Mapping the Nephrology Research Output During 2020 – 2024: A Scientometrics Study

K. Kanipriyan

Master of Library and Information Science, Periyar University, Salem, Tamil Nadu, India

kanipriyan112003@gmail.com

ABSTRACT

The present paper explores the Scientometric analysis of 'Nephrology' from 2020 to 2024. The information was gathered from the Web of Science database and analyzed using the Bibexcel Software. The study examines the Year Wise Publication Research Output, Author Wise, Co-Author Wise, Degree of Collaboration, Relative Growth Rate and Doubling Time, Language Wise, Country Wise, etc. The study revealed that most of the publication was found in 2021 (22.61%). The Degree of Collaboration was high in 2021 (0.95). The study analyzed the Relative Growth Rate (RGR), which has increased from 2021 (0.68) to 2024 (1.83) in five years. The maximum number of publications was found in the USA (1948), and most records are articles (5,488). Regarding the language (5089) Publication was found in English Language. The Jha V (78) publication found the maximum number of authors. 5,245 records were retrieved and analyzed by Bibexcel and VOSviewer Software.

KEYWORDS: Nephrology, Acute Kidney Injury (AKI), Kidney Transplantation, Glomerular Filtration Rate, and Diagnosis.

1. INTRODUCTION

The term Nephrology was first used in the Year 1960, consistent with the French Word "Nephrologie" brought through Pr. Jean Hamburger in the Year 1953, from the Greek Word Nephros, Nephros manner that kidney. Nephrology means the observation of remedy, prognosis, and control of kidney sicknesses. It has an extensive range of conditions affecting the kidneys, including Acute Kidney Injury (AKI), Chronic Kidney Disease (CKD), Kidney Stones, Glomerular Diseases, Dialysis, Kidney Transplantation, and Nephrotic Syndrome. Nephrologists, the medical Professionals are educated to control the complex nature of Kidney function, which the important for regulating blood strain, maintaining fluid stability, and doing away with waste products from the body. Numerous renal illnesses are systemic conditions that aren't particular to the kidney and may call for specialized care. Nephrology entails addressing the systemic effects of kidney disease, along with Electrolyte Imbalances, Hypertension, and Headaches like Cardiovascular Disease.

2. REVIEW OF LITERATURE

Hussain, I., & Chetia, S. (2022)[1] Carried out a study on was to use scientometric analysis to quantify the number of contributions and highlight those made by nephrology researchers who published in the Web of Science database

between 2012 and 2021. Software like VOSviewer and Bibexcel were used to interpret the data, and Microsoft Excel was used to tabulate the results. The findings showed that 7539 papers were published from 2012 and 2021, with 2020 producing the most publications at 1166 (15.4%). Journals were the primary means of communication for researchers for a decade. Compared to single-authored publications (9.84%), the trends in multi-authored papers have significantly grown (90.16%). The partnership of the two authors generated the most publications (967, 12.8%), and the degrees of collaboration (0.90%) are noteworthy. Additionally, it mentioned that in 2021, the highest degree of collaboration was recorded at 0.94%. Researchers are quite picky when it comes to publishing their findings in specialized journals, as evidenced by their publication patterns. 2021 saw the production of the collaborative index (6.47%) and a rise in collaborative co-efficient papers (0.75%).

Velmurugan, D. C. (2021)[2] Analysed the research output of nephrology, the study has attempted to investigate the co-authorship network and bibliographic coupling with institutions, authors, and nations. A total of 2626 pieces of literature were found by the researcher using the Web of Science core collection citation database from Clarivate Analytics. There were 11,993 global citations, 84,129 cited references, 10,846 authors, 595 core journals, 3494 institutions, 6630 institutions with subdivisions, and 108 participating countries altogether. The present study utilized scientometric indicators and computer software, including Average Citation Per Paper (ACPP), Exponential Growth Rate (EGR), VOSviewer mapping software, HistCite software, Microsoft Excel, and Microsoft Word, to extract relevant findings on Nephrology research.

Natarajan, R. (2018)[3] Denoted that the study of the kidneys and related disorders in adults and children is known as nephrology. The productivity of nephrology research is the subject of this chapter. The data was taken from the Web of Science database because the study is based on a scientometric approach. The study's goals are to determine the pace of increase in research productivity, track the different kinds of nephrology documents, discover authorship patterns and language-wise classifications, and determine distributions by institution and geographic area. The data has been successfully analyzed using software programs like VOSviewer and HisCite. Furthermore, several scientometric techniques were used. In terms of contribution, the United States of America leads the globe in nephrology.

3. METHODOLOGY

The present study aims to analyze the research publication of the Nephrology. The required data from the Web of Science core collection was published by Clarivate Analytics. The basic search strategy has been used for collecting data about the publication Nephrology, Year: 2020 – 2024. The 5,245 publications have been taken up for the study period. The facts of Nephrology published articles such as Year Wise Distribution, Author Wise Pattern, Co-Authorship Pattern, Language Wise Distribution and Types of documents, etc., were recorded and analyzed by using the Bibexcel Software and VOSviewer Software.

3.1 OBJECTIVES

The major Objectives of the study is as follows:
- ➢ To find out the quantum of Scientific Productivity in Nephrology at the Global level during the Year 2020 – 2024.

- To examine the Geographical distribution. Example: Country Wise publication and Language Wise Publications on Nephrology research.
- To find out the nature of Authorship Pattern analysis and Co-Authorship Pattern analysis and Degree of Collaboration in Nephrology research.
- To identify the implications of Scientometrics analysis on Nephrology Publications and to monitor the progress and growth of Nephrology Publication in India.
- Ranking of the Zipf's Law of Words of Occurrence.

4. DATA ANALYSIS AND INTERPRETATIONS

This study has examined a total of 5,245 Publications in Nephrology Research Output for 5 Years from 2020 to 2024 indexed by the Web of Science Core Collection Database, at the Global level. The highest numbers of papers were published during the year 2021 with 1,186 records followed by the year 2020 with 1,164 records. Overall, 25,533 authors have contributed from 6,728 Institutions located in 142 Countries.

Table: 4.1 Nephrology Research Output during 2020-2024

S. No	Particular	Data
1.	Records	5,245
2.	Time Span	5 Years
3.	Contributed Author	25,533
4.	Document Types	14
5.	Contributing Country	142
6.	Language	8
7.	Institution	6,728

Table: 4.1 reveals a brief description of the Nephrology Research Output during the sample period from the Web of Science Core Collection Database. The total period is 5 years, and 5,245 records were downloaded. Overall the Nephrology Research Output was in 8 different languages and published through 14 different types of documents, for which 25,533 authors have contributed. The Contribution was from 142 Countries and Published by 6,728 Institutions.
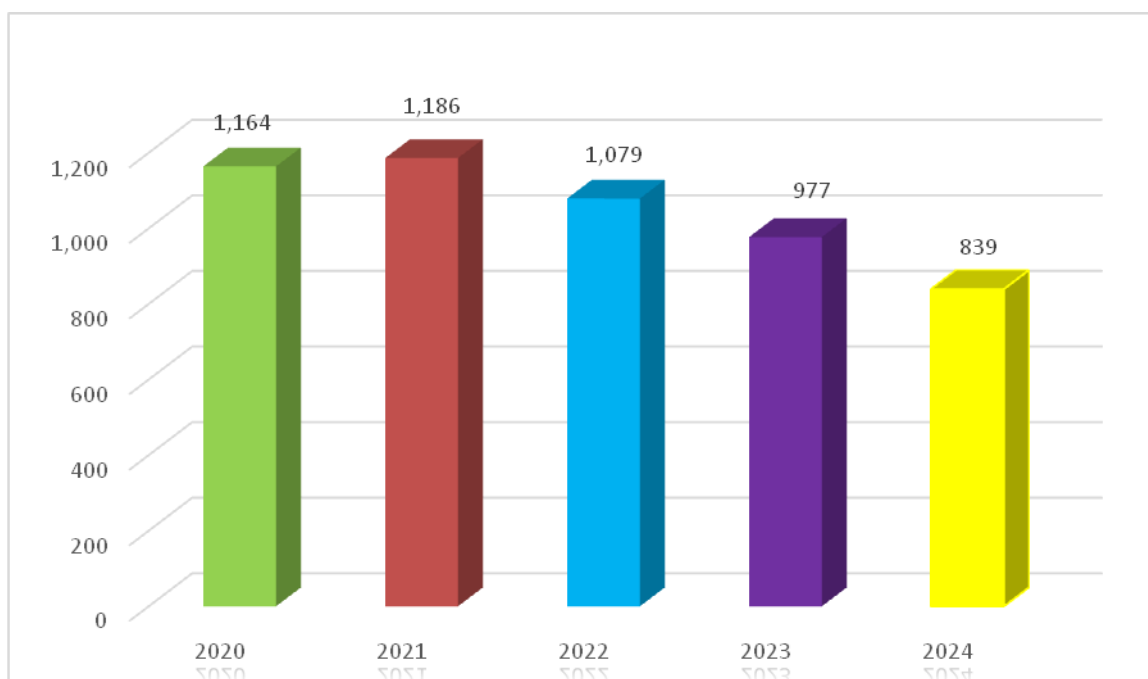
Table: 4.2 Year Wise Distribution of the publications

S.No	Publication Year	Records	Percent
1.	2020	1,164	22.19
2.	2021	1,186	22.61
3.	2022	1,079	20.58
4.	2023	977	18.62
5.	2024	839	15.99
	Total	**5,245**	**100%**

To analyze the Year Wise Publications of Research Output on Nephrology, the data presented in Table: 4.2 from Table 4.2 below, it be seen that during the period 2020-2024, a total of 5,245 Publications were published. The

highest number of Publications are 1,186 in 2021, followed by 1,164 papers in 2020, 1,079 papers in 2022, and 977 papers in 2023. The least number of publications was in the year 2024 with only 839 records of publication.

Fig:1 Year Wise Distribution of the Publication

Table: 4.3 Trend Value of Nephrology Research Output

S.No	Year	Record	X	X²	XY
1.	2020	1,164	-2	4	-2,328
2.	2021	1,186	-1	1	-1,186
3.	2022	1,079	0	0	0
4.	2023	977	1	1	977
5.	2024	839	2	4	1,678
Total		**5,245**	**0**	**10**	**-859**

Straight line equation Y c = a + b X since $\sum x = 0$ for SAP

$$a = \frac{\sum Y}{N},$$

Where,

$\sum y$ = Total Number of Paper

N = Number of Years

$$b = \frac{\sum XY}{\sum}$$

Where,

$\sum XY$ = Total Number of XY Tables

$\sum$ = Total of X² Tables

$$a = \frac{\sum Y}{N} = \frac{5,245}{5} = 1,049,$$

$$b = \frac{\sum XY}{\sum} = \frac{-859}{10} = -85.9$$

Estimated Literature in 2029 is when X = 2030-2020 = 10

$$= 1,049 + 85.9*10$$
$$= 1,049 + 859$$
$$= 1,908$$

Estimated Literature in 2035 is when X = 2035-2020 = 15

$$= 1,049+85.9*15$$
$$= 1,049+1,288.5$$
$$= 2,337.5$$

Table: 4.3 The calculated value of literature out of Nephrology for the year 2029 is 1,908 and the Output for the year 2035 is 2,337.5. With the application of the formula, the time series analysis calculated from the results for the years 2029 and 2035, it is found that the future of Nephrology research output will slightly increase in forthcoming years.

Table: 4.4 Doubling Time in the number of publications observed from 2020-2024

S.No	Year	Number of Record	Cumulative Total	$Log_e W_1$	$Log_e W_2$	RGR = W_2-W_1	Mean Relative Growth	DT = 0.693/R	Mean
1.	2020	1,164	-	7.06	-	-		-	
2.	2021	1,186	2,350	7.08	7.76	0.68		1.01	
3.	2022	1,079	3,429	6.98	8.14	1.16	1.034	0.59	0.488
4.	2023	977	4,406	6.89	8.39	1.50		0.46	
5.	2024	839	5,245	6.73	8.56	1.83		0.38	

Table: 4.4 that the Relative Growth Rate of Nephrology has consistently increased from 0.68 in 2021 to 1.83 in 2024. The mean Relative Growth Rate (RGR) has declined from 1.034 for the period 2020-2024. The Doubling time of research articles in Nephrology shows a decreasing trend of 1.01 years in 2021 to 0.38 years in 2024. The mean Doubling Time for research articles in Nephrology has decreased from 1.01 years for the period 2021 to 0.38 years for 2024 with an average Doubling Time of 0.488 years for the period.

Where,

Mean Relative Growth = Mean Relative Growth Rate over the Specific Period interval

W1 = log W1 (Natural log of the initial number of the Publication)

W2 = log W2 (Natural log of the initial number of the Publication)

W2-W1 = Unit Difference between the initial and final period

RGR = Relative Growth Rate per unit Publication per unit of time in Year.

Table: 4.5 Exponential Growth Rate in Number of Publications Observed from 2020 to 2024

S.No	Year	Record	Exponential Growth Rate
1.	2020	1,164	-
2.	2021	1,186	1.02
3.	2022	1,079	0.90
4.	2023	977	0.90
5.	2024	839	0.86
Total		5,245	

Table: 4.5 reveals the Exponential Growth Rate of Nephrology during the study period (2020 to 2024). An Exponential Growth Rate in the Number of Publications on Nephrology was observed during 5 years. The highest Growth Rate of 1.02 was found during the year 2021 with 1,186 Publications. The average Exponential Growth Rate for the period of study is 0.74 and this is found in the above table.

Table: 4.6 Document wise Distribution of the Publication

S.No	Document Type	Record	Percentage
1.	Article	3383	64.5
2.	Review Article	795	15.16
3.	Editorial Material	609	11.62
4.	Meeting Abstract	284	5.41
5.	Early Access	137	2.612
6	Letter	131	2.49
7.	Meeting	18	0.343
8.	Proceeding Paper	17	0.324
9.	Correction	16	0.305
10.	Biographical Item	5	0.095
11.	Retracted Publication	5	0.095
12.	Book Review	2	0.038
13.	News Item	2	0.038
14.	Data Paper	1	0.019

Table: 4.6 shows the Document Wise Distribution of the Publications on Nephrology for the period 2020-2024. The article takes up 64.5% (3383 records) of the Overall Publications on Nephrology followed by Review Articles with 15.16% (795 records), the Editorial Material with 11.62% (609 records), Meeting Abstract with 5.41% (284 records), Early Access with 2.612% (137 records) and the document types like Proceeding Paper, Biographical Items, Retracted Publications, Book Review, News Items, Data Papers has only one record of Publication for each type of Document.

Fig: 2 Document Wise Distribution of the Publication
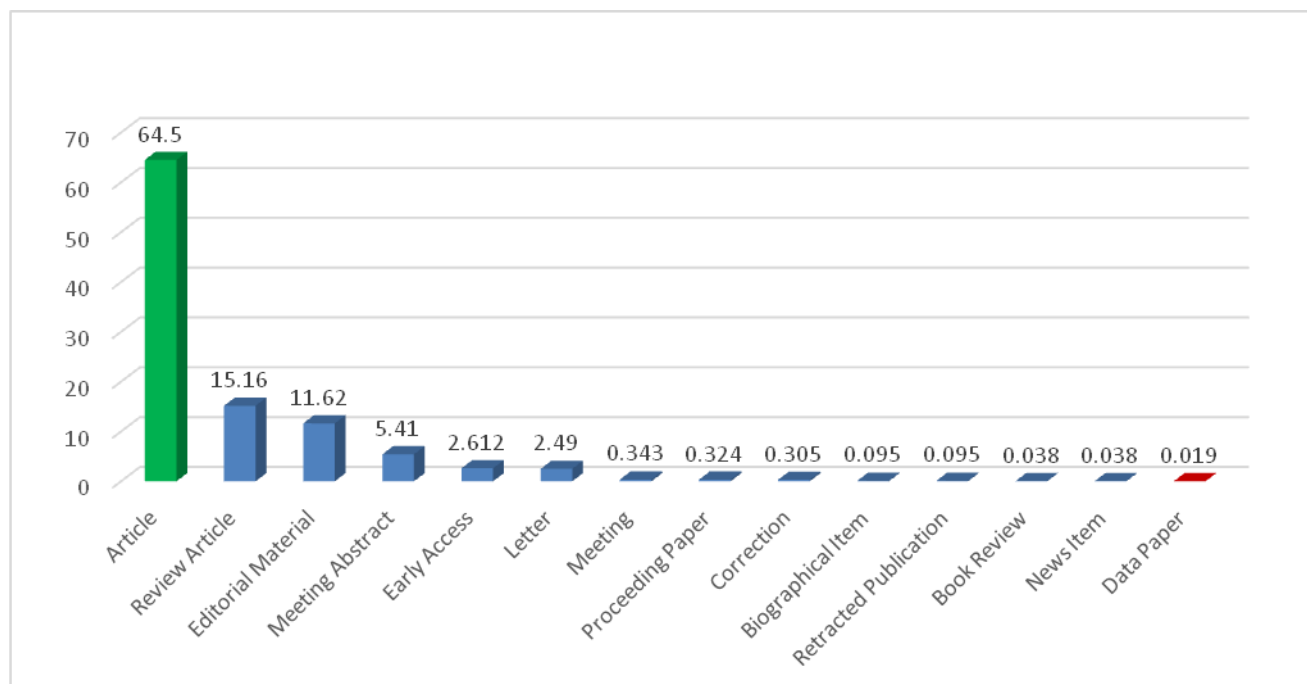
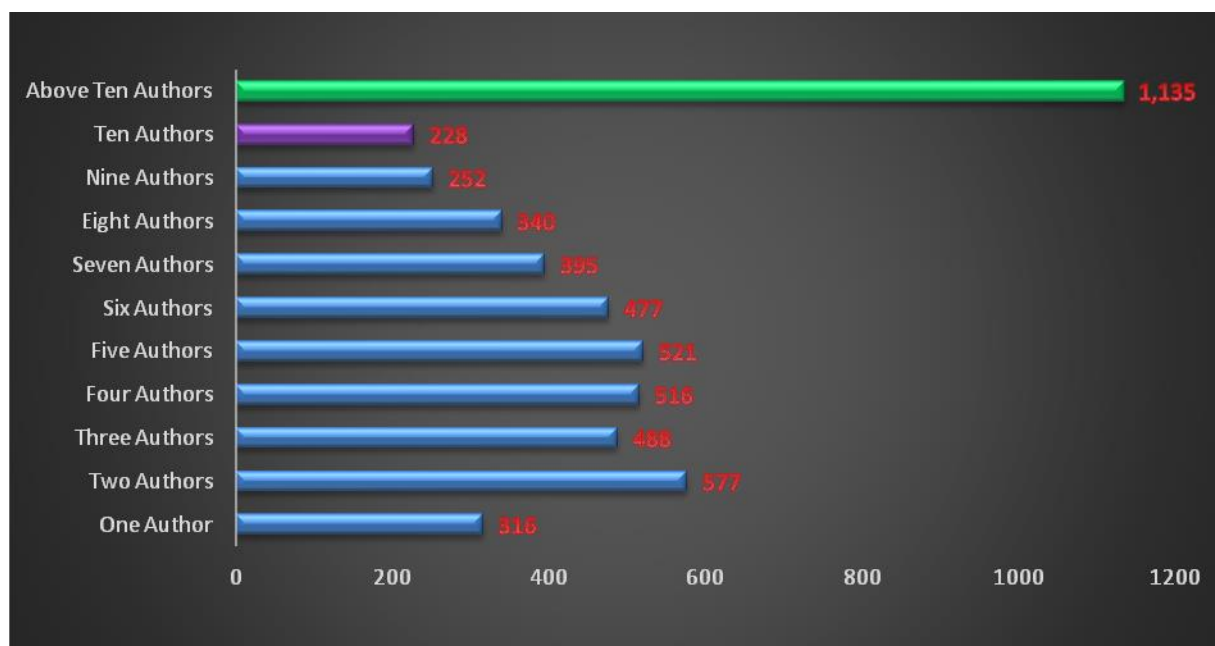**Table: 4.7** Author-Wise Distributions of the Publications

Authorship Pattern	2020	2021	2022	2023	2024	Total
One Author	94	65	54	64	39	316
Two Authors	148	141	112	93	83	577
Three Authors	107	100	119	92	70	488
Four Authors	109	109	103	102	93	516
Five Authors	106	113	106	110	86	521
Six Authors	95	103	98	99	82	477
Seven Authors	89	93	71	67	75	395
Eight Authors	76	76	77	64	47	340
Nine Authors	54	65	49	46	38	252
Ten Authors	52	47	52	43	34	228
Above Ten Authors	234	274	238	197	192	1,135
Total	**1,164**	**1,186**	**1,079**	**977**	**839**	**5,245**

In Nephrology the Authorship Pattern-Year Wise has been analyzed is shown in Table: 4.7. In table reveals that the Year Wise Authorship pattern of article publications in the research area of the total 5 years, the above ten authors scored in first place have contributed 1,135. The Second and Third place scores for Two authors and Five authors in each 577 and 521 Counts. The Four and Three authors scored fourth and fifth place in each 516 and 488 Counts.

Table: 4.8 Publication Wise Authorship Pattern

Authorship Pattern	Publication	Percentage
One Author	316	6.02
Two Authors	577	11.00
Three Authors	488	9.30
Four Authors	516	9.84
Five Authors	521	9.93
Six Authors	477	9.09
Seven Authors	395	7.53
Eight Authors	340	6.49
Nine Authors	252	4.80
Ten Authors	228	4.34
Above Ten Authors	1,135	21.64
Total	**5,245**	**100**

Table: 4.8 mentions the authorship Pattern of contributions. Out of 5,245 articles, a Single author has contributed 316 (6.02)%, 11.00% of the article were published with Two authors 577, 9.30% of articles were published by Three authors 488, 9.84% of the contributions were published by Four authors 516, 9.93% of the contributions were published by Five authors 521, 9.09% of the contributions were published by Six authors 477, 7.53% of articles were produced by Seven authors 395, 6.49% of articles were from Eight authors 340, 4.80% of articles were contributed by Nine authors 252, 4.35% of articles were published by10 authors 228 and 21.64% of articles were published from more than Ten authors 1,135 respectively.

Fig: 3 Publication Wise Authorship Pattern

Table: 4.9 Co Authorship Index distribution of the publication

Authorship Pattern	2020		2021		2022		2023		2024		Total
	No	CAI	No	CAI	No	CAI	No	CAI	No	CAI	
One Author	94	1.34	65	0.91	54	0.83	64	1.09	39	0.77	316
Two Authors	148	1.15	141	1.08	112	0.94	93	0.87	83	0.89	577
Three Authors	107	0.99	100	0.91	119	1.19	92	1.01	70	0.89	488
Four Authors	109	0.95	109	0.93	103	0.97	102	1.07	93	1.13	516
Five Authors	106	0.92	113	0.96	106	0.99	110	1.13	86	1.03	521
Six Authors	95	0.89	103	0.95	98	0.99	99	1.12	82	1.08	477
Seven Authors	89	1.02	93	1.04	71	0.88	67	0.91	75	1.19	395
Eight Authors	76	1.01	76	0.99	77	1.10	64	1.01	47	0.87	340
Nine Authors	54	0.97	65	1.14	49	0.94	46	0.98	38	0.94	252
Ten Authors	52	1.03	47	0.92	52	1.11	43	1.01	34	0.93	228
Above Ten Authors	234	0.93	274	1.07	238	1.02	197	0.93	192	1.06	1,135
Total	**1,164**		**1,186**		**1,079**		**977**		**839**		**5,245**

It is observed from Table: 4.9 that the value of Co-Authorship Index Distribution of Publication for three authored papers during 2020-2024 was the highest (1.19), similarly, for the above ten authored papers, during 2020-2024, the Co-Authorship Pattern was (1.07). The Co-Authorship Pattern for four authored papers was the lowest (0.93) period from 2020 to 2024.

The Co-Authorship Index was suggested by Garg and Padhi has been used. For finding CAI the full data set was divided into four sections.

$$CAI = \frac{N_{ij}/N_{io}}{N_{oj}/N_{oo}}$$

$$CAI = \frac{94/316}{1,164/5,245}$$

$$CAI = \frac{0.297}{0.221}$$

$$CAI = 1.34.$$

While CAI >100 indicates higher than average Co-Authorship effort and CAI<100 indicates lower than average Co-Authorship pattern in a given block for a specific type of Authorship, CAI = 100 indicates that Co-Authorship in a given block for a specific type of Authorship corresponds to the world average.

Table: 4.10 Research Output of Single vs. Multiple Authors

Year	Single Author		Multiple Author		Total
	No of Output	Percentage	No of Output	Percentage	
2020	94	29.75	1,070	21.71	1,164
2021	65	20.57	1,121	22.75	1,186
2022	54	17.09	1,025	20.79	1,079
2023	64	20.25	913	18.56	977
2024	39	12.35	800	16.23	839
Total	316	100	4,929	100	5,245

Table: 4.10 show the Research Output of Single Versus Multiple Authors. The highest number of publications by a Single Author is 94 records in the year 2020, followed by 65 records in the year 2021, 64 records in the year 2024, 54 records in the year 2022, and 36 records in the year 2024. It is also known that as many as 1,121 records were published by Multiple Authors in the year 2021, followed by 1,070 records in the year 2020, 1,025 records in the year 2022, 913 records in the year 2023, and 800 records in the year 2024.

Table: 4.11 Year-Wise Distribution of Degree of Collaboration

Year	Single Author (NS)	Multiple Author (NM)	Total (NS+NM)	Degree of Collaboration (DC)
2020	94	1,079	1,164	0.92
2021	65	1,121	1,186	0.95
2022	54	1,025	1,079	0.95
2023	64	913	977	0.93
2024	39	800	839	0.95

To determine the Degree of Collaboration Single Versus Multiple Authors in quantitative terms, the formula is suggested by K.Subramaniyam (1983),

The Formula was suggested by

$$DC = \frac{NM}{NM+NS}$$

Where,

DC = Degree of Collaboration

NM = Number of Multiple Authors

NS = Number of Single Authors

Examples,

$$DC = \frac{1,070}{1,164}$$

DC = 0.92

Table: 4.11 In this present Study, the most average value of DC = 0.95. The Degree of Collaboration in the field of Nephrology Literature is 0.95, which indicates the dominance of Single Versus Multiple Author Contribution.

**Table: 4.12** Language Wise Distributions of the publications

S.No	Language	Record	% of 5,245
1.	English	5089	97.02
2.	Spanish	63	1.20
3.	French	42	0.80
4.	German	42	0.80
5.	Russian	5	0.09
6.	Portuguese	2	0.04
7.	Hungarian	1	0.02
8.	Turkish	1	0.02

Table: 4.12 shows the Language Wise Distribution of the Publications on Nephrology Research Productivity. It is noted that the total research productivity on Nephrology is contributed in Eight Languages. English has the highest number of Publication with 5089 records (97.02%), followed by Spanish with 63 records (1.20%), French with 42 records (0.80%), German with 42 records (0.80%), Russian with 5 records (0.09%), Portuguese with 2 records (0.04%), Hungarian with 1 records (0.02%) and Turkish with 1 records (0.02%) research publication respectively.

Table: 4.13 Country Wise Distribution of the publications

S.No	Countries/ Regions	Record	Percentage
1.	USA	1948	35.49
2.	England	518	9.43
3.	Peoples R China	460	8.38
4.	Italy	445	8.10
5.	Canada	424	7.72
6.	France	411	7.48
7.	Australia	404	7.36
8.	Germany	337	6.14
9.	Spain	289	5.26
10.	Netherlands	252	4.59
	Total	5,488	100

Table: 4.13 indicates the Country Wise Distribution of Nephrology Research Output covered for the study period 2020-2024. USA tops with 1948 (35.49%) Publications followed by England with 518 (9.43%), the Peoples R China with 460 (0.38%), Italy with 445 (8.10%), Canada with 424 (7.72%), France with 411 (7.48%), Australia with 404 (7.37%), Germany with 337 (6.14), Spain with 289 (5.26%) and Netherlands with 252 (4.59%) Research Publication respectively.
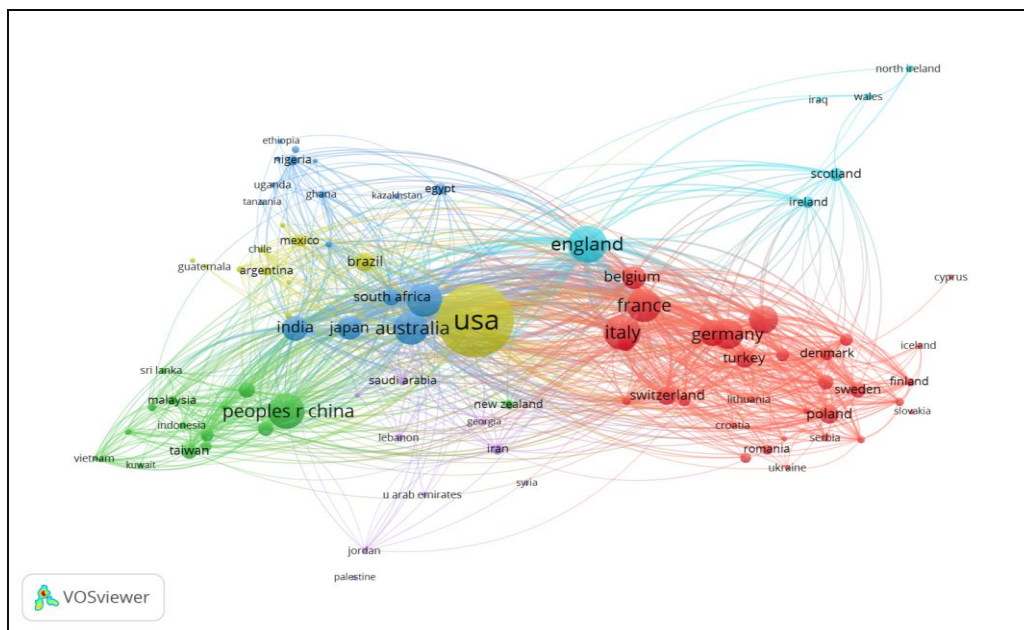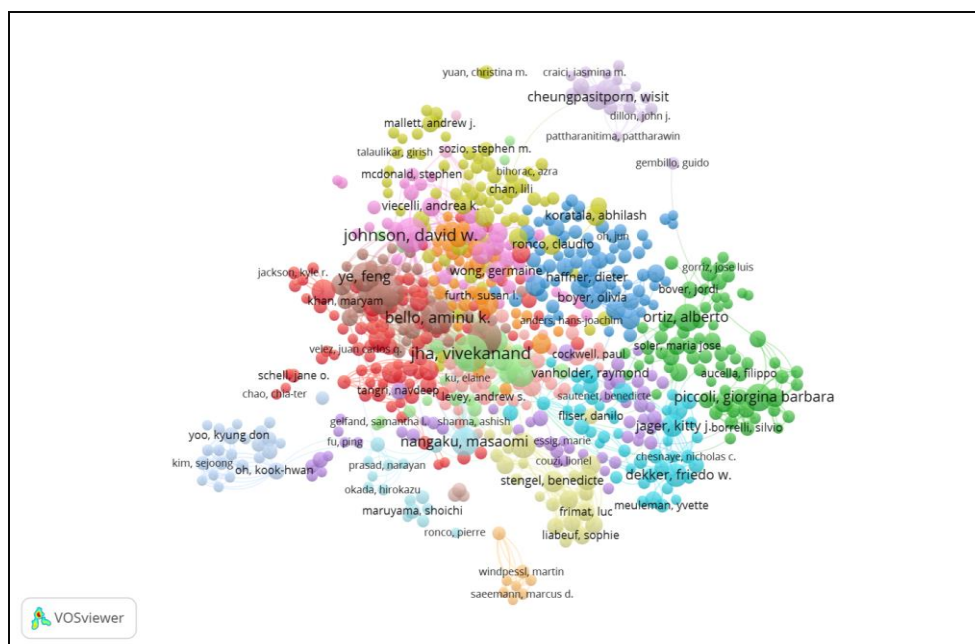
Fig: 4 Visualization Map of Country Wise Distribution

Table: 4.14 Most Prolific Authors (Top 15 Only)

S.No	Author	Records
1.	Jha V	78
2.	Johnson DW	70
3.	Levin A	68
4.	Bello AK	57
5.	Okpechi IG	49
6.	Ye F	48
7.	Caskey FJ	46
8.	Tonelli M	45
9.	Nangaku M	39
10.	Piccoli GB	36
11.	Ortiz A	32
12.	Craig JC	29
13.	Damster S	29
14.	Jager KJ	29
15.	Segev DL	28

Table: 4.14 indicates the most prolific author based on publication. The author Jha V occupies the first rank with 78 Publications. Followed by Johnson D W with 70 Publications, Levin A with 68 Publications, and Bello A K with 57 Publications. The remaining Authors have contributed less than 57 Publications.

Fig: 5 Visualization Map of Co-Authorship Pattern Wise Distribution

Table: 4.15 Words Wise Distribution of the Publications

S.No	Words	Records	Percent
1.	OUTCOMES	470	8.52
2.	RISK	423	7.67
3.	DISEASE	414	7.51
4.	MORTALITY	351	6.36
5.	CHRONIC KIDNEY DISEASE	337	6.11
6.	MANAGEMENT	331	5.99
7.	DIALYSIS	252	4.57
8.	CHILDREN	252	4.57
9.	CARE	231	4.19
10.	HAEMODIALYSIS	225	4.08
11.	ASSOCIATION	206	3.73
12.	PREVALENCE	192	3.48
13.	CKD	173	3.14
14.	STAGE RENAL DISEASE	165	2.99
15.	QUALITY OF LIFE	161	2.92
16.	PROGRESSION	160	2.89
17.	IMPACT	151	2.74
18.	RISK FACTOR	148	2.68
19.	HEALTH	147	2.67

20.	GLOMERULAR FILTRATION RATE	141	2.56
21.	NEPHROLOGY	130	2.36
22.	SURVIVAL	126	2.29
23.	KIDNEY DISEASE	113	2.05
24.	DIAGNOSIS	112	2.05
25.	ACUTE KIDNEY INJURY	108	1.96
	Total	**5,519**	**100**

Table: 4.15 A total of 5,519 words are in the Publications that are considered for the study of Nephrology. Among the words "Outcomes" occurs in 470 records of the Publications taking up the first position in frequency, followed by the word "Risk" which occurs in 423 records occupying the second position in frequency, the word "Disease" which occurs in 414 records occupying the third position in frequency, the word "Mortality" which occurs in 351 records with the fourth position in frequency.

4.1.1 Zipf's Law of Word Occurrence

George Kingsley Zipf developed his law in 1935 to forecast how frequently words would appear in a book. The law states that the rank of a word on a list multiplied by its frequency will equal a constant if the words that appear in a fairly long text are listed in decreasing order of frequency.

$$r \times f = C \qquad \text{(where C is Constant)}$$

Taking log on both sides, $\log f + \log r = \log C$

To apply this law, the terms were gathered from the article titles and arranged in decreasing order of word occurrence frequency.

Table: 4.16 Ranking of Word Occurrence

S.No	Words	Frequency	Rank	Log F	Log R	Log C
1.	OUTCOMES	470	1	2.68	0	2.68
2.	RISK	423	2	2.63	0.31	2.94
3.	DISEASE	414	3	2.62	0.48	3.10
4.	MORTALITY	351	4	2.55	0.60	3.15
5.	CHRONIC KIDNEY DISEASE	337	5	2.53	0.70	3.23
6.	MANAGEMENT	331	6	2.52	0.78	3.30
7.	DIALYSIS	252	7	2.40	0.85	3.25
8.	CHILDREN	252	7	2.40	0.85	3.25
9.	CARE	231	8	2.37	0.91	3.28
10.	HAEMODIALYSIS	225	9	2.35	0.96	3.31
11.	ASSOCIATION	206	10	2.31	1.00	3.31

12.	PREVALENCE	192	11	2.28	1.04	3.32
13.	CKD	173	12	2.24	1.08	3.32
14.	STAGE RENAL DISEASE	165	13	2.22	1.11	3.33
15.	QUALITY OF LIFE	161	14	2.21	1.15	3.36
16.	PROGRESSION	160	15	2.20	1.18	3.38
17.	IMPACT	151	16	2.18	1.20	3.38
18.	RISK FACTOR	148	17	2.17	1.23	3.40
19.	HEALTH	147	18	2.16	1.26	3.42
20.	GLOMERULAR FILTRATION RATE	141	19	2.15	1.28	3.43
21.	NEPHROLOGY	130	20	2.11	1.30	3.41
22.	SURVIVAL	126	21	2.10	1.32	3.42
23.	KIDNEY DISEASE	113	22	2.05	1.34	3.39
24.	DIAGNOSIS	112	23	2.05	1.36	3.41
25.	ACUTE KIDNEY INJURY	108	24	2.03	1.38	3.41

Table 4.16 only includes terms that have a frequency of up to 5,519. After this law was applied, the log of the frequency of terms that occurred was discovered. The findings are nearly identical for each term when added to the log of their rank. Below is a log showing the frequency of the five most powerful terms that were used in titles.

1. Word: OUTCOMES

Frequency: 470

Rank: 1

log of Frequency + log of Rank

log 470 + log 1

$$= 2.68 + 0$$

$$= 2.68$$

2. Word: RISK

Frequency: 423

Rank: 2

log of Frequency + log of Rank

log 423 + log 2

$$= 2.63 + 0.31$$

$$= 2.94$$

Thus, it is proved that Zipf's law is valid even today.

FINDINGS

- ➢ During the period (2020-2024) 5,245 articles were published which are indexed on the Web of Science. Overall, 25,533 authors have contributed to the Publication.

- ➢ A total of 5,245 Publications were Published at the global level. Among them, the highest Publication of 1,186 records was found in the year 2021, followed by 1,164 records in the year 2020, 1,079 records in the year 2022, 977 records in the year 2023, and 839 records of publication in the year 2024.

- ➢ The Doubling time in the number of publications was observed for the period 2020-2024. It denotes that the Doubling time is 0.48 for the research Output on Nephrology during the study period.

- ➢ The highest number of articles was contributed by multiple authors during the Study Period. The Degree of Collaboration among the authors is 0.95.

- ➢ Jha V Published the highest number of articles for the study period with 78 records, followed by the author Johnson D W with 70 records, Levin A with 68 records, Bello A K with 57 records, Okpechi I G with 49 records, Ye F with 48 records, and the authors Tonelli M with 45 records.

- ➢ The Document-Wise Distribution of the Publication

- ➢ The article takes up 64.5% (3383 records) of the Overall Publications on Nephrology followed by Review Article with 15.16% (795 records), the Editorial Material with 11.62% (609 records), Meeting Abstract with 5.41% (284 records), Early Access with 2.612% (137 records) and the document types like Proceeding Paper, Biographical Item, Retracted Publication, Book Review, News Item, Data Paper has only one record of Publication for each type of Document.

- ➢ The Country-Wise Distribution of the Publication

- ➢ USA tops with 1948 (35.49%) Publications followed by England with 518 (9.43%), the Peoples R China with 460 (0.38%), Italy with 445 (8.10%), Canada with 424 (7.72%), France with 411 (7.48%), Australia with 404 (7.37%), Germany with 337 (6.14), Spain with 289 (5.26%) and Netherlands with 252 (4.59%) Research Publication respectively.

- ➢ Language Wise Distribution of the Publication

- ➢ English has the highest number of Publication with 5089 records (97.02%), followed by Spanish with 63 records (1.20%), French with 42 records (0.80%), German with 42 records (0.80%), Russian with 5 records (0.09%), Portuguese with 2 records (0.04%), Hungarian with 1 records (0.02%) and Turkish with 1 records (0.02%) research publication respectively.

CONCLUSION

This study has been highlighted for bibliometric analysis to measure various reviews such as Year Wise distribution of the Publication, Trend Value of Nephrology Research Output, and Country Wise Distribution which can be used for observations has analysis of the article. The most commonly used keyword in which publications on Nephrology during this period were "Outcomes", "Risk", "Disease", "Mortality" and "Chronic Kidney Disease". The bibliometric analysis indicates that nephrology is still a significant field of study overall.

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