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Authorship pattern and growth of scholar contributions for PHFI: A Bibliometric Analysis

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Abstract:

The purpose of this research study is to identify the authorship patterns and degree of collaboration and growth of Public health foundation of India in Public Health research related with a total of 1941 records of publications authored by 12523 authors during the period 2011– 2020 derived from SCOPUS database. Validation of determine chronological growth, authorship pattern, core sources for research communication, and encouragement of productivity by citations received, various indicators, and indices and bibliometric laws i.e. Authorship pattern, RGR, Dt, CAI, DC, Bradford's Law of distributions, and more have been applied appropriately. Additionally, used deferent software of like 'MS-Excel' and 'bibliometrix' & 'biblioshiny' of R-Package software and VOSviwer software applied for detailed and reliable analysis. Evaluated data figured out Average yearly contribution 194 research however accounted Mean RGR(P) '0.34'; Mean Dt (P) '2.74 reveals inconsistent growth of research output. Average of 'Collaboration index' (CI) '5.60' A total Average yearly citations were received for research occurrence in the span with an average of 10.46, Prabhakaran. D., was published highest papers 260 and got received highest citation also 4958 and total link strength 1457. For PHFI and individual research scholars. PHFI has to make more effort to promote research and create quality culture, attention of developing better policies to enhance and enrich the research performance of individuals.

Keywords; *PHFI, IIPH, Bibliometric, Scientometrics Citation Analysis, Research Productivity*

Introduction

Lately, COVID-19 Pandemic has become an important concern after public health research. Research on the subject has increased to extent in the interest of public health. An interesting approach to have an overview of the research developed on health related is to conduct a bibliometric review which helps to identify the PHFI and IIPH research contribution for the health system of our countries that have worked extensively on this topic, by studying the most relevant authors in the field, and their contributions. Bibliometric Analysis also known as scientometrics, is based on the concept that scientific literature mirrors scientific activity because publishing papers is an important goal for the scientific community, (Lundberg, 2006) bibliometric studied show of trends in ADINET seminar paper presented most of papers are single authors (Chaudhari, Bhatt, & Mandalia, 2020) Public Health Foundation of India (PHFI) was established in the year 2006 and under the MoU with Indian institute of public health (IIPH(University)-Gandhinagar, IIPH-Delhi, IIPH-Hyderabad, IIPH-Bhubaneswar, IIPH-Shillong all IIPH and PHFI affiliation name under PHFI in Soups Database, PHFI and IIPH offers Master Degree Course, Master of Public health, and Master of Hospital Administration. Ph.D. Program and other training research activity. (PHFI, 2021)

Review of Literature

Bibliometric methods are statistical analysis and quantitative tools that have been used in information research and library science practice over a long period (Daim, Rueda, Martin, & Gerdsri, 2006) the university level bibliographic study, usually researcher tried to understand the growth rate publications, the pattern of authorship, core area sources in which the publications have been published and lastly the productivity of the publications. (Patel, Trivedi, Bhatt, & Shanti, Web visibility and research productivity of NIRF ranked universities in India: A Webometric study, 2021). Investigation on "Collaborative coefficient: A solitary proportion of the level of joint effort in research" it is approved that the mean number of researcher of each paper of the degree of the different created paper is insufficient as an amount as an extent of the level of coordinated effort in a request. An action which joins a bit of the benefits of the two measures is proposed and decided. This action, called the collective coefficient, is derived for four commonly used likelihood movements. (Ajiferuke, Burell, & Tague, 1988) By using statistical and quantitative tools, bibliometric analysis can show information of a assured field to researchers,

including patterns of countries, universities, journals, authors, and subject keywords related to specific publication types (Liang, et al., 2017)

Objective of Study

To account chronological growth of PHFI and IIPH research productivity

- To identify authorship pattern and distribution of the publication,
- To analyze Collaboration index of the authors, Co-authorship index,
- To recognize the core sources for research communication
- To identify the productivity by citations received
- To find out the Relative Growth Rate and Double Time of publications

Research Methodology

The search considered only "Public health foundation of Indian" keywords, using in affiliation organization name search in Scopus. The search started in 2006 and ended on 2021 and considered a timespan for the analysis that ranged from 2011 to 2020. Keywords combination returned 1941 documents, for data analysis using Software packages of 'RStudio' cloud i.e. 'bibliometrix' & 'biblioshiny' developed by Professor Massimo Aria in 2017 (R Studio , 2021) and the 'Microsoft-Excel' has been using for the data analysis and graphic design,

Limitations of the Study

The Study criteria and the method used in the present study may have some limitations:

- The search focused on only Scopus listed journals and others peer-reviewed documents as indexing. Only one database was used, which may result in the loss of some information.
- Only Scopus database is used, which may result in the loss of some information. the use of a single database avoids removing false duplicates when merging the selected documents from more than one database, as well as inconsistent information such as total citations of a document which may differ, albeit slightly, among different databases.

Analysis and Interpretation

Relative Growth Rate and Double Time of Publication

Table 1: Relative Growth Rate and Double Time of Publications

Year	Total Publications & (% age)	Cumulative Sum	W1	W2	RGR	Dt
2011	129	129	0	4.86	0	0
2012	135	264	4.86	5.58	1.05	0.66
2013	186	450	5.58	6.11	0.70	0.99
2014	193	643	6.11	6.47	0.43	1.61
2015	210	853	6.47	6.75	0.33	2.10
2016	284	1137	6.75	7.04	0.33	2.10
2017	213	1350	7.04	7.21	0.19	3.65
2018	203	1553	7.21	7.35	0.15	4.62
2019	200	1753	7.35	7.47	0.13	5.33
2020	188	1941	7.47	7.57	0.11	6.30
Total	**1941**				**0.34**	**2.74**

RGR: Relative Growth Rate; Dt: Doubling Time;

Table 1 illustrates that the Relative Growth Rate and Doubling Time of publication during the period of study of Public health foundation of India (PHFI) and including All IIPH . “The growth rate of publication has been calculated on the basis of Relative Growth Rate (RGR) and Doubling Time (Dt) model, which is developed by. (Mahapatra, 1994) The extreme 1.05 RGR was recorded in the year 2013, followed by 0.70 in the year 2012. And the maximum Dt. Recorded in the year 2020 i.e. 6.30 followed by in the year 2019 with second 5.33 and 2018 with 4.62 Third one. The relative growth rate and doubling time is calculated using the following formula:

Where,

“RGR = Growth Rate over the particular period of the interval,

$W1 = \text{Log}_e$ (natural log of the initial number of influences)

$W2 = \text{Log}_e$ (natural log of the final number of influences)

T1 = the unit of initial time

T2 = the unit of final time”

R= Growth rate

Table 2: Collaboration index of the Authors

Year	Single Author RP	Two Author RP	Three Author RP	Four Author RP	Five Author RP	Six Author RP	Seven Author RP	Mega Author RP	Total Publication	Collaboration Index
2011	13	19	17	12	12	12	2	42	**129**	4.90
2012	14	24	15	14	11	14	9	34	**135**	4.72
2013	9	21	36	18	18	16	11	57	**186**	5.11
2014	15	15	27	33	21	9	16	57	**193**	5.10
2015	16	17	23	30	21	22	14	67	**210**	5.29
2016	9	18	41	23	31	33	20	109	**284**	5.72
2017	12	14	15	30	17	17	13	95	**213**	5.84
2018	5	11	14	21	18	28	9	97	**203**	6.16
2019	5	14	18	10	17	16	9	111	**200**	6.30
2020	5	10	20	16	13	9	15	100	**188**	6.24
Total	**103**	**163**	**226**	**207**	**179**	**176**	**118**	**769**	**1941**	5.60

Table 2 illustrate that the PHFI Authors collaboration index of the authors during the period of 2011 to 2020 of study. This is calculated as a mean number of authors each paper. It is not certainly interpretable as a degree. It has no upper limit and cannot be shown as percentage. It gives a non-zero weight to single-authored publications. Which include no collaboration. The maximum 6.30 collaboration index was recorded in the years. 2019. Followed by 2 collaboration index was recorded in the years 2020 CI was 6.24 recorded. (It may be impact of COVID-19 otherwise 2012 after every years CI was increased)The average collaboration index was 5.60.

The Collaboration index counted by the following formula suggested by the (Lawani, 1980)

$$CI = \frac{\sum_{1}^{A} = 1jfj}{\mathrm{N}}$$

Where

“J” = the number authors in an article i.e. 1, 2, 3…..

Fj= the number of j authored articles

N= the total number of articles published, and

A = the total number of authors per articles'

Hence, table 2 is calculated by the using above formula thus;

$$CI = \frac{\sum_1^A = 1jfj}{N}$$

$$CI = \frac{(1 \times 13) + (2 \times 19) + (3 \times 17) + (4 \times 12) + (5 \times 13) + (6 \times 2) + (7 \times 2) + (8 \times 42)}{129}$$

$$= \frac{(13) + (38) + (51) + (48) + (65) + (12) + (14) + (336)}{129}$$

$$= \frac{632}{129}$$

Similarly, the value of Collaboration Index is calculated for all the corresponding years,

Table 3: Co-authorship index (CAI)

Year	Single Author RP	CAI 1 Authorship	Two Author RP	CAI 2 Authorship	Three Author RP	CAI 3 Authorship	Four Author RP	CAI 4 Authorship	Five Author RP	CAI 5 Authorship	Six Author RP	CAI 6 Authorship	Seven Author	CAI 7 Authorship	Mega Author	CAI Mega Authorship	TP
2011	13	189.91	19	175.39	17	113.18	12	87.23	12	100.87	12	102.59	2	25.50	42	82.18	**129**
2012	14	195.43	24	211.70	15	95.43	14	97.24	11	88.36	14	114.37	9	109.66	34	63.57	**135**
2013	9	91.18	21	134.44	36	166.23	18	90.74	18	104.94	16	94.87	11	97.28	57	77.35	**186**
2014	15	146.46	15	92.55	27	120.15	33	160.33	21	117.99	9	51.43	16	136.37	57	74.54	**193**
2015	16	143.58	17	96.40	23	94.06	30	133.95	21	108.44	22	115.54	14	109.66	67	80.53	**210**
2016	9	59.72	18	75.47	41	123.99	23	75.94	31	118.36	33	128.15	20	115.84	109	96.87	**284**
2017	12	106.17	14	78.27	15	60.48	30	132.07	17	86.54	17	88.02	13	100.39	95	112.58	**213**
2018	5	46.42	11	64.53	14	59.23	21	97.00	18	96.15	28	152.12	9	72.93	97	120.61	**203**
2019	5	47.11	14	83.36	18	77.30	10	46.88	17	92.17	16	88.23	9	74.02	111	140.09	**200**
2020	5	50.12	10	63.34	20	91.37	16	79.80	13	74.98	9	52.80	15	131.24	100	134.26	**188**
Total	**103**	**100.00**	**163**	**100.00**	**226**	**100.00**	**207**	**100.00**	**179**	**100.00**	**176**	**100.00**	**118**	**100.00**	**769**	**100.00**	**1941**

Table 3 depicts the co-authorship index (CAI) of the particular journal from 2011 to 2020 the period of study. Out of 1941 articles, the maximum 574 publications were co-authorship index while 103 publications were single author index. In single author (CAI) is recorded in year 2012 i.e. 195.43. In two authors (CAI) is recorded in the year in the year 2012 i.e.211.70 and three authors (CAI) is recorded in the year

2013 i.e. 166.23 the overall description of the co-authorship index is shown in the below table 3.

In order to calculate the pattern of Co-Authorship index (CAI) and how it has been different from the marked period of study. The following formula of Co- Authorship index was used by (Subramanyam, 1983).

Table 4 Bradford's Law of distribution in research communication source

Zone	RCS	CRCS	Rate (%)	RP	CRP	Rate (%)
Zone 1	17	17	3.66	648	648	33.38
Zone 2	93	110	16.17	654	1302	33.69
Zone 3	465	575	80.87	639	1941	32.92

RCS: Research Communication Source**; CRCS:** Cumulative of Research Communication sources**; RP:** Research Publications**; CPR:** Cumulative of Research Publications

Table 4 Bradford's Law analysis of scattering with respect 1941 articles are distributed in table 4 according to their zones. First zone, RCS is 17 (3.66%) source of contributed of communication sources published. RP is 648 (33.38%) research publication. second Zone, RCS 93 (16.17%) publication source of contributed of CS, and RP is 654 (33.69%) research publication, Third Zone, RCS 465(80.87%) source of contributed of communication sources published, RP is 639 (32.92%) total research productivity. After this analyzed the numbers of journals in each zone increase and citation productivity decrease simultaneously.

Table 5 Average Citations per Year

Year	Number of Publications	TC per Year Citable Years	Average C T per Years
2011	129	57.78	5.78
2012	135	27.70	3.08
2013	186	49.04	6.13
2014	193	74.64	10.66
2015	210	83.57	13.93
2016	284	64.50	12.90
2017	213	88.55	22.14
2018	203	47.41	15.80

2019	200	20.25	10.12
2020	188	4.01	4.01
Average	194	51.74	10.46

Table no. 5 shows year wise publications, citable years and average. This breakthrough indicates and derived median value which is fixed with 10.46. So the years 2014, 2015, 2016 and 2017 are higher impact than other years.

It is quantified an influence of citation for PHFI research published amongst 2011 to 2020. The total average citations per year is received 51.74 for all years, and total cited articles are 1941 with an average value of 10.46 citations per article. In the year of 2017, the most citations per year are 213 (88.55%) at CT per year (22.14%). In the year 2015, TC per year was received 210 (83.55%) for at CT (13.93%) publications. Citation analysis for the chronological series indicates the decline trend, fall from 284 (64.50%) at CT (12.90 %); In the observation of 'average per year citation' for the 'life of publications' year, 2017 ranked on top-cited by 88.55% times per year.

Table-6 Top-10 Authors more Articles and received more Citation

Rank	Author	Articles	Citations	Total link strength	Author	Articles	Citations	Total link strength
1	Prabhakaran D.	260	4958	1457	Prabhakaran D.	260	4958	1457
2	Reddy K.S.	128	4004	503	Laxminarayan R.	67	4809	81
3	Patel V.	105	4776	339	Patel V.	105	4776	339
4	Zodpey S.	87	746	241	Reddy K.S.	128	4004	503
5	Tandon N.	84	1011	633	Nair H.	32	2687	89
6	Arora M.	70	595	172	Shidhaye R.	53	2183	313
7	Kinra S.	69	884	446	Ebrahim S.	68	2153	370
8	Ebrahim S.	68	2153	370	Grenfell B.T.	5	2035	8
9	Murthy G.V.S.	68	395	191	Campbell H.	22	1998	85
10	Laxminarayan R.	67	4809	81	Rudan I.	16	1755	72

Table no-6 evaluation of PHFI publications productivity, and received good citation, while ranking as per receive total citation base, on research 'Prabhkaran D ranked in the top with 260 research publication received 4958 citation, and social networking strength also high 1457, followed by Laminarayan, R.' with 67 research publications

received 4809 citation, Patel, V.' with 105 research publications received 4776 citation received ranked 3rd both in terms of number of publications and citations while having a total link strength of 339. While Laxminarayan R. ranks 2nd in number of citations, the rank for number of publication is 10th. At the same time Reddy KS ranks 2nd in terms of article published, with 4th highest citations of 4004, they have a link strength of 503.

Using VOS viewer to data analyze

Figure 1 Authors Citation

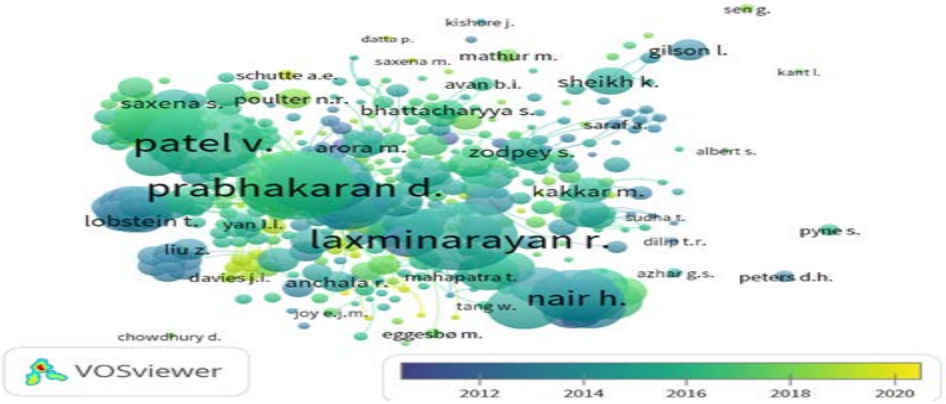

Table-7 Most Global cited Documents

Paper	DOI	Total Citations	TC per Year	Normalized TC
NG M, 2014, LANCET	10.1016/S0140-6736(14)60460-8	6169	771.13	82.65
NAGHAVI M, 2015, LANCET	10.1016/S0140-6736(14)61682-2	4162	594.57	49.80
VOS T, 2015, LANCET	10.1016/S0140-6736(15)60692-4	3275	467.86	39.19
GBD 2015 DISEASE GBDD, 2016, LANCET	10.1016/S0140-6736(16)31678-6	2914	485.67	45.18
GBD 2015 MORTALITY GBDM, 2016, LANCET	10.1016/S0140-6736(16)31012-1	2772	462.00	42.98
VOS T, 2017, LANCET	10.1016/S0140-6736(17)32154-2	2125	425.00	24.00
AFSHIN A, 2017, NEW ENGL J MED	10.1056/NEJMoa1614362	1943	388.60	21.94
FITZMAURICE C, 2017, JAMA ONCOL	10.1001/jamaoncol.2016.5688	1840	368.00	20.78
FOROUZANFAR MH, 2016, LANCET	10.1016/S0140-6736(16)31679-8	1793	298.83	27.80

LAXMINARAYAN R, 2013, LANCET INFECT DIS	10.1016/S1473-3099(13)70318-9	1775	197.22	36.20
NAGHAVI M, 2017, LANCET	10.1016/S0140-6736(17)32152-9	1744	348.80	19.69
FITZMAURICE C, 2015, JAMA ONCOL	10.1001/jamaoncol.2015.0735	1727	246.71	20.67
JAMES SL, 2018, LANCET	10.1016/S0140-6736(18)32279-7	1626	406.50	34.29
COHEN AJ, 2017, LANCET	10.1016/S0140-6736(17)30505-6	1612	322.40	18.20
FOROUZANFAR MH, 2015, LANCET	10.1016/S0140-6736(15)00128-2	1484	212.00	17.76
EHRET GB, 2011, NATURE	10.1038/nature10405	1381	125.55	23.90
GBD 2017 CAUSES OF DEATH COLLABORATORS GBDCDC, 2018, LANCET	10.1016/S0140-6736(18)32203-7	1223	305.75	25.79
FISCHER WALKER CL, 2013, LANCET	10.1016/S0140-6736(13)60222-6	1143	127.00	23.31
ROTH GA, 2017, J AM COLL CARDIOL	10.1016/j.jacc.2017.04.052	1077	215.40	12.16
WILLETT W, 2019, LANCET	10.1016/S0140-6736(18)31788-4	1065	355.00	52.61

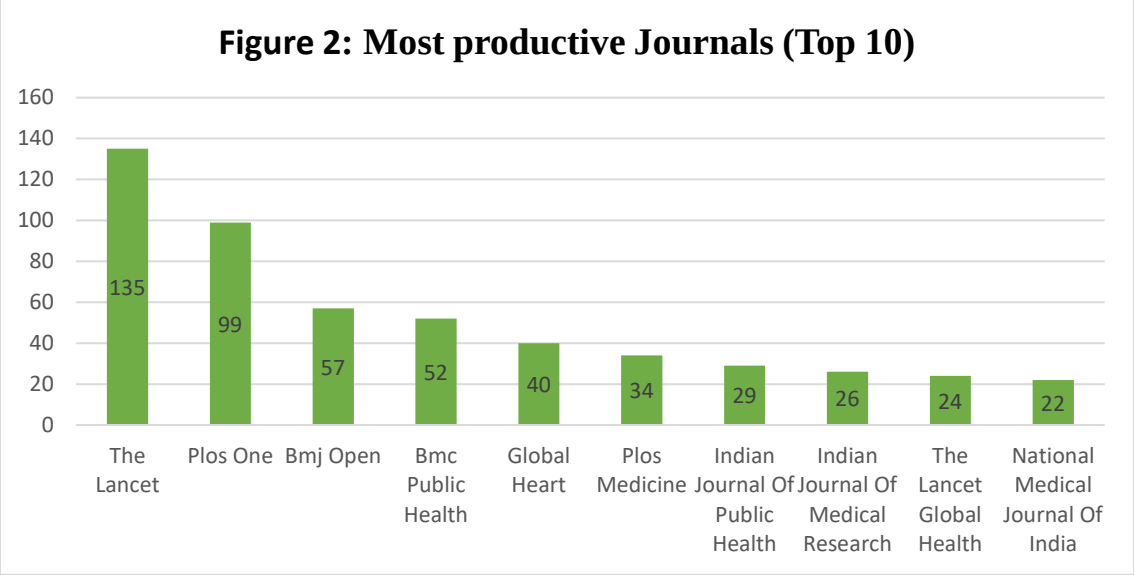

Figure 2 ranked according to the number of research article published “The Lancet” Impact Factor 60.392 (2019 Journal Citation Reports®, Clarivate Analytics 2020)) ranked on the top with 135

(6.95%) publications, followed “Plos One” (Impact Factor 2.740) with 99 (5.1%) publications, 2nd ranked, followed by “BMJ Open” (Impact Factor 2.496) with 57 (2.93%) publication, 3rd rank,

Table 8. Global collaboration and Most Relevant Affiliations:

No	Affiliations	Articles
1	Public Health Foundation of India	1286
2	Tehran University of Medical Sciences	828
3	Indian Institute of Public Health	655
4	London School of Hygiene and Tropical Medicine	636
5	University of Washington	458
6	All India Institute of Medical Sciences	354
7	Kermanshah University Of Medical Sciences	349
8	Iran University of Medical Sciences	340
9	Mekelle University	297
10	Harvard University	280
11	Shahid Beheshti University of Medical Sciences	262
12	University of Melbourne	262
13	Ministry of Health	244
14	University of Oxford	239
15	Mazandaran University of Medical Sciences	238
16	Imperial College London	229
17	Addis Ababa University	228
18	Centre for Chronic Disease Control	228
19	Johns Hopkins University	208
20	University College London	208

Table no-8 given the information on PHFI publications collaboration with others institutes. Collaboration with top 20 affiliations institute. All publication they published 1941 including third rank IIPHI.(all IIPH names in Scopus call “PHFI”) Highest collaboration with Tehran university of medical sciences, follow by London school of hygiene and tropical medicine.

Figur-3 Keyword used by PHFI authors

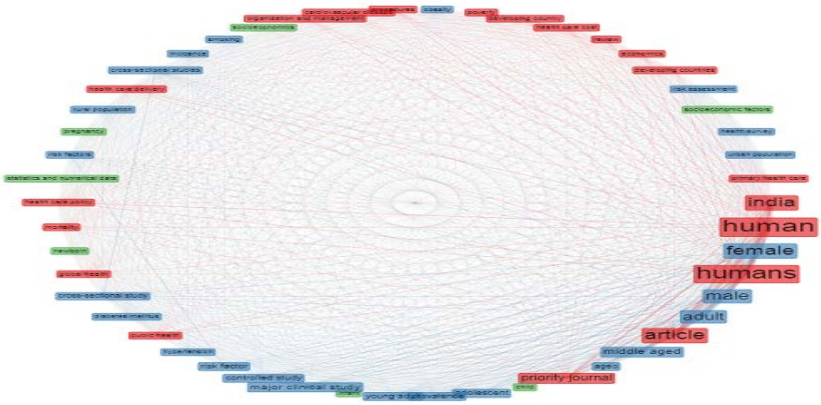

Figure 3. **VOS Viewer visualization of the most frequently using keywords by PHFI authors**

Conclusion:

Mapping of authorship and collaboration index pattern and growth of publication trend of the Public health foundation of India. From the marked period (2011-2020). It is found that a total of 1941 documents were published in SCOUPS Listed journals and others publications. The highest 284 (14.63%) of articles were published in the year 2016, followed by 213 (10.97%) of publications in the year 2017. The maximum 103 of publications were contributed by a single author. The maximum collaboration index (6.30) and the maximum RGR was recorded in the year 2012 and maximum Doubling time was recorded in 2020. PHFI author Prabhakaran, D. ranked in the top with 260 research article and received 4958 citation, the Lancet most productive journals and most cited journal also, a total 1941 articles were published by PHFI from 2011 to 2020 at global level. Study show positive growth trend is observed during the study period. Year 2020 publications decrease may be due to covid-19 effect of global level. PHFI good collaboration with others institutes authors. Along these statement, there has been an increasing pattern towards collaboration strength in all subject of science and technology. Besides, the degree of collaboration and their rate of progress change initial with one subject then onto the next, one outlet then onto the next part of a related subject and preliminary with one nation to another nation. (Beaver & R., 1978)

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