

## Indian Research on Stillbirth: A Bibliometric Assessment of Publications Output during 2000-19

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### Abstract

The paper describes quantitative and qualitative dimensions of stillbirth research output in India, based on publications data (661) as covered in Scopus database during 2000-19. Stillbirth research in India registered 19.29% growth, averaged 18.38 citations per paper and contributed 5.40% share to the global stillbirth research. Stillbirth research is skewed as top 10 countries account for 81.28% of global output. India ranks as the 10<sup>th</sup> most productive country in the world. Stillbirth research applications across subjects were the largest in medicine (88.35%), followed by three other disciplines (with 2.57% to 11.35% share). All India Institute of Medical Sciences, New Delhi, Jawaharlal Nehru Medical College, Belgaum and Postgraduate Institute of Medical Education and Research, Chandigarh lead the country as the most productive organizations (with 43, 40 and 38 papers). Besides, Public Health Foundation of India, New Delhi (76.2 and 4.15), Postgraduate Institute of Medical Education and Research, Chandigarh (50.61 and 2.75) and All India Institute of Medical Sciences, New Delhi (46.47 and 2.53) lead the country as the most impactful organizations in terms of citation per paper and relative citation index. S.S. Goudar (29 papers), A. Patel (23 papers) and S.M. Dhaded (11 papers) have been the most productive authors. R.Bahl (153.0 and 8.32), V.K. Paul (146.44 and 7.97) and R. Kumar (125.33 and 6.82) have been the most impactful authors, *Journal of Obstetrics and Gynecology of India* (with 35 papers), *The Lancet* (22 papers) and *International Journal of Gynecology and Obstetrics* (18 papers) topped the list of most productive journals.

**Keywords:** Stillbirth Research; Indian Publications; Scientometrics; Bibliometrics

### Introduction

According to WHO, stillbirth is a baby born with no signs of life at or after 28 weeks' gestation. It refers to the death of a baby after 28 weeks of pregnancy but before birth [1]. Here Stillbirths are classified into two groups - antepartum stillbirths (baby has died in the womb) and intrapartum stillbirths (baby died during delivery). Stillbirth is a traumatic experience for both the mother and the obstetrician. Despite the advances in Fetomaternal medicine the stillbirth rate continues to be high [2].

In 2015 there were 2.6 million stillbirths globally, with more than 7178 deaths a day. The majority of these deaths occurred in developing countries. Ninety-eight percent occurred in low- and middle-income countries. About half of all stillbirths occur in the intrapartum period, representing the greatest time of risk. Estimated proportion of stillbirths that are intrapartum varies from 10% in developed regions to 59% in south Asia [1].

India has highest number of stillbirths in the world. In India, the stillbirth rates (SBR) varied from 20 to 66 per 1,000 total births in different States. The current Perinatal mortality rate in India is 35.1 per 1000.6. Nearly 60% of perinatal deaths are stillbirths of which many are preventable [3].

The major causes of stillbirth include: child birth complications, post-term pregnancy, maternal infections in pregnancy (malaria, syphilis and HIV), maternal disorders (especially hypertension, obesity and diabetes), fetal growth restriction, congenital abnormalities. Almost half of stillbirths happen when the woman is in labour. The majority of stillbirths are preventable, evidenced by the regional variation across the world [1].

### Literature review

No bibliometric/scientometric studies related to analysis of "Stillbirth" research covering publications is available, both at national and international level. However a few related bibliometric studies exist. Amongst them, Visser, de Boer and de Groot [4] indicate that preterm birth is the most important cause of perinatal morbidity and mortality. The authors evaluated 47811 publications during 1997-2016 on the subject of preterm birth and used an advanced bibliometric visualization methodology to show the main research topics studied in the literature on the topic and the scientific development over time, using Web of Science database. Taskaya and Demirkiran [5] determined the predictors of infant mortality in last two decades with a bibliometric and a content analysis, by examining the frequency of 478 publications by year, the distribution of articles by country location using data from publication data during 1996-2015. Aski, Akbari, Hantoushzadeh and Ghotbizadeh [6] indicated that Intrauterine growth restriction (IUGR) is not a new subject in pregnancy. A bibliometric study of IUGR researches consisting of 1469 documents in obstetrics and gynecology areas were analyzed from publications indexed in WoS database. The paper identifies main keywords, authors and journals publishing IUGR related research.

### Objectives

The study is designed to examine qualitative and quantitative aspects of India's overall research output in the area of stillbirth research indexed in Scopus database during 2000-19. The specific objectives of this study are: (i) to analyze global research in the subject in terms of publications growth and global share of top 10 most productive countries, (ii) to analyze stillbirth research in India in terms of publications growth, its distribution by document types, source publication types and broad subject areas (iii) to analyze stillbirth research in India in terms of citation impact and describe bibliographic features of highly-cited papers, and (iv) to identify top 20 most productive organizations and authors and top 20 journals for research communications.

### Materials and Methods

In order to undertake a study of India's contribution in the area of stillbirth research, publications data was sourced from the Scopus database (<http://www.scopus.com>) covering 20-year period 2000-19. Two keyword "stillbirth" or "intrauterine fetal death" were used in "Keyword tag" as well as in "Article Title tag" (joined by Boolean operator "OR") simultaneously and restricted the output to period "2000-19" in the "period tag", to get global publication data (consisting of 122,34 records). The above described search strategy was refined by country of publication (including India) to get publication output data on top 10 countries. India's publication output comprised of 661 records. The search strategy for obtaining India's output was further refined to get statistics on India's output by subject, collaborating country, organization, author and journal. Citations to publications were counted from date of their publication till 5 May 2020. All type of publications have been used in this study.

- KEY(stillbirth or "intrauterine fetal death") OR TITLE(stillbirth or "intrauterine fetal death") AND PUBYEAR > 1999 AND PUBYEAR < 2020 AND (LIMIT-TO (AFFILCOUNTRY,"India"))).
- KEY(stillbirth or "intrauterine fetal death") OR TITLE(stillbirth or "intrauterine fetal death") AND PUBYEAR > 1989 AND PUBYEAR < 2020.

**Analysis**

**Publication growth**

India accumulated 661 publications in the field of stillbirth in 20 years during 2000-19, averaging 33.5 publications per year. India’s annual publications registered 19.29% growth, up from 6 publications in the year 2000 to 45 in the year 2019. India’s ten-year cumulative publications registered 111.61% growth, up from 167 during 2000-09 to 494 during 2010-19. India’s global publication share was 5.40% during 2000-19; its 10-year global publications share surged from 4.25% (2000-09) to 5.95% (2010-19). India’s 661 publications registered 18.38 average citation impact per paper during 2000-19 and its 10-year citation impact dropped from 28.03 CPP to 15.12 CPP during 2000-09 to 2010-19. Only 86 of the 661 papers have received funding supporting from 50+ national and international funding agencies (Table 1). Of the total publications, 24% (537) appeared as articles, 8.32% (55) as reviews, 4.08% (27) as letters, 3.78% (25) as notes, 1.51% (10) as editorials, 0.76% (5) as conference papers, 0.15% (1 each) as short survey and erratum.

Publication Year	Global Publications (TP)	Indian Publications						FP
		TP	%TP	TC	CPP	ICP	%ICP	
2000	202	6	2.97	33	5.50			
2001	248	5	2.02	53	10.60	1	16.67	
2002	286	16	5.59	188	11.75	1	20.00	
2003	311	19	6.11	260	13.68	3	18.75	2
2004	420	18	4.29	383	21.28	2	10.53	
2005	401	22	5.49	669	30.41	3	16.67	3
2006	486	23	4.73	1421	61.78	7	31.82	5
2007	496	15	3.02	355	23.67	1	4.35	
2008	515	18	3.50	394	21.89	4	26.67	2
2009	561	25	4.46	925	37.00	10	55.56	1
2010	607	27	4.45	541	20.04	5	20.00	1
2011	712	49	6.88	1376	28.08	12	44.44	2
2012	784	47	5.99	629	13.38	12	24.49	3
2013	758	55	7.26	1124	20.44	13	27.66	3
2014	850	43	5.06	1323	30.77	15	27.27	11
2015	845	48	5.68	580	12.08	21	48.84	7
2016	936	61	6.52	1117	18.31	15	31.25	8
2017	836	53	6.34	497	9.38	18	29.51	10
2018	979	66	6.74	243	3.68	19	35.85	13
2019	1001	45	4.50	40	0.89	16	24.24	15
2000-09	3926	167	4.25	4681	28.03	32	19.16	13
2010-19	8308	494	5.95	7470	15.12	146	29.55	73
2000-19	12234	661	5.40	12151	18.38	178	26.93	86
TP=Total Papers; TC=Total Citations; CPP=Citations Per Paper; ICP=International Collaborative Papers; FP=Funded Papers								

**Table 1:** Annual and Cumulative Publications on Stillbirths in India during 2000-19.

**Top 10 most productive countries**

In all, 155 countries participated in global stillbirth research and shown uneven distribution. For instance, 63 countries published 1-10 papers, 42 published 11-50 papers, 20 published 51-100 papers, 25 published 101-500 papers, 3 published 501-1000 and 2 published 2061-3406 papers.

The 81.28% of the global output in stillbirth research was contributed by top 10 most productive countries alone during 2000-19, which increased from 73.64% (2000-09) to 84.89% (2010-19). USA and UK are in the leadership position in the world ranking, accounting for 27.84% and 16.85% global publications share respectively. India ranks 10<sup>TH</sup> in the world ranking with 5.40% share. The global publication share of 8 other top 10 counties has been in single digit ranging between 3.33% and 6.65% (Table 2).

S.No	Name of the Country	Number of Papers			Share of Papers		
		2000-09	2010-19	2000-19	2000-09	2010-19	2000-19
1	USA	1021	2385	3406	26.01	28.71	27.84
2	U.K.	652	1409	2061	16.61	16.96	16.85
3	Australia	178	635	813	4.53	7.64	6.65
4	Canada	249	560	809	6.34	6.74	6.61
5	India	167	494	661	4.25	5.95	5.40
6	Sweden	128	340	468	3.26	4.09	3.83
7	Germany	172	276	448	4.38	3.32	3.66
8	Italy	132	311	443	3.36	3.74	3.62
9	France	151	276	427	3.85	3.32	3.49
10	China	41	367	408	1.04	4.42	3.33
	Total	2891	7053	9944	73.64	84.89	81.28
	World	3926	8308	12234			

**Table 2:** Stillbirths Research: Top 10 Most Productive Countries during 2000-19.

**Collaboration among top 10 countries**

All the top 10 countries have one to one collaborative linkages, as observed from table 3. The top three countries with largest collaborative linkages (1194, 938 and 590) with 9 other countries each were depicted by USA, U.K. and Canada. The top three countries with least collaborative linkages (240, 290 and 353) with 9 countries each were China, India and Germany. Among country-country collaborative linkages, USA-U.K. had registered highest number of collaborative linkages (324), followed by USA-Canada (201), UK and Australia (150), USA-Australia (137), etc (Table 3).

S.No	Name of the Country	Collaborative Linkages with Other Countries	Total Collaborative Linkages (Number of countries)
1	USA	2(324), 3(137), 4(201), 5(122), 6(114), 7(66), 8(91), 9(65), 10(74)	1194 (9)
2	U.K.	1(324), 3(150), 4(108), 5(64), 6(103), 7(71), 8(99), 9(87), 10(32)	938 (9)
3	Australia	1(137), 2(150), 4(55), 5(23), 6(39), 7(21), 8(27), 9(26), 10(23).	501 (9)
4	Canada	1(201), 2(108), 3(55), 5(29), 6(44), 7(32), 8(35), 9(51), 10(35)	590 (9)
5	India	1(122), 2(64), 3(23), 4(29), 6(13), 7(8), 8(7), 9(11), 10(13)	290 (9)
6	Sweden	1(114), 2(103), 3(39), 4(44), 5(13), 7(35), 8(32), 9(37), 10(13)	430 (9)
7	Germany	1(66), 2(71), 3(21), 4(32), 5(8), 6(35), 8(54), 9(51), 10(15)	353 (9)
8	Italy	1(91), 2(99), 3(27), 4(35), 5(7), 6(32), 7(54), 9(66), 10(17)	428 (9)
9	France	1(65), 2(87), 3(26), 4(51), 5(11), 6(37), 7(51), 8(66), 10(18)	412(9)
10	China	1(74), 2(32), 3(23), 4(35), 5(13), 6(13), 7(15), 8(17), 9(18)	240 (9)

**Table 3:** Collaboration Linkages among Top 10 Countries during 2000-19.

**Subject-wise distribution of india’s research output**

In all, stillbirth research in India intersected with 4 disciplines (as identified in Scopus database classification). Of these, medicine has been the most favored subject areas in stillbirth research pursuits (with 88.35% national publications share). In other 3 disciplines, national publications share ranged between 2.57% and 11.35% (Table 4).

S.No	Subject*	Number of Papers (TP)			Activity Index		TC	CPP	%TP
		2000-09	2010-19	2000-19	2000-09	2010-19			
1	Medicine	146	438	584	98.95	100.35	10968	18.78	88.35
2	Biochemistry, Genetics and Molecular Biology	12	63	75	63.33	112.40	1361	18.15	11.35
3	Pharmacology, Toxicology and Pharmaceutics	4	25	29	54.59	115.35	311	10.72	4.39
4	Immunology and Microbiology	5	12	17	116.41	94.45	321	18.88	2.57
	India’d total	167	494	661			12151	18.38	
<ul style="list-style-type: none"> <li>• There is overlapping of literature covered under various subjects</li> </ul>									
TP=Total Papers; TC=Total Citations; CPP=Citations Per Paper									

**Table 4:** Subject-Wise Breakup of Indian Publications on Stillbirths during 2000-19.

Research activity index in all of 4 disciplines witnessed fluctuations between 2000-09 and 2010-19. Compared to world average index of 100, three disciplines registered significant rise in their activity index, and in immunology and microbiology, it registered significant decline. Immunology and microbiology recorded the highest citation impact per paper of 18.78 and pharmacology, toxMost Productive icology and pharmaceutics the least (710.72) during 2000-19 (Table 4).

**Top 20 most productive organizations**

The productivity of top 20 most productive organizations varied from 8 to 43 publications per organization; together they contributed 52.95% (350) Indian publications share and 89.18% (10836) Indian citations share during 2000-19. table 5 provides the profile of top 20 most productive organizations. On further analysis, it was observed that.

- Six organizations registered their publications output above their group average (17.5): All India Institute of Medical Sciences, New Delhi (43 papers), Jawaharlal Nehru Medical College, Belgaum (40 papers), Postgraduate Institute of Medical Education and Research, Chandigarh (38 papers), Public Health Foundation of India, New Delhi (25 papers), Christian Medical College (CMC), Vellore (24 papers) and Lady Hardinge Medical College (LHMC), New Delhi (19 papers);
- Six organizations registered their citations per paper and relative citation index above the group average (30.96 and 1.68) of all organizations: Public Health Foundation of India, New Delhi (76.2 and 4.15), Postgraduate Institute of Medical Education and Research, Chandigarh (50.61 and 2.75), All India Institute of Medical Sciences, New Delhi (46.47 and 2.53), King’s George Medical University, Lucknow (36.0 and 1.96), Christian Medical College, Vellore (32.67 and 1.78) and Government Medical College, Nagpur (31.57 and 1.72).

S.No	Name of the Organization	TP	TC	CPP	HI	ICP	%ICP	RCI
1	All India Institute of Medical Sciences (AIIMS), New Delhi	43	1998	46.47	15	16	37.21	2.53
2	Jawaharlal Nehru Medical College, Belgaum	40	976	24.40	18	35	87.50	1.33
3	Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh	38	1923	50.61	17	12	31.58	2.75
4	Public Health Foundation of India, New Delhi	25	1905	76.20	9	15	60.00	4.15
5	Christian Medical College (CMC), Vellore	24	784	32.67	11	8	33.33	1.78
6	Lady Hardinge Medical College (LHMC), New Delhi	19	314	16.53	6	1	5.26	0.90
7	Sanjay Gandhi Postgraduate Institute of Medical Sciences (SGPIMS), Lucknow	17	375	22.06	8	5	29.41	1.20
8	Maulana Azad Medical College (MAMC), Delhi	17	442	26.00	10	3	17.65	1.41
9	KLE Academy of Higher Education and Research, Belgaum	15	304	20.27	7	12	80.00	1.10
10	Government Medical College, Nagpur	14	442	31.57	8	8	57.14	1.72
11	Lata Medical Research Foundation, Nagpur	12	237	19.75	8	12	100.00	1.07
12	Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), poNDICHERRY ^	12	97	8.08	4	0	0.00	0.44
13	Mahatma Ganghi Institute of Medical Sciences	11	151	13.73	6	3	27.27	0.75
14	King's George Medical University, Lucknow	10	360	36.00	7	3	30.00	1.96
15	Lok Nayak Hospital, Delhi	10	278	27.80	7	2	20.00	1.51
16	King Edward Memprial Hospital	9	164	18.22	3	1	11.11	0.99
17	Kasturba Medical College (KMC), Manipal	9	7	0.78	2	0	0.00	0.04
18	Regional Institute of Medical Sciences (RIMS), Imphal	9	5	0.56	2	0	0.00	0.03
19	Pt.B.D.Sharma PGIMS, Rohtak	8	57	7.13	5	0	0.00	0.39
20	J.J.M. Medical College, Devangere, Karnataka	8	17	2.13	2	1	12.50	0.12
	Total of 20 organizations	350	10836	30.96	7.75	137	39.14	1.68
	Total of India	661	12151	18.38				
	Share of top 20 organizations in India's total output	52.95	89.18					

TP=Total Papers; TC=Total Citations; CPP=Citations Per Paper; HI=h-index; ICP=International Collaborative Papers; RCI=Relative Citation Index

**Table 5:** Scientometric Profile of Top 20 Most Productive Indian Organizations in Stillbirths Research during 2000-19.

### Collaboration among Top 10 organizations

All the top 15 organizations have one to one collaborative linkages, as observed from table 3. The top three organizations with largest collaborative linkages (37,30and28) with 3- 4 other organizations each were depicted by Jawaharlal Medical College, Belgaum, Lata Medical Research Foundation, Nagpur and KLE Academy of Higher Education and Research, Belgaum. The top three organizations with least collaborative linkages (2,5 and 5) with 2 - 3 organizations each were JIPMER-Pondicherry, King George's Medical University, Lucknow an Mahatma Gandhi Institute of Medical Sciences, Wardha. Among organization to organization linkages, Jawaharlal Medical College, Balgaum and Lata Medical Research Foundation, Nagpur had registered highest number of collaborative linkages (15), Jawaharlal Medical College, Belgaum and KLE Academy of Higher Education and Research, Belgaum (14 linkages), etc (Table 6).

S.No	Name of the Organization	Number of collaboration linkages	Total Collaborative Linkages (Number of organizations)
1	All India Institute of Medical Sciences (AIIMS), New Delhi	3(3), 4(5), 5(3), 6(2), 7(3), 8(3), 15(1)	20(7)
2	Jawaharlal Nehru Medical College, Belgaum	9(14), 10(6), 11(15), 13(2)	37(4)
3	Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh	1(3), 4(2), 12(1)	6(3)
4	Public Health Foundation of India, New Delhi	1(5), 5(3), 14(2)	10(3)
5	Christian Medical College (CMC), Vellore	1(3), 7(3), 10(1)	7(3)
6	Lady Hardinge Medical College (LHMC), New Delhi	1(2), 8(2), 15(1)	5(3)
7	Sanjay Gandhi Postgraduate Institute of Medical Sciences (SGPIMS), Lucknow	1(3), 5(3), 14(3)	9(3)
8	Maulana Azad Medical College (MAMC), Delhi	1(3), 15(10)	13(2)
9	KLE Academy of Higher Education and Research, Belgaum	2(14), 11(13), 13(1)	28(3)
10	Government Medical College, Nagpur	2(6), 5(1), 11(1)	8(3)
11	Lata Medical Research Foundation, Nagpur	2(15), 9(13), 13(2)	30(3)
12	Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry	3(1), 13(1)	2(2)
13	Mahatma Gandhi Institute of Medical Sciences	2(2), 11(2), 12(1)	5(3)
14	King's George Medical University, Lucknow	4(2), 7(3)	5(2)
15	Lok Nayak Hospital, Delhi	1(1), 6(1), 8(10),	12(3)

**Table 6:** List of top 15 organization with collaboration linkages among them.

**India's top 20 most productive authors**

The research productivity of top 20 most productive authors varied from 5 to 29 publications per author. Together they contributed 28.44% (188) global publications share and 78.46% (9534) global citations share during 2000-19. Their detailed scientometric profile is presented in table 7.

- Four authors registered their publications output above the group average of 9.4: S.S. Goudar (29 papers), A. Patel (23 papers), S.M. Dhaded (11 papers) and V. Suri (10 papers);
- Ten authors registered their citation per paper and relative citation index above the group average (50.71 and 2.76) of all authors: R.Bahl (153.0 and 8.32), V.K. Paul (146.44 and 7.97), R. Kumar (125.33 and 6.82), R. Bahl (100.67 and 5.48), S.R. Phadke (94.71 and 5.15), M.Mathai (94.22 and 5.13), L. Dandona (85.5 and 4.65), G.A. Kumar (73.29 and 3.99), R. Bagga (64.17 and 3.49) and V. Kumar (59.88 and 3.26).

S.No	Name of the Author	Affiliation of the Author	TP	TC	CPP	HI	ICP	%ICP	RCI
1	S.S. Goudar	JN Medical College, Belgaum	29	846	29.17	18	28	96.55	1.59
2	A.Patel	Lata Medical Research Foundation, Nagpur	23	556	24.17	14	23	100.0	1.32
3	S.M.Dhaded	JN Medical College, Belgaum	11	221	20.09	7	11	100.0	1.09
4	V.Suri	PGIMER-Chandigarh	10	96	9.60	5	0	0.00	0.52
5	V.K.Paul	AIIMS - New Delhi	9	1318	146.44	7	7	77.78	7.97
6	R. Bahl	AIIMS - New Delhi	9	906	100.67	6	9	100.00	5.48
7	M.Mathai	CMC - Vellore	9	848	94.22	7	6	66.67	5.13

8	J.B.Sharma	AIIMS – New Delhi	8	191	23.88	5	2	25.00	1.30
9	L.Dandona	Public Health Foundation of India	8	684	85.50	6	8	100.0	4.65
10	S.B.Neogi	Public Health Foundation of India, New Delhi	8	28	3.50	3	0	0.00	0.19
11	V.Kumar	King’s George Medical University, Lucknow	8	479	59.88	6	8	100.0	3.26
12	S.Chopra	PGIMER-Chandigarh	7	108	15.43	6	0	0.00	0.84
13	G.A. Kumar	Public Health Foundation of India, New Delhi	7	513	73.29	4	7	100.0	3.99
14	M.Kumar	LHMC-New Delhi	7	13	1.86	2	0	0.00	0.10
15	S.R.Phadke	SGPGIMS-Lucknow	7	663	94.71	8	1	14.29	5.15
16	R.Bagga	PGIMER-Chandigaeh	6	385	64.17	4	3	50.00	3.49
17	R.Kumar	PGIMER-Chandigarh	6	752	125.33	5	3	50.00	6.82
18	J.E.Mathews	CMC-Vellore	6	86	14.33	4	1	16.67	0.78
19	R.Bahl	AIIMS-New Delhi	5	765	153.00	4	5	100.0	8.32
20	N.Aggarwal	PGIMER-Chandigarh	5	76	15.20	5	1	20.00	0.83
	Total		188	9534	50.71	6.3	123	65.43	2.76
	Total of World		661	12151	18.38				
	Share of 25 Authors in India’s Output		28.44	78.46					
TP=Total Papers; TC=Total Citations; CPP=Citations Per Paper; HI=h-index; ICP=International Collaborative Papers; RCI=Relative Citation Index									

**Table 7:** Scientometric Profile of Top 25 Most Productive Indian Authors in Stillbirths during 2000-19.

### Medium of research communication

661 articles on stillbirth research unevenly appeared in 183 journals. Of the 183 journals, 153 published 1-5 papers each, 18 published 6-10 papers each, 10 published 11-20 papers each and 2 published 22-35 papers each during 2000-19. The top 20 most productive journals accounted 40.39% of total Indian output in journals (covering stillbirth research) during 2000-19, The 10-year output in journals increased from 35.93% to 41.90% between 2000-09 and 2010-19. Their detailed scientometric profile is presented in table 8.

S.No	Name of the Journal	Number of Papers			TC	CPP
		2000-09	2010-19	2000-19		
1	Journal of Obstetrics and Gynecology of India	0	35	35	63	1.80
2	The Lancet	4	18	22	3235	147.05
3	International Journal of Gynecology and Obstetrics	11	7	18	913	50.72
4	Indian Pediatrics	1	14	15	39	2.60
5	Journal of Clinical and Diagnostic Research	0	15	15	25	1.67
6	BJOG.An International Journal of Obstetrics and Gynecology	2	12	14	176	12.57
7	Indian Journal of Pathology and Microbiology	6	8	14	53	3.79



8	Journal of Safog	0	14	14	2	0.14
9	BMC Pregnancy and Childbirth	0	13	13	237	18.23
10	Indian Journal of Pediatrics	8	5	13	201	15.46
11	Reproductive Health	0	13	13	237	18.23
12	Journal of Obstetrics and Gynecology Research	2	9	11	149	13.55
13	Indian Veterinary Journal	8	2	10	15	1.50
14	Journal of Obstetrics and Gynecology	3	7	10	66	6.60
15	Indian Journal of Medical Research	4	5	9	264	29.33
16	National Medical Journal of India	1	8	9	17	1.89
17	Archives of Gynecology and Onstetrics	4	4	8	84	10.50
18	Bulletin of WHO	3	5	8	543	67.88
19	Journal of Indian Medical Association	3	5	8	15	1.88
20	PLOS One	0	8	8	192	24.00
	Total of 20 journals	60	207	267	6526	24.44
	Total global journal output	167	494	661		
	Share of top 20 journals in global journal output	35.93	41.90	40.39		

**Table 8:** Top 20 Most Productive Journals in Stillbirths during 2000-19.

Journal of Obstetrics and Gynecology of India was the topmost productive journal (with 35 papers) in reporting Indian research in the field of stillbirth research, followed by The Lancet (22 papers), International Journal of Gynecology and Obstetrics (18 papers), Indian Pediatrics and Journal of Clinical and Diagnostic Research (15 papers each). The Lancet was the top most journal in terms of citations per paper (147.05), followed by Bulletin of WHO (67.88), International Journal of Gynecology and Obstetrics (50.72), Indian Journal of Medical Research (29.33) and PLOS One (24.0). The Lancet was the top most journal in terms of total citations (3235), followed by International Journal of Gynecology and Obstetrics (913 citations), Bulletin of WHO (543 citations), Indian Journal of Medical Research (264 citations) and BMC Pregnancy and Childbirth (237 citations).

### Highly - cited papers

Of the total India's output in stillbirth research (661 publications), only 30 (4.54% share) accumulated 100 to 526 citations per paper (cumulative total 6375 citations) since their publication during 2000-19, averaging to 212.5 citations per paper. The distribution of these 30 highly cited papers is skewed. 18 hundred nine papers accumulated citations in the range 100-200 per paper, 8 papers were in citation range 229-196 and 4 papers in citation range 304-526.

- Of the 30 highly cited papers, 4 resulted from contribution by single organizations per paper (non-collaborative papers) and 26 from two or more organizations per paper (2 national collaborative and 24 international collaborative papers).
- Among 30 highly cited papers, USA collaborated in the largest number of papers (20 papers), followed by U.K. (16 papers), Switzerland (11 papers), Pakistan and South Africa (10 papers each), Canada (9 papers), Australia (8 papers), Bangladesh (7 papers), China (6 papers), Netherlands (5 papers), France (4 papers), etc.

- The leading organizations participating in highly-cited papers were: AIIMS-New Delhi (7 papers), PGIMER-Chandigarh (6 papers), CMC-Vellore (4 papers), Public Health Foundation of India, New Delhi (3 papers), Jawaharlal Nehru Medical College, Balgaum and SGP GIMS-Lucknow (2 papers each), etc.
- The leading authors participating in highly cited papers were: V.K. Paul (5 papers), R.Bahl and M/Mithai (3 papers), R.Dandona and R.Dandona (2 papers each), etc.
- Of the 30 highly cited papers, 17 were published as articles, 9 review papers, 3 conference papers and 1 note.
- These 30 highly cited papers appeared across 15 journals, of which 10 papers were published in The Lancet, 4 papers in International Journal of Gynecology and Obstetrics, 2 papers each in Bulletin of WHO and Pediatric Research and 1 paper each in American Journal of Epidemiology, Annals of Internal Medicine, Indian Journal of Medical Research, Journal of Clinical Oncology, Journal of Perinatology, Lancet Infectious Disease, Nature Genetics, Neurology, Pediatrics, PLOS One and Tropical Medicine and International Health.

### Summary and Conclusion

This paper analyzes India research in the domain of stillbirth on select bibliometric indicators during 2000-19. During the period, Stillbirth research by India registered a fast 19.29% average annual growth, contributed 5.40% share to global output, averaged citation impact of 18.38 citations per paper and registered 30 papers (4.54% share of national output) as highly cited papers. In all, 153 countries contributed to global stillbirth research (12234 publications). The top 10 most productive countries in the world alone accounted for 81.28% bulk share to global publications output in the subject. USA and U.K. are in the leadership position in the world ranking, with 27.84% and 16.85% global publications share respectively. India ranks 10<sup>th</sup> most productive country in the world with 5.40% share. The global publication share of other 7 amongst top 10 countries has been in single digit ranging between 3.33% and 6.65%. Medicine has been the preferred subjects in stillbirth research in India (with 88.35% share), followed by biochemistry, genetics and molecular biology (11.35%), pharmacology, toxicology and pharmaceuticals (4.39%) and immunology and microbiology (2.57%) during 2000-19.

The distribution of India research by participating organizations is skewed. The top 20 organizations contributed 52.95% publications share and 89.18% citations share respectively during the period. All India Institute of Medical Sciences, New Delhi (43 papers), Jawaharlal Nehru Medical College, Balgaum (40 papers) and Postgraduate Institute of Medical Education and Research, Chandigarh (38 papers) have been the most productive research organizations in the country. The organizations leading in terms of citation per paper and relative citation index were: Public Health Foundation of India, New Delhi (76.2 and 4.15), Postgraduate Institute of Medical Education and Research, Chandigarh (50.61 and 2.75) and All India Institute of Medical Sciences, New Delhi (46.47 and 2.53). The distribution of India research by participating authors is highly scattered. The top 20 authors across India contributed 28.44% publications share and 78.46% citations share respectively during the period. S.S. Goudar (29 papers), A. Patel (23 papers), S.M. Dhaded (11 papers) and V. Suri (10 papers) have been the most productive authors in stillbirth research. R.Bahl (153.0 and 8.32), V.K. Paul (146.44 and 7.97) and R. Kumar (125.33 and 6.82) have been the most impactful authors in terms of citations per paper and relative citation index.

Journal of Obstetrics and Gynecology of India (with 35 papers), The Lancet (22 papers) and International Journal of Gynecology and Obstetrics (18 papers) are the top three most popular journals in the subject that published 136 and 106 papers respectively.

### Conclusion

Compared to incidence and number of deaths due to stillbirth in India, India's publications output is very small and constitute only 5.40% share of global output during 2000-19. There is, therefore, an urgent need to do much more R and D in the country, both in terms of investment and manpower training, besides enhancing international collaboration which may help in increasing the quality of research in the country.

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