effect on healthy cells. Ongoing studies are also investigating the use of these fluids in treating pediatric brain cancers and other cancers. These two successes earned Dr. Subraphat Mukherjee worldwide recognition and secured his place among the top 2% of world's greatest scientists on the prestigious list compiled by *Stanford University, USA and Elsevier* [10, 5].

Research Significance

Dr. Mukherjee's research discoveries play an important role in the lives of people. His single potential vaccine *AbhiSCoVac* is such a vaccine that can be used for any kind of corona diseases. Second success is discovery of new treatment procedure for colon cancer using fluid of Custard Apple Seeds. Current research is exploring the potential of these fluids in treating pediatric brain tumors as well as other forms of cancer. This groundbreaking innovation of this century might enthuse present and next generation researchers to follow suit. No doubt it will be helpful for mankind in cancer treatment without any bad effects on healthy cells [10].

ROLES IN CURRENT JOURNALS

Besides his research works and teaching, Dr. Mukherjee plays several crucial roles for publication of journals [4]. He serves as Peer Reviewer of nearly 25 journals like Innate immunity (f.1994, IF 2.8), International Journal of Peptide Research and Therapeutics (f. 1995, IF 2.0), Cytokine (f. 1989, IF 3.7), Separation and Purification Technology (f.1997 IF 8.1), Frontiers in Immunology (f.2010, IF 5.7); as Divisional Editor of PLOS ONE (f. 2006, IF 2.9), Frontiers in Clinical Diabetes (f. 1920), Journal of Visualized Experiments (f. 2006, IF 1.2), Cells (f. 2012, IF 6.0), etc.; as Review Editor of Frontiers in Molecular Medicine (f. 2021), Frontiers in Genetics (f. 2010, IF 2.85), Frontiers in Cell and Developmental Biology, (f.2013, IF 4.6), Frontiers in Public Health (f. 2013, IF 4.8), etc. Besides, he

also worked as reviewer of manuscript in many other journals of Springer, Taylor & Francis, Elsevier, and SciPress. Dr. Mukherjee is one of the life members of Indian Society for Parasitology since 2013. He is an expert reviewer of Natural resources i.e. Natural Product and Immunopharmacology [5, 6].

OBJECTIVES

The main objectives of this study are:

- To find year wise publications of Suprabhat Mukherjee with authorship pattern.
- To observe his position as main author and co-author.
- To calculate the degree of collaboration.
- To measure author productivity.
- To identify age wise publication pattern.
- To find the research team with co-authors.
- To identify the preferred journals.
- To calculate Annual Growth Rate of publications.
- To analyze citation received form his scholarly works.
- To test validation of the Lotka's Law and Bradford's law.

MATERIALS AND METHODOLOGY

This scientometric assessment is based on 154 publications of Dr. Suprabhat Mukherjee during the period 2010–2024. His publications include 87 journal articles, 01 book, 26 book chapters, 30 conference proceedings, 03 invited lectures delivered and 07 others, available in different publication medias at national and international level. All the publications have been extracted from ResearchGate (RG), Google Scholar (GS) databases, scientist's web site and author's profile from the web sites of Kazi Nazrul University, West Bengal. In addition, other data has been collected from various offline and online sources. A compiled data sheet of his publications was prepared for this study. Then all data were taken into MS-excel and Words, and tabulated for reaching to the insights of objectives of this study. Finally, finding statements are prepared one by one and discussed in the following sections.

REVIEW OF LITERATURE

Many bibliometric studies have been carried out by librarians and information scientists. Some of these have been reviewed subject-wise in chronological order. For instance, studies have been conducted on a Nobel laureate and eminent physicist, a nuclear physicist, and a distinguished physiologist. The scholarly contributions of a notable plant biologist and a biometeorologist have also been analyzed. An analytical study was undertaken on a linguist and businessman considered a founder of bibliometrics and scientometrics. A bio-bibliometric portrait of a renowned Indian statistician has also been published. Additionally, the works of a prominent librarian and scientometrician, as well as those of a theoretical physicist, have been examined. More recently, a statistical analysis was carried out on an ecologist and environmental scientist. Further studies have focused on medical scientists such as the creator of India's first IVF baby and the pioneer of Oral Rehydration Solution (ORS). The academic contributions of an economist and former Governor of the Reserve Bank of India have also been assessed. Despite the broad scope of these bibliometric evaluations, no such study appears to have been conducted on a young scientist working in the field of biochemistry and immunology of infectious and inflammatory diseases. Therefore, the present work stands as an original contribution, aimed at evaluating and highlighting research achievements in this specialized area through scientometric analysis.

RESULTS AND DISCUSSION

Year- and -age wise publications

Table 1 shows chronological and age wise publication of Dr. Suprabhat during 2010 to 2024. During the short time span of 15 years, he has published 154 papers, of which maximum number of papers i.e. 145 are multi-authored papers. Total 536 co-authors were involved for this purpose. Out of 145, his first paper was published in 2010, when he was 23 years old i.e. too young. He has 5 single-authored papers, i.e., papers without collaboration. Year-wise, the highest number of papers—25—was published

in 2023, when he was 36 years old. This was followed by the next highest outputs of 22, 20, 15, and 11 papers in 2022, 2021, 2019, and 2018, respectively. Only a few single-authored papers were published in the years 2018, 2019, and 2022. The yearly DC (Degree of Collaboration) values for multi-authored publications were counted as 1. Figure 1 draws a chart using clustered columns to show age wise paper publications. With the increase of his age, his publication follows upward trend (Figure 1).

Table 1. Year-and-age wise publications of Suprabhat, 2010–2024.

Year	TP	CP	AA (b.1987)	PPA	SAP	MAP	Authorship Status									UK	CoA	DC=MAP/TP
							1st	*2nd*	*3rd*	*4th*	*5th*	*6th*	*7th*	*8th*	*9th*	*15th*			
2010	1	1	23	1		1	1										3	1.00
2011	6	7	24	2		6	2	1	1	2							22	1.00
2012	3	10	25	3		3	2		1								15	1.00
2013	3	13	26	4		3	1	1	1								11	1.00
2014	9	22	27	5		8	2	3	2			1				1	36	1.00
2015	12	34	28	6		10	4	3	3							2	44	1.00
2016	6	40	29	7		6	2	3	1								30	1.00
2017	5	45	30	8		5	1	4									18	1.00
2018	11	56	31	9	1	9	6	1	2							1	36	0.82
2019	15	71	32	10	2	13	7	3	1	2							49	0.87
2020	9	80	33	11		9	3	1	3	1			1				25	1.00
2021	20	100	34	12		20	2	3	5	2	2	5	1				68	1.00
2022	22	122	35	13	2	20	-	2	5	6	4	2			1		68	0.91
2023	25	147	36	14		25	2	8	4	5	2	3				1	84	1.00
2024	6	153	37	15		6			2	1	2	1					20	1.00
2025	1	154				1								1			7	1.00
Total	154				5	145	35	33	31	19	10	12	2	1	1	1	4	536	0.94

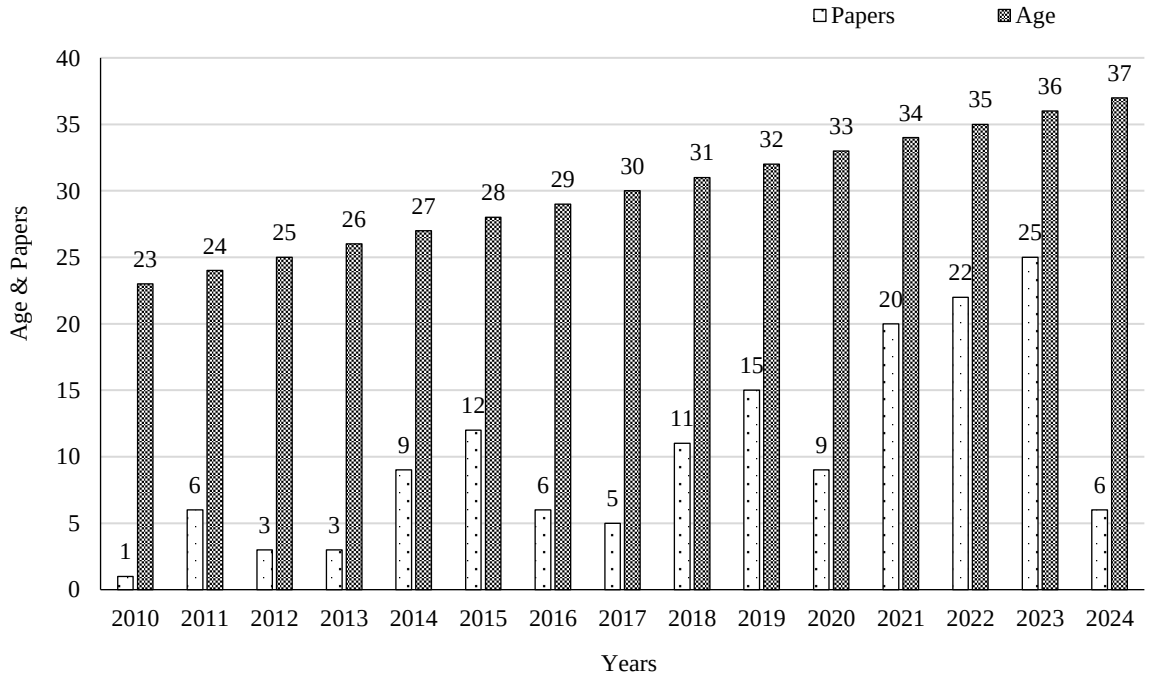

Figure 1. Year and age wise publication of Mukherjee.

Authorship Pattern

Table 2 shows pattern of collaboration, and time span of 145 multi-authored publications. Of 154, authorship pattern of four publications (UK in Table 1) could not be ascertained and so out of 150 papers, 145 are multi-authored publications and only five papers are single-authored, that is, without collaboration. Among 145, the maximum number of papers, i.e., 30 published as five-authored followed by 27 four-authored paper; 24 three-authored, 22 six-authored and 20 two-authored, and nine each is 7- and 8-authored paper. There are 2 ten-authored and one each 9- and 16-authored papers. He has produced 5 single-authored papers during the time span of 5 years. 22-authored papers were published in the time span of 6 years. He spent 11 years for 24 three-authored, 15 years for 27 four-authored, 14 years for 30 five-authored papers, 13 years for 22 six-authored papers and so on. Time span of 9 eight-authored papers could not be estimated because year of publication of one paper of the authorship has not identified.

Status in Byline of Authors

Table 3 shows status of the scientist in the byline of authorships. Dr. Mukherjee has appeared in 35 papers as first author, in 33 papers as second author, in 31 as third author, in 19 as fourth author, in 10 as fifth and 12 as sixth author and so on. In mega-authorship, he occupied 15th position in one paper. Out of first highest 30 five-authored papers, he appeared as author in 1st position in 11, second position in 6, third in 3, fourth in 2 and fifth in 8 papers.

Table 2. Authorship pattern and time span of publications.

Authorship Pattern	Non-collaborative papers	Collaborative papers	Time Span	FYP to LYP
Single	5	--	5	2018–2022
Two	--	20	6	2018–2023
Three	--	24	11	2014–2024
Four	--	27	15	2010–2024
Five	--	30	14	2011–2024
Six	--	22	13	2012–2024
Seven	--	9	11	2011–2021
Eight	--	9	??	2018–2022
Ten	--	1	1	2023–2023
Eleven	--	2	9	2014–2022
Sixteen	--	1	1	2023–2023
Total	5	145	--	--

Table 3. Position in the byline in collaborative papers.

Position → / Authorship pattern ↓	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	15th	Total
Two-authored	7	13									20
Three-authored	6	3	15								24
Four-authored	5	2	6	14							27
Five-authored	11	6	3	2	8						30
Six-authored	4	5	2		1	10					22
Seven-authored	2	2		2	1		2				09
Eight-authored			5	1		2		1			09
Ten-authored		1									01
Eleven-authored		1							1		02
Sixteen-authored										1	01
Total	35	33	31	19	10	12	2	1	1	1	145

Among second highest 27 four-authored papers, he occupied 1st position in 5 papers, and 2nd position in 2 papers, third in 6, and fourth in 14 papers. Similarly, from the next 24 three-authored papers, he ranked first in 6, second in 3 and third position in 15 papers. Apart, out of 22 six-authored papers, he received 1st position in 4, 2nd in 5, 3rd in 2, 5th in 1 and 6th in 10 papers. In case of 20 two-authored papers, he authored in 1st position in 7 papers, and 2nd in 13 papers. In mega-authorship, he has held 2nd position of 10-authored paper; 2nd position and 9th position in one each in case of 2 eleven-authored papers; and 15th authorship position in one sixteen-authored paper.

Most close Contributors

Table 4 enlists the name of the most close collaborators according to individual paper production with Dr. Mukherjee including year of first and last publication, average paper per year. *Santi P. Sinha Babu* is his most close collaborator who has produced maximum number of papers i.e., 51 with the scientist in the time spam of 8 years and 6 papers per year, followed by *Nabarun Chandra Das* with 32 papers during 5 years, average 6 papers each year; *Ritwik Patra* with 30 papers, yearly average around 7 papers; *Niladri Mukherjee*, 27 papers, nearly 2 papers per year, earned during 12 years; *Nikhilesh Joardar*, 18 articles, yearly 3 approximately; *Pritha Chakraborty*, 15 papers, yearly 5 papers; *Abhigyan Choudhury*, 14 papers, yearly around 5 papers; *Jagadeesh Bayry*, 13, yearly 2 papers; Biswanath Mondal, 12, yearly 3 papers; and Priya Roy with 12 papers, annually 2 papers. A group of two collaborators includes Prasanta Saini; Parth Sarathi Sen Gupta with 10 papers each, for which they took time 3 and 5 years respectively. So, they have produced yearly 3 (3.33) papers, and 2 per annum respectively. Thus, remaining collaborators are classified into several categories according to their paper productions such as group of 3 collaborators who has 9 papers each; other group of 3 collaborators who has 8 papers each; class of 2 co-authors having 7 papers each; group of another 2 authors who are involved in 6 papers each; category of 4 collaborators with 5 papers each. Similarly, another 135 co-authors of Mukherjee have been categorized into more 4 groups according to the paper production viz, three authors @ 4 each, 12 authors @ 3 each, 28 authors @ 2 each and 92 co-authors @ 1 each respectively (Table 4). This research activity of Dr. Mukherjee has produced 536 co-authors in total and individual name wise it stands at 161 in all. Figure 2 represents highly productive collaborators.

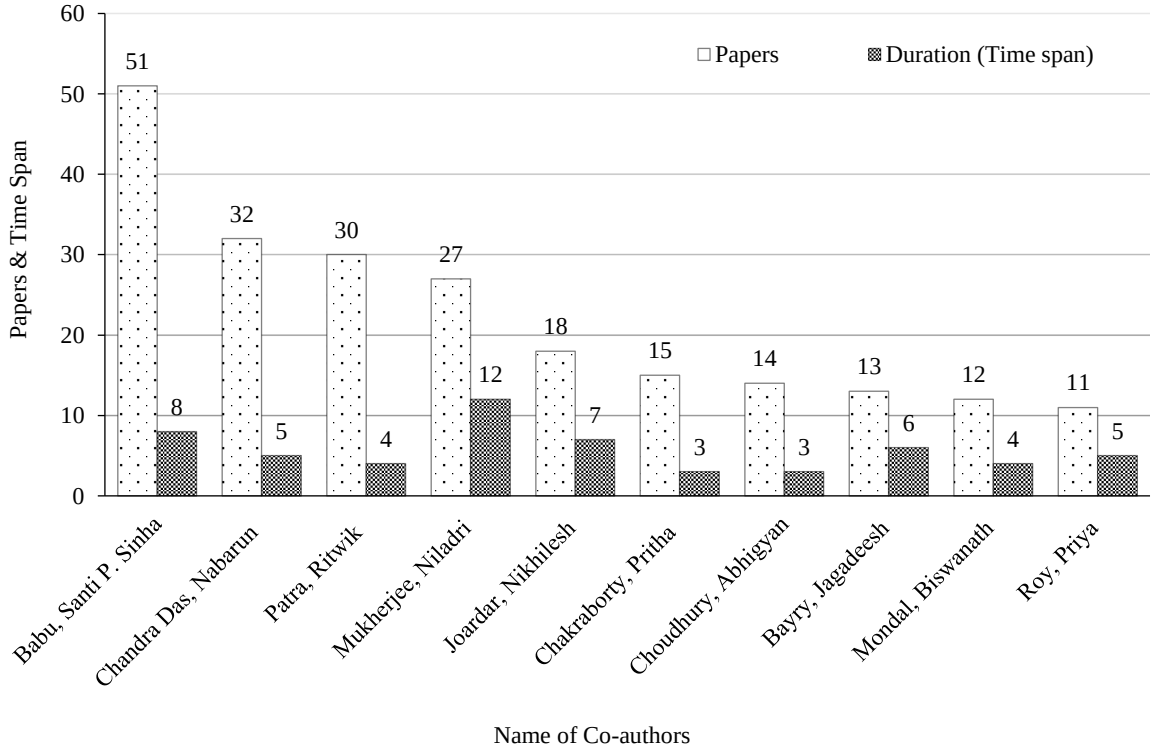

Figure 2. Top 10 collaborators' publication during a specific time span.

Table 4. Names of leading collaborators of Mukherjee.

Rank	Papers	Co-author's names	FYP	LYP	Year taken= LYP–FYP	Paper production per year
1	51	Babu, Santi P. Sinha	2013	2020	8	6.38
2	32	Chandra Das, Nabarun	2020	2024	5	6.4
3	30	Patra, Ritwik	2020	2023	4	7.5
4	27	Mukherjee, Niladri	2013	2024	12	2.25
5	18	Joardar, Nikhilesh	2015	2021	7	2.57
6	15	Chakraborty, Pritha	2022	2024	3	5
7	14	Choudhury, Abhigyan	2020	2022	3	4.67
8	13	Bayry, Jagadeesh	2019	2024	6	2.17
9	12	Mondal, Biswanath	2011	2014	4	3
10	11	Roy, Priya	2013	2017	5	2.2
11	10	Saini, Prasanta; Sen Gupta, Parth Sarathi (02)			3, 5	3.33, 2
12	9	Bardhan, Rajashree; Padma, Somrita; Rana, Malay Kumar (03)			3, 3, 5	3, 3, 1.8
13	8	Chowdhury, Pranesh; Dey, Apurba; Mondal, Sudip (03)			7, 4, 3	1.14, 2, 2.67
14	7	Dey, Biswajit; Roy, Bishnupada (02)			7, 8	1, 0.87
15	6	Chakraborty, Ankita; Satpati, Biswarup (02)			2, 7	3, 0.85
16	5	Bhattacharya, Manojit; Gayen, Prajna; Mondal, Ranjan; Panda, Saroj (04)			2, 3, 4, 3	2.5, 1.67, 1.25, 1.67
17	4	Das, Mrinmoy; Karnam, Anupama; Senapati, Dulal (03)			1, 1, 2	4, 4, 2
18	3	Basak, Bikram; Bhattacharya, Samir; Das, N.C.; Dey, Abhijit; Dey, Shankar; Dey, Subhankar; Ghosh, Pratik; Mitra, Saubhik; Modak, Biplob; Mondal, Maloy; Patra, Bidhan; Roy, Debiprasad (12)			2, 3, 3, 2, 2, 3, 2, 3, 3, 3, 1, 3	1.5, 1, 1.5, 1.5, 1.5, 1, 1.5, 1, 1, 1, 3, 1
19	2	Bandyopadhyay, Bidyut; Banerjee, Monojit; Bhattacharjee, Subham; Bhunia, Biswanath; Biswal, Satyaranjan; Chakraborty, Indranil; Chatterjee, Moytrey; Dubey, Soumen; Ghosh, Angshuman; Ghosh, Narendra; Gorai, Sampa; Goswami, Ramansu; Hoerauf, Achim; Huda, S; Kumar, Deepak; Mandal, Amit; Mandal, Jishu; Mandal, Kalyan; Mandal, Nilrudra; Mondal, Sandip; Mondal, Shovan; Mukherjee, Gargi; Mukherjee, Sandip; Mukhopadhyay, Sudit ; Pal, Bikas; Ray, Anindya; Schiefer, Andrea; Maiti, Tushar Kanti (28)			1, 2, 2, 1, 1, 3, 1, 2, 2, 2, 3, 3, 1, 1, 2, 2, 2, 3, 3, 2, 2, 1, 3, 2, 2, 4, 1, 2	2, 1, 1, 2, 2, 0.67, 2, 1, 1, 1, 0.67, 0.67, 2, 2, 1, 1, 1, 0.67, 0.67, 1, 1, 2, 0.67, 1, 1, 0.5, 2, 1
20	1	92 authors @ 1 paper each (92)			1 year each	1 per year
	Total	161 co-authors (individual name wise)				

Validation of Lotka's Law and Productivity Index of Authors

According to the Lotka's Law, 60% of total co-authors should have one publication, 15 will have 2 publications, 7% of authors will have 3 publications, and so on. Using the general equation of Lotka's Law, $b=C/a^2$, calculated values have been enumerated which are tabulated in the Table 5. Here, a= Relative frequency of author's publishing, b= Total no. of Co-authors (calculated/ expected) corresponding to the relative frequency of author's publishing, and C= Constant that is to be estimated. For the data set of this study, firstly considering, b=92, a=1 which indicate 92 authors are contributing 1 paper each. If these values are put in the formula for calculating the value of $C=b\times a^2=92\times 1^2$ or 92. Taking this constant value, calculated values of number of authors (i.e. b) is to be counted. Such as,

i. a=1, C=92, and $b=C/a^2=92/1^2=92$;
ii. a=2, C=92, and $b=92/2^2=92/4=23$
iii. a=3, C=92, and $b=92/3^2=92/9=10$ and so on.

Table 5 shows that the figure of calculated number of authors is 151 and actual authors are 161. According to the Table 5, the observed value of b for a=2 is 28 and calculated value is 23; in the case of a=3, the observed value is 12 and calculated value is 10; in the case of a=4, the calculated value is 6

corresponding to the observed value 3 and the calculated value of a=5 is 4 and observed authors is also 4. As the actual values which represent the author productivity are slightly varying from the calculated number of authors. Therefore, it can be concluded that inverse square law of Lotka validates the data set of this study. Figure 3 shows the graphical representation of validation of Lotka's law.

Table 6 enlists types of Information Flow (communication) Channels. It indicates form of documents in which form information are embedded and manifested in the information markets such as journals, books, conference proceedings, delivered lecture papers, letters, etc. Table 5 focuses on number of publications, year of first and last publication, origin and impact factor of the journals.

Table 5. Calculation for Lotka's law application.

Relative frequency of author's publishing (a)	No. of authors, giving credit to individual name wise (Observed/actual)	%age of authors	No. of authors (calculated/expected) (b)
1	92	57.14	92
2	28	17.39	23
3	12	7.45	10
4	03	1.87	06
5	04	2.48	04
6	02	1.25	03
7	02	1.25	02
8	03	1.86	01
9	03	1.86	01
10	02	1.25	01
11	01	0.62	01
12	01	0.62	01
13	01	0.62	01
14	01	0.62	0.46
15	01	0.62	0.41
18	01	0.62	0.01
27	01	0.62	0.13
30	01	0.62	0.10
32	01	0.62	0.09
51	01	0.62	0.04
Total	161	100	151

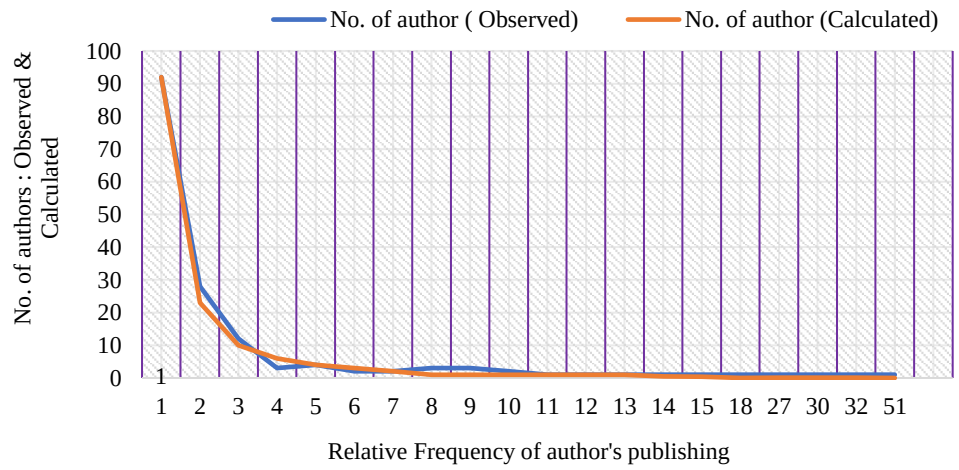

Figure 3. Graphical representation of validation of Lotka's Law.

Table 6. Information flow channels.

S.N.	Communications Channels	Papers	%age	FPY	LPY	Country	IF
GR-A	**Journals (JA 87, 56.5%)**						
1	Future Virology	5	3.25	2021	2023	UK	3.015
2	RSC Adv.	5	3.25	2014	2016	UK	3.9
3	Journal of Medical Virology	4	2.63	2020	2021	USA	12.7
4	Antibodies	3	1.95	2021	2023	Switzerland	4.7
5	Journal of Molecular Liquids	3	1.95	2019	2022	Netherlands	5.3
6	International Journal of Biological Sciences and Engineering	3	1.95	2011	2011	India	Unknown
7	Chemistry - A European Journal	2	1.29	2022	2023	Germany	4.3
8	International Immunopharmacology	2	1.29	2022	2024	Netherlands	4.8
9	International Journal of Biological Macromolecules	2	1.29	2017	2023	Netherlands	7.7
10	Journal of Biomolecular Structure & Dynamics	2	1.29	2021	2021	UK	5.235
11	PLoS ONE	2	1.29	2018	2023	USA	2.9
12	Proceedings of the Zoological Society	2	1.29	2020	2021	Germany	1.04
13	Scandinavian Journal of Immunology	2	1.29	2019	2019	USA	3.889
14	Human Immunology	2	1.29	2021	2021	Netherlands	2.7
15	ACS Applied Nano Materials	1	0.65	2021	2021	USA	5.3
16	Advanced Composites and Hybrid Materials	1	0.65	2018	2018	Germany	23.2
17	Applied Surface Science.	1	0.65	2019	2019	Netherlands	6.3
18	Asian Pacific Journal of Tropical Medicine.	1	0.65	2014	2014	Netherlands	1.9
19	bioRxiv	1	0.65	2019	2019	USA	NA
20	Bulletin of Materials Science	1	0.65	2018	2018	India	1.8
21	Clean Technologies and Environmental Policy.	1	0.65	2016	2016	Germany	4.2
22	Communications Biology	1	0.65	2019	2019	UK	5.9
23	Coronaviruses	1	0.65	2021	2021	Netherlands	NA
24	Current Bioactive Compounds	1	0.65	2017	2017	Netherlands	0.4
25	Current drug metabolism	1	0.65	2016	2016	Netherlands	2.96
26	Desalination and water treatment	1	0.65	2013	2013	Netherlands	1
27	European Journal of Pharmaceutical Sciences	1	0.65	2019	2019	Netherlands	5.112
28	Experimental Parasitology	1	0.65	2013	2013	Netherlands	1.859
29	Frontiers in Genetics	1	0.65	2021	2021	Switzerland	2.8
30	Frontiers in Immunology	1	0.65	2023	2023	Switzerland	5.7
31	Frontiers in Radiology	1	0.65	n.d.	n.d.	Switzerland	5.7
32	Geomicrobiology Journal	1	0.65	2014	2014	USA	2.2
33	Human Gene	1	0.65	2023	2023	Netherlands	0.5
34	Immunotherapy	1	0.65	2024	2024	UK	NA
35	Indian Journal of Experimental Biology	1	0.65	2015	2015	India	0.944
36	Infection Genetics and Evolution	1	0.65	2020	2020	Netherlands	4.4
37	Infectious diseases of poverty	1	0.65	2014	2014	Germany	4.8
38	J. Chem. Inf. Model	1	0.65	2022	2022	USA	5.6
39	Journal of Cellular and Molecular Medicine	1	0.65	2023	2023	USA	5.31

40	Journal of Food Science and Technology	1	0.65	2014	2014	Germany	3.117
41	Journal of Helminthology	1	0.65	2018	2018	UK	1.421
42	Journal of Molecular Epidemiology and Evolutionary Genetics in Infectious Diseases	1	0.65	2022	2022	Germany	8
43	Letters in Drug Design & Discovery	1	0.65	2021	2021	Netherlands	1.2
44	Materials Science and Engineering	1	0.65	2017	2017	Netherlands	NA
45	MethodsX	1	0.65	2023	2023	Netherlands	1.6
46	Microbiology	1	0.65	2020	2020	UK	2.8
47	Mini reviews in medicinal chemistry	1	0.65	2015	2015	Netherlands	3.862
48	Molecular and Biochemical Parasitology	1	0.65	2023	2023	Germany	1.4
49	Nanoscience & Nanotechnology-Asia	1	0.65	2020	2020	Netherlands	0.33
50	Parasite Immunology	1	0.65	2017	2017	USA	1.4
51	Parasitology International	1	0.65	2014	2014	Germany	1.5
52	Peel	1	0.65	2012	2012	USA	NA
53	Pharmaceutical biology	1	0.65	2015	2015	UK	2.971
54	Physical Chemistry Chemical Physics.	1	0.65	2019	2019	UK	2.9
55	Preparative biochemistry & biotechnology.	1	0.65	2015	2015	UK	2
56	Recent Patents on Anti-Infective Drug Discovery.	1	0.65	2021	2021	Netherlands	NA
57	Research in Veterinary Science	1	0.65	2014	2014	Netherlands	2.2
58	Reviews in Environmental Science and Bio/Technology	1	0.65	2013	2013	UK	8.6
59	The Brazilian Journal of Infectious Diseases	1	0.65	2016	2016	Brazil	3
60	The Journal of infectious diseases	1	0.65	2017	2017	UK	5.226
61	The Journal of Nutritional Biochemistry	1	0.65	2018	2018	Germany	6.048
62	Vaccines	1	0.65	2023	2023	Switzerland	5.2
GR-B	**Books (BK1, 0.65%)**						
63	Molecular evolution of the inflammatory mediators of animal kingdom. Lambert Academic Publishing (LAP), Beau Bassin, Mauritius.	1	0.65	2020	2020	Mauritius	
GR-C	**Book Chapters (BC 26, 16.88%)**						
64	Nanotechnology for Advances in Medical Microbiology (pp.165-205) (Eds. Naga Raju Maddela, Sagnik Chakraborty, & Ram Prasad, Publisher: Springer.)	2	1.29	2021	2022	Germany	
65	Prebiotics, Probiotics and Nutraceuticals, (pp.133-154) Eds. Kambaska Kumar Behera, Renu Bist, Sangita Mohanty, & Manojit Bhattacharya, Publisher: Springer	2	1.29	2022	2022	Singapore	
66	Advances in medico-veterinary parasitology: an Indian perspective (pp.397-414) Publisher: Panima Publishing Corporation, New Delhi	1	0.65	2018	2018	India	

67	Applications of Biotribology in Biomedical Systems (pp.79-111) Publisher: Springer, Cham	1	0.65	2024	2024	Germany	
68	Big Data Analytics for Healthcare Datasets, Techniques, Life Cycles, Management, and Applications (pp.73-82), Publisher: Elsevier	1	0.65	2022	2022	Netherlands	
69	Bioactive Compounds Against SARS-CoV-2 (pp.1-11)	1	0.65	2023	2023	UK	
70	Computational Intelligence Techniques for Combating COVID-19 (pp.45-60), Publisher: Springer, Cham	1	0.65	2021	2021	Germany	
71	Computational Vaccine Design (pp.431-452)	1	0.65	2023	2023	USA	
72	Coronavirus Therapeutics – Volume I (pp.87-109), Publisher: Springer, Cham	1	0.65	2022	2022	Germany	
73	Extremophiles, Publisher: CRC Press	1	0.65	2022	2022	UK	
74	Heat Shock Proteins (HSP) in Translational Neuroscience (pp.125-135), Publisher: Scientific Scholar LLC	1	0.65	2023	2023	USA	
75	Intelligente Nano-Bio-Geräte der nächsten Generation. Springer Spektrum, Singapore [Dutta, G., Biswas, A. (eds)]	1	0.65	2024	2024	Singapore	
76	IoT in Healthcare and Ambient Assisted Living (pp.17-41) Chapter: 2, Publisher: Springer, Singapore	1	0.65	2021	2021	Singopore	
77	Medicinal Plants and Antimicrobial Therapies. Springer, Singapore. [Kumar, V., Shriram, V., Dey, A. (eds)]	1	0.65	2024	2024	Singopore	
78	Modern Techniques in Biosensors. Studies in Systems, Decision and Control, vol 327. Springer, Singapore.[Dutta, G., Biswas, A., Chakrabarti, A. (eds)]	1	0.65	2021	2021	Singopore	
79	Nano-Bioremediation : Fundamentals and Applications (pp.111-145), Publisher: Elsevier	1	0.65	2022	2022	Netherlands	
80	Nanomaterials for Bioreactors and Bioprocessing Applications (pp.365-392), Publisher: Elsevier	1	0.65	2023	2023	Netherlands	
81	Nature-Inspired Methods for Smart Healthcare Systems and Medical Data. Springer, Cham. [Anter, A.M., Elhoseny, M., Thakare, A.D. (eds)]	1	0.65	2023	2023	Germany	
82	Neurology in Tropics (E-book) 2nd Edition (pp.279-290), Publisher: Elsevier	1	0.65	2018	2018	Netherlands	
83	Next Generation Smart Nano-Bio-Devices. Smart Innovation, Systems and Technologies, vol 322. Springer, Singapore. [Dutta, G., Biswas, A. (eds)]	1	0.65	2022	2022	Singapore	
84	Oxidative Stress in Microbial Diseases, Publisher: Springer Nature	1	0.65	2019	2019	Germany	

85	River Health and Ecology in South Asia. Springer, Cham. [Patra, B.C., Shit, P.K., Bhunia, G.S., Bhattacharya, M. (eds) River]	1	0.65	2022	2022	Germany	
86	Next-Generation Nanobiosensor Devices for Point-Of-Care Diagnostics (pp.79-103)	1	0.65	2022	2022	Germany	
87	Spatial Modeling and Assessment of Environmental Contaminants (pp.247-258), Springer, Cham	1	0.65	2021	2021	Germany	
GR-D	**Conference Proceedings (CP 30, 19.43%)**						
88	108th Indian Science Congress, RTM Nagpur University, Nagpur, India	4	2.59	2023	2023	India	
89	18th International Congress of Immunology IUIS 2023, Cape Town, South Africa	2	1.29	2023	2023	South Africa	
90	49th Annual Conference of Indian Immunology Society IMMUNOCON	2	1.29	2022	2022	India	
91	5th Regional Science and Technology Congress (Region-7), 2022–2023, the University of Burdwan	2	1.29	2023	2023	India	
92	99th Indian Science Congress association, KIIT University Bhubaneswar, India Vol.1	2	1.29	2012	2012	India	
93	International Conference on Molecular Signaling Department of Zoology, North-Eastern Hill University, Shillong; India	2	1.29	2015	2015	India	
94	International conference on Tissue Engineering & Regenerative Medicine (ICTERM), NIT Rourkela, India, NIT Rourkela, India, Volume: 1	2	1.29	2011	2011	India	
95	15th International Congress of Parasitology, ICOPA-2022, Copenhagen, Denmark	1	0.65	2022	2022	Denmark	
96	18th West Bengal state science congress, Narendrapur, Kolkata. Volume: 1	1	0.65			India	
97	6th ASEAN Congress of Tropical Medicine Parasitology (ACTMP)	1	0.65	2014	2014	Malayasia	
98	Acharya P C Ray National Young Scientists' Conference, Kolkata	1	0.65	2018	2018	India	
99	ICSMAT: MNIT, Jaipur, Rajasthan.	1	0.65	2015	2015	India	
100	In silico analyses of the Evolution and Form-Function relationship of the Principal Inflammation Inducing Factors of the Animalia.	1	0.65	2019	2019	Unknown	
101	International Congress of Parasitology, (South Korea), SCientifiC REPOrtS	1	0.65	2018	2018	South Korea	
102	International Conference on Nano Science and Engineering Application, Jawaharlal Nehru Technological University, Hyderabad.	1	0.65	2014	2014	India	
103	International Seminar on exploring the modern approach in Biological Science: From Genome to organism; (India)	1	0.65	2015	2015	India	

104	National Level Seminar from Genome to Organism Part III	1	0.65	2024	2024	Unknown	
105	National seminar on Recent trends in Biotechnology, Burdwan University, India, Burdwan University, India, Volume: 1	1	0.65	2010	2010	India	
106	National Symposium on Comparative Endocrinology and Reproductive Biology; India	1	0.65	2015	2015	India	
107	POLY 2014, Visva-Bharati, Santiniketan	1	0.65	2015	2015	India	
108	Comparative characterization of SARS-CoV-2 spike glycoprotein homologs and their interacting partners of human: a bioinformatics approach.	1	0.65	2020	2020	Unknown	
GR-E	**Invited Lecture Delivered (ILD 3, 1.95%)**						
109	Central Dogma: mystery behind the molecular design of life. College, Malda	1	0.65	2018	2018	India	
110	DNA: The Molecular Design of Life., Department of Zoology, Michael Madhusudan Memorial College, Durgapur, West Bengal	1	0.65	2019	2019	India	
111	Quinolone derivatives as novel antifilarial agents with potential macrofilaricidal and anti-inflammatory actions, Department of Zoology, Visva-Bharati University, Santiniketan, West Bengal	1	0.65	2019	2019	India	
GR-F	**Unknown Category (UC 7, 4.59%)**						
112	Supplementary Material	4	2.64	2019	2019	Unknown	
113	ExPar.	1	0.65	2015	2015	Unknown	
114	Kazi Nazrul University	1	0.65	2021	2021	India	
115	Designing single potential vaccine AbhiSCoVac through Immuno-informatics and Immune Simulation approaches. Patent: 202231020075 A	1	0.65	2022	2022	India	
	Total	154	100				

Abbreviations: FPY= First Publication Year; LPY= Last Publication Year, IF= Impact Factor; NA= Not Available.

The list includes 62 journals, 25 books including editorial monographs, 21 conference proceedings, 3 delivered lectures, and 4 unknown categories of formats. His first paper was appeared in the conference proceedings "*National seminar on Recent trends in Biotechnology*, during March 11–12, 2010 at Burdwan University, India". His most of the papers were published in the journals; 3.25% each in Future *Virology* (IF 3.015), and *RSC Adv.* (IF 3.9), both emanating from UK followed by Journal of Medical Virology (N4, 2.63%) whose IF is 12.7 and it is originated from USA. A group of three journals including *Antibodies*, *Journal of Molecular Liquids*, and *International Journal of Biological Sciences and Engineering* which published 3 papers each, from Switzerland, Netherlands, and India respectively. Another category of eight highly impactful journals has been chosen by the scientist and they selected 2 papers each for publication in their journals, and out of which *International Journal of Biological Macromolecules*, and Journal *of Biomolecular Structure & Dynamics* are most highly impactful, i.e., IF 7.7 and 5.235 respectively. Apart, a class of 48 journals has published 1 paper each and mostly is emanated from Netherlands and UK. Beyond his journal articles, Dr. Mukherjee tries to disseminate his research activities through many other Medias like in the form of books (1, 0.65%), contributing his

works as book chapters (26, 16.88%), presenting papers/posters in national and international seminars and conferences (30, 19.43%), delivering in the form of lectures (3, 1.95%) throughout the country and abroad. In addition, several data of his work have been published as "Data" which are included in the unknown category in this study.

Bradford's Law

In this study, first zone with first 26 journals enumerates 33.1% of total publications; second zone consists of next 50 communication channels for 33.13% of publications; and finally, third zone covers last 39 channels with 33.12% publications. Therefore, the data set for publication channels validates Bradford's Law.

Geographical Distribution of Publications

Table 7 counts country wise distribution of publications. It is observed that out of 154 published documents during 2010 to 2024, the maximum number of his publications i.e. 33 (21.43%) have been emanated from India, followed by Netherlands (30, 19.48%), UK (23, 14.94%), Germany (22, 14.28%), USA (17, 11.04) and so on. Seven papers (7) each has been published from Switzerland and Singapore; 2 from South Africa, 1 each from Brazil, Denmark, Malayasia, Mauritius, and South Korea. Place of publication of 8publications (5.19%) could not be identified.

Growth of Publications

Table 8 shows Annual Growth Rate (AGR), and Cumulative Annual Growth Rate (CAGR) of Mukherjee's publication during 2010–2024. Using the formula, Annual Growth Rate (AGR) ={(End Value–First Value)×100}/First Value [23]. For example, from the first two years are: 2011 (starting year) to 2012 (ending year), first value =3 and the end value =1. Now, putting the both the values in the formula, {(1–3)×100}/3=AGR =–100; again, for the year 2012 to 2013, here First value =1 and End value =3, similarly, {(3–1)×100}/1 =AGR=200 and so on. Same formula will be applied to find out the values of CAGR. As per Table 7, in 2012–2013, there is an increase of 200% from 1 to 3 articles; both in 2013–2014 from 3 to 6 articles, and 2016–2017 from 3 to 6 with a 100% growth; in 2020–2021 from 9 to 17 articles with a yearly 88.89% growth; for the year 2015, it is 50% and so on.

Table 7. Geographical area wise publications.

Country	Papers	%age
India	33	21.43
Netherlands	30	19.48
UK	23	14.94
Germany	22	14.28
USA	17	11.04
Switzerland	7	4.55
Singapore	7	4.55
South Africa	2	1.29
Brazil	1	0.65
Denmark	1	0.65
Malayasia	1	0.65
Mauritius	1	0.65
South Korea	1	0.65
Unknown	8	5.19
Total	154	100

In case of cumulative annual growth, it reveals that during the years 2013–2014, a growth is 85.71% from the previous year, followed by 75% in 2012–2013, 69.23% for the years 2014–2015, 33.34% in 2011–2012, 32.07% in respect to 2020–2021 and so on. After that, the CAGR varies from 7 to 20%. As 2024 has already passed and the last year of publication has not been identified, this study does not include the Annual Growth Rate (AGR) calculation for these years.

Table 9 counts publication growth rate of publications from year to year other than research articles.

Table 8. Annual growth rate of Mukherjee's research articles.

Year	APC	CAPC	Annual Growth Rate (%) [AGR]	Cumulative Annual Growth Rate (%) [CAGR]
2010	0	0	-	-
2011	3	3	0	0
2012	1	4	–66.67	33.34
2013	3	7	200	75
2014	6	13	100	85.71
2015	9	22	50	69.23
2016	3	25	–66.67	13.64
2017	6	31	100	24
2018	6	37	0	19.35
2019	7	44	16.67	18.92
2020	9	53	28.57	20.45
2021	17	70	88.89	32.07
2022	9	79	–47.05	12.85
2023	6	85	–33.33	7.59
2024	1	86	-	-
2025	1	87	-	-

Abbreviation: APC= Annual Paper count; CAPC= Cumulative Annual Paper count.

Table 9. Growth of publications other than research articles.

Year	BK	BC	CP	ILD	PT	Others	APC	CAPC	AGR %	CAGR %
2010	-	-	1	-	-	-	01	01	-	-
2011	-	-	3	-	-	-	03	04	200	300
2012	-	-	2	-	-	-	02	06	-33.34	50
2013	-	-		-	-	-	00	06	-100	0
2014	-	-	2	-	-	-	02	08	0	33.34
2015	-	-	6	-	-	1	07	15	250	87.5
2016	-	-		-	-	-	00	15	-100	0
2017	-	-		-	-	-	00	15	0	0
2018	-	2	2	1	-	-	05	20	0	33.34
2019	-	1	1	2	-	4	08	28	60	40
2020	1	-	-	-	-	-	01	29	-87.5	3.57
2021	-	5	-	-	-	1	06	35	500	20.69
2022	-	10	4	-	1	-	15	50	150	42.86
2023	-	5	8	-	-	-	13	63	-13.34	26
2024	-	3	1	-	-	-	04	67	-	-
2025	-	-	-	-	-	-	00	67	-	-
Total	01	26	30	03	01	06	67	-		

Abbreviations: BK=Book, CP= Conference Proceedings, BC= Book Chapter, ILD= Invited Lecture Delivered, PT=Patent.

It shows that in case of AGR, in 2020 and 2021, there is an increase of 500% from 1 to 6 publications, followed by 250% in 2014 and 2015 from 2 to 7 publications, 200% in 2010 and 2011 for 1 to 3 publications, and so on. In cumulative growth percentage, a growth of 200% was found during the initial years 2010 and 2011 for 1 to 4 publications, 87.5% in the years 2014 and 2015, an increase of 50% in 2012 and 2013, 42.86% in 2021–2022, 40% in 2018 and 2019. After that, remaining CAGRs vary from 3 to 30%. It can be noted that inference in the number of publications lies between 1 and 10.

Citation Analysis

Top 11 Highly Cited Scholarly Works

Table 10 shows Mukherjee's top 11 highly cited scholarly works and citation growth rates (CGR) during 2010–2024. He received the highest number of citations i.e. 486 in GS and 426 in RG from the article "*In silico studies on the comparative characterization of the interactions of SARS-CoV-2 spike glycoprotein with ACE-2 receptor homologs and human TLRs".* Age of this paper is 4 years and CGR is 121.5 in GS and 106.5 in RG. Next is "*TLR2 and TLR4 mediated host immune responses in major infectious diseases: a review", age* 8 years and CGR counts 50.5 in GS and 40.5 in RG.

The maximum CGR has been counted in the first two papers in both the databases RG and GS respectively. Surprisingly, citation wise ranks are same for the 9 papers according to the serial 1 to 8, and 11 in both the databases GS and RG. It is also observed that CGR values in GS and RG are not much different and closeness of the graphical curves in Figure 4 proves that.

Table 10. Citation analysis.

Sl. No.	Name of Articles	Publication channels (Year)	Times cited (TC)		Ranks		Articles' age (A) In 2024	Citation Growth Rate =TC/A	
			GS	*RG*	*GS*	*RG*		*GS*	*RG*
01	In silico studies on the comparative characterization of the interactions of SARS-CoV-2 spike glycoprotein with ACE-2 receptor homologs and human TLRs	Journal of Medical Virology (2020)	486	426	1	1	4	121.5	106.5
02	TLR2 and TLR4 mediated host immune responses in major infectious diseases: a review	Brazilian Journal of Infectious Diseases (2016)	404	324	2	2	8	50.5	40.5
03	Toll-like receptor polymorphism in host immune response to infectious diseases: A review	Scandinavian Journal of Immunology (2019)	244	197	3	3	5	48.8	39.4
04	Potential use of polyphenol oxidases (PPO) in the bioremediation of phenolic contaminants containing industrial wastewater	Reviews in Environmental Science and Bio/Technology (2013)	177	156	4	4	11	16.09	14.18
05	Targeting human TLRs to combat COVID-19: a solution?	Journal of Medical Virology (2021)	119	111	5	5	3	39.67	37
06	Gut microbes as future therapeutics in treating inflammatory and infectious diseases: lessons from recent findings	The Journal of Nutritional Biochemistry (2018)	105	91	6	6	6	17.5	15.17
07	In silico analyses on the comparative sensing of SARS-CoV-2 mRNA by the intracellular TLRs of humans	Journal of Medical Virology (2021)	95	86	7	7	3	31.67	28.67
08	Exploring the binding efficacy of ivermectin against the key proteins of SARS-CoV-2 pathogenesis: an *in silico* approach	Future Virology (2021)	79	72	8	8	3	26.34	24

09	An approach towards optimization of the extraction of polyphenolic antioxidants from ginger (*Zingiber officinale*)	Journal of Food Science and Technology (2014)	58	52	9	10	10	5.8	5.2
10	Antifilarial effects of polyphenol rich ethanolic extract from the leaves of Azadirachta indica through molecular and biochemical approaches describing reactive oxygen species …	Experimental Parasitology (2014)	56	61	10	9	10	5.6	6.1
11	Phenolics and terpenoids; the promising new search for anthelmintics: a critical review	Mini Reviews in Medicinal Chemistry (2016)	55	27	11	11	8	0.63	3.38

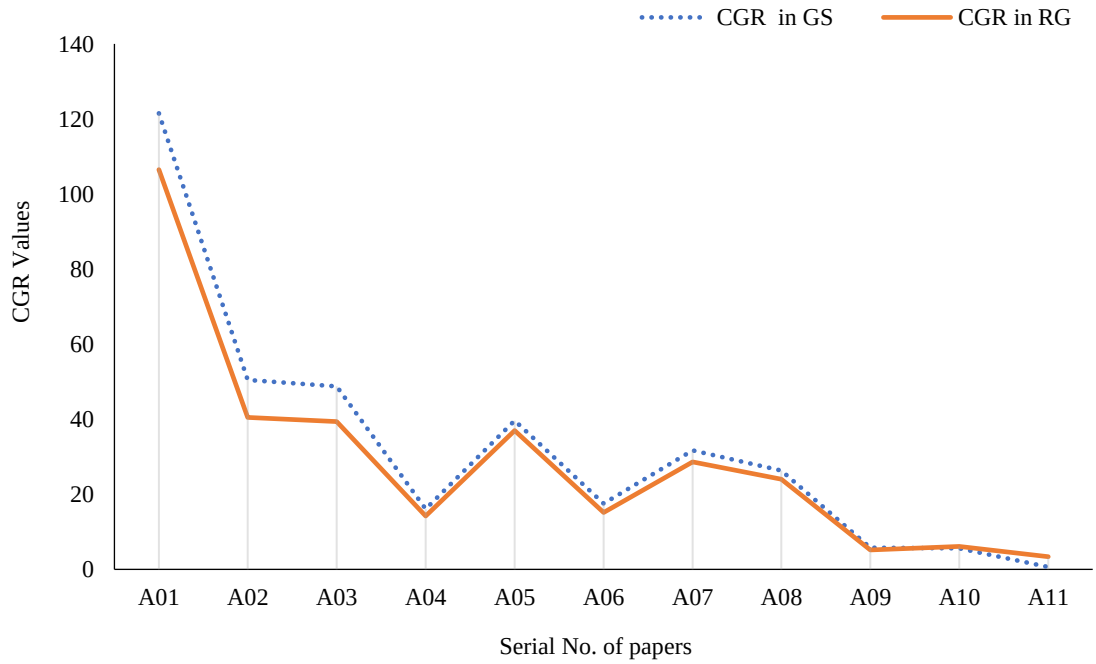

Figure 4. Curves of CGR.

CONCLUSION

Dr. Mukherjee ‘s research and findings will show innovative way for treatment in medical sciences. To protect epidemic cancer, one answer after another is being found in the pursuit of science and technological research in India. Prior to Dr. Mukherjee, recent past, Dr. Tony Dhillon, a British-born Medical Oncologist of Indian Origin has prepared a vaccine for the treatment of colon Cancer. Apart, Dr. Vishal Rao, a Bengaluru based Indian throat cancer expert also designed a world’s cheapest speaking device for the cancer patients who lost vocal box after surgery. Hope all these works will be helpful for the treatment of cancers over the world. It is a matter of pride that both the scientists are Indian. It may conclude in the words of Claude Bernard, *“The joy of discovery is certainly the liveliest that the mind of man can ever feel”* that Dr. Mukherjee believes the truth.

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