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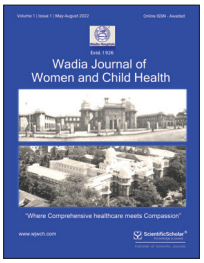

Original Article

Pediatric surgical research over the last decade: A bibliometric citation analysis

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ABSTRACT

Objectives: A way of identifying significant works from a plethora of published material is by a bibliometric analysis. The citation count of a particular article indicates its influence within the readership. A survey of the top 10 articles (in terms of citations per year) in pediatric surgery from each of the three leading international journals (Journal of Pediatric Surgery [JPS], European Journal of Pediatric Surgery [EurJPS], and Pediatric Surgery International [PSI]) and the foremost Indian journal (Journal of Indian Association of Pediatric Surgeons [JIAPS]) should give an insight into the research that has been quoted the most in the last decade. Through an extensive literature search, this paper aims to identify, analyse and categorize the characteristics of the most cited papers in pediatric surgery in the last decade, worldwide and in India.

Material and Methods: The number of citations of all articles from 4 journals (JPS, EurJPS, PSI, JIAPS) published between January 2013 and May 2022 were sorted using the "Publish or Perish®" software (version 8). The top 10 articles in each journal (by citations per year) published between January 2013 and May 2022 were then tabulated into a Microsoft Excel® sheet and details including the topic studied, citations per year, year of publication and type of study were noted.

Results: Out of the 40 articles, there were 13 review articles and 27 original articles – 12 retrospective reviews, 6 consensus papers, 6 surveys and 3 animal research studies. 15 of these articles were from the United States of America (USA), 12 were from Europe and 3 were global, spanning continents. Among the top 10 cited papers from JIAPS, 8 were from India. The most commonly covered topics were esophageal atresia, necrotizing enterocolitis, acute appendicitis and Hirschsprung's disease.

Conclusion: The most influential manuscripts relate to common neonatal surgical conditions and appendicitis. This information should be of value to upcoming pediatric surgeons to choose their prospective research and create a long-lasting impact on the field of pediatric surgery. For the editorial team, it provides an insight into the kind of articles that are of interest to pediatric surgeons.

Keywords: Pediatric surgery, Pediatric surgical research, Citation, Bibliometry

INTRODUCTION

The current age pediatric surgeon is faced with a deluge of printed and electronic information. Around 20–25 medical journals (in English language) dedicated solely to research in pediatric surgery are currently published around the world. Besides these, there are printed articles available from national and international conferences, various training courses, and CMEs.

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Journals in non-English languages are also available with English translations. It would be interesting to know what does a pediatric surgeon read which would not only provide an insight into the type of manuscripts widely accessed but also will enable editorial teams in selection of informative articles preferred by the pediatric surgery readership.

With the vast volume of published material, one of the several methods of identifying significant works is by a bibliometric analysis, i.e., providing a quantitative assessment of the relative importance of a research paper by examining its citation history. Bibliometric analysis can be utilized for a variety of reasons, such as to uncover emerging trends in article and journal performance, collaboration patterns and research constituents. The citation count, amongst these, of a particular article is one of the indicators of its influence within the readership. Citation analysis also serves to rank journals based on the total number of citations normalized to the number of articles published within the journal over a defined time period (impact factor [IF]).[1]

Although most journals quote their calculated IF, citation half-life, and other parameters, no information exists whatsoever about what was mostly read and how much. The websites of a few journals do have the statistics of the most cited articles, but on scrutiny, they are found to underestimate the number of citations by a considerable margin when compared with the most accessible database, i.e., "Google Scholar."

It may be safely assumed that readers prefer journals ranking highly on the IF list and that those who are actively publishing are the ones who read these journals the most. Hence, a survey of the top 10 articles (in terms of citations per year) in pediatric surgery from 3 top international journals (Journal of Pediatric Surgery [JPS]; IF = 2.545, European Journal of Pediatric Surgery [EurJPS]; IF = 2.191, and Pediatric Surgery International [PSI]; IF = 1.827) and the foremost Indian journal (Journal of Indian Association of Pediatric Surgeons [JIAPS]; IF = 0.543) was done so as to know the scientific article that has been read and quoted the most in the last decade.

This study aims to identify, analyse and categorise the characteristics (the type of article, country of origin, topic, and the number of citations) of the articles published in JPS, EurJPS, PSI and JIAPS from January 2013 to May 2022. This study also aims to highlight as to what articles do the pediatric surgeons read and what is their focus of research.

MATERIAL AND METHODS

The number of citations of all articles published between January 2013 and May 2022 were obtained from three databases: "CrossRef," "MEDLINE," "Thomson Reuters Web of Science" and "Google Scholar" using A.W. Harzing's "Publish or Perish®" software (version 8). The entire data was collected over 24 h and the final tally was obtained by adding all the citations in the three databases after removing common entries.

The top 10 articles (as per citations per year) from each of the 4 journals (JPS, EurJPS, PSI, JIAPS) published between January 2013 and May 2022 were tabulated into a Microsoft Excel® sheet. The type of article, authorship, journal of publication, publication year, country of origin, topic, total citations and number of citations per year were noted. The articles were then sorted based on the citations per year.

RESULTS

The total number of scientific articles, in the four journals, published between January 2013 to May 2022, was 7078. Out of which, 4098 (57.9%) were original articles, 1476 (20.85%) were case reports, 874 (12.35%) brief communications and 630 (8.9%) were review articles [Figure 1].

The top 10 articles, based on citations per year, in each of the 4 journals, published between January 2013 and May 2022 are shown in [Table 1]. These articles garnered a total of 3028 citations (18.7 citations per article per year) until May 2022.

Out of the 40 articles, there were 13 review articles and 27 original articles – 12 retrospective reviews, 6 consensus papers, 6 surveys and 3 animal research studies [Figure 2].

15 of these articles were from the United States of America (USA), 4 from Canada, 2 from Spain and 1 each from Italy, Ireland, Germany and Japan. Of the multi-institutional articles, 7 were from Europe and 3 were global, spanning continents (one had Asian authorship while two were from African institutions in collaboration with American and European centres).

In the Indian journal JIAPS, amongst the top 10 cited papers, 8 were from India, 1 from Italy and one multi-institutional review article with authors from Malawi, Poland, Switzerland, Italy and the United Kingdom [Table 1].

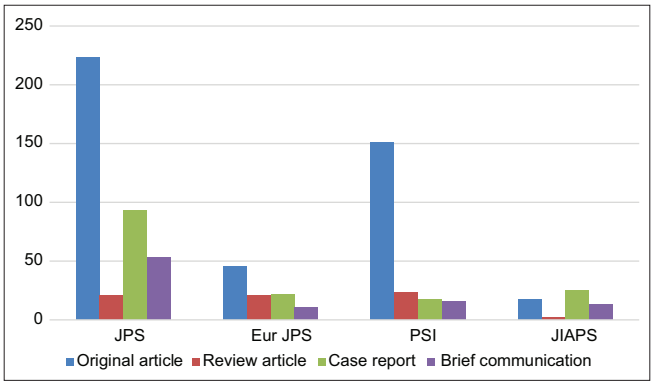

Figure 1: Distribution of articles published between 2013 and 2022 in the top pediatric journals.

Table 1: Top ten cited articles from each of JPS, EurJPS, PSI, JIAPS ranked by citations per year.

Rank	Cites per year	Journal	Authors	Title	Year	Type of Study	No of patients	Country	Total citations	ArticleURL
1	51	JPS	CD Gerall, JR DeFazio, AM Kahan, et al	Delayed presentation and sub-optimal outcomes of pediatric patients with acute appendicitis during the COVID-19 pandemic	2021	Retrospective review	89	USA	51	https://www.sciencedirect.com/science/article/pii/S0022346820307569
2	47	JPS	CL Kvasnovsky, Y Shi, BS Rich, et al	Limiting hospital resources for acute appendicitis in children: lessons learned from the US epicenter of the COVID-19 pandemic	2021	Retrospective review	55	USA	47	https://www.sciencedirect.com/science/article/pii/S0022346820304449
3	38.83	JPS	R Langer, J Vacanti	Advances in tissue engineering	2016	Review article	-	USA	233	https://www.sciencedirect.com/science/article/pii/S0022346815006314
4	31.8	EurJPS	P Triana, M Dore, VN Cerezo, et al	Sirolimus in the treatment of vascular anomalies	2017	Retrospective review	41	Spain	159	https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0036-1593383
5	28	JPS	A Hock, H Miyake, B Li, et al	Breast milk-derived exosomes promote intestinal epithelial cell growth	2017	Animal research	-	Canada	140	https://www.sciencedirect.com/science/article/pii/S0022346817300659
6	26.33	JPS	HD Baumgarten, AJ Bauer, A Isaza, et al	Surgical management of pediatric thyroid disease: Complication rates after thyroidectomy at the Children's Hospital of Philadelphia high-volume Pediatric Thyroid ...	2019	Retrospective review	464	USA	79	https://www.sciencedirect.com/science/article/pii/S0022346819301228
7	26.33	JPS	EA Newman, S Abdessalam, JH Aldrink, et al	Update on neuroblastoma	2019	Review article	-	USA	79	https://www.sciencedirect.com/science/article/pii/S0022346818305748
8	25	JPS	JD Horton, S Munawar, C Corrigan, et al	Inconsistent and excessive opioid prescribing after common pediatric surgical operations	2019	Retrospective review	470	USA	75	https://www.sciencedirect.com/science/article/pii/S0022346818304317
9	24.6	PSI	A Gosain, PK Frykman, RA Cowles, et al	Guidelines for the diagnosis and management of Hirschsprung-associated enterocolitis	2017	Consensus	-	USA	123	https://link.springer.com/article/10.1007/s00383-017-4065-8
10	24.2	JPS	DR Lal, SK Gadepalli, CD Downard, et al	Perioperative management and outcomes of esophageal atresia and tracheoesophageal fistula	2017	Retrospective review (Multi-institutional)	396	USA	121	https://www.sciencedirect.com/science/article/pii/S0022346816305978
11	23.4	PSI	RM Rentea, SDS Peter, CL Snyder	Pediatric appendicitis: state of the art review	2017	Review article	-	USA	117	https://link.springer.com/article/10.1007/s00383-016-3990-2
12	23.25	JPS	HL Short, KF Heiss, K Burch, et al	Implementation of an enhanced recovery protocol in pediatric colorectal surgery	2018	Retrospective review (Comparative)	79	USA	93	https://www.sciencedirect.com/science/article/pii/S0022346817302695
13	22.5	JPS	C Pisano, J Galley, M Elbahrawy, et al	Human breast milk-derived extracellular vesicles in the protection against experimental necrotizing enterocolitis	2020	Animal research	-	USA	45	https://www.sciencedirect.com/science/article/pii/S0022346819307055
14	22	PSI	G Lakshin, S Banek, D Keese, et al	Telemedicine in the pediatric surgery in Germany during the COVID-19 pandemic	2021	Survey	-	Germany	22	https://link.springer.com/article/10.1007/s00383-020-04822-w
15	20.5	PSI	H Miyake, C Lee, S Chusilp, et al	Human breast milk exosomes attenuate intestinal damage	2020	Animal research	-	Global	41	https://link.springer.com/article/10.1007/s00383-019-04599-7
16	18.2	PSI	M Nio	Japanese biliary atresia registry	2017	Survey	-	Japan	91	https://link.springer.com/article/10.1007/s00383-017-4160-x
17	18.2	PSI	JC Langer, MD Rollins, M Levitt, et al	Guidelines for the management of postoperative obstructive symptoms in children with Hirschsprung disease	2017	Consensus	-	Canada, USA	91	https://link.springer.com/article/10.1007/s00383-017-4066-7
18	17.8	PSI	KC Soares, SD Goldstein, MA Ghaseb, et al	Pediatric choledochal cysts: diagnosis and current management	2017	Review article	-	USA	89	https://link.springer.com/article/10.1007/s00383-017-4083-6
19	17	EurJPS	C Dingemann, S Eaton, G Aksnes, et al	ERNICA consensus conference on the management of patients with long-gap esophageal atresia: perioperative, surgical, and long-term management	2021	Consensus	-	Europe	17	https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0040-1713932
20	16.75	EurJPS	A Zani, S Eaton, ME Hoellwarth, et al	International survey on the management of esophageal atresia	2014	Survey	-	Europe	134	https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0033-1350058
21	16.25	EurJPS	LF Goodman, E St-Louis, Y Yousef, et al	The global initiative for children's surgery: optimal resources for improving care	2018	Consensus	-	Global	65	https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0037-1604399
22	15.33	JIAPS	SK Ratan, T Anand, J Ratan	Formulation of research question–Stepwise approach	2019	Review article	-	India	46	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6322175/
23	15.29	PSI	JC Lim, JM Golden, HR Ford	Pathogenesis of neonatal necrotizing enterocolitis	2015	Review article	-	USA	107	https://link.springer.com/article/10.1007/s00383-015-3697-9
24	14.22	PSI	FR Demehri, IF Halaweish, AG Coran, et al	Hirschsprung-associated enterocolitis: pathogenesis, treatment and prevention	2013	Review article	-	USA	128	https://link.springer.com/article/10.1007/s00383-013-3353-1
25	14	PSI	E Kirby, R Keijzer	Congenital diaphragmatic hernia: current management strategies from antenatal diagnosis to long-term follow-up	2020	Review article	-	Ireland, Canada	28	https://link.springer.com/article/10.1007/s00383-020-04625-z
26	13.71	EurJPS	A Zani, S Eaton, P Puri, et al	International survey on the management of necrotizing enterocolitis	2015	Survey	-	Europe	96	https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0034-1387942
27	13.5	EurJPS	C Dingemann, S Eaton, G Aksnes, et al	ERNICA consensus conference on the management of patients with esophageal atresia and tracheoesophageal fistula: diagnostics, preoperative, operative, and ...	2020	Consensus	-	Europe	27	https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0039-1693116
28	13.43	JIAPS	AN Gangopadhyay, V Pandey	Anorectal malformations	2015	Review article	-	India	94	https://www.ncbi.nlm.nih.gov/pmc/articles/pmc4268748/
29	13	EurJPS	C Delgado-Miguel, AJ Muñoz-Serrano, et al	Complicated acute appendicitis during COVID-19 pandemic: the hidden epidemic in children	2021	Retrospective review	168	Spain	13	https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0041-1723992
30	12	EurJPS	A Zani, S Eaton, F Morini, et al	European Paediatric Surgeons' Association survey on the management of Hirschsprung disease	2017	Survey	-	Europe	60	https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0036-1593991
31	12	EurJPS	J Zimmer, S Eaton, LE Murchison, et al	State of play: eight decades of surgery for esophageal atresia	2019	Review article	-	Europe	36	https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0038-1668150
32	11.67	EurJPS	R Baird, JM Laberge...	Anastomotic stricture after esophageal atresia repair: a critical review of recent literature	2013	Review article	-	Canada	105	https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0033-1347917
33	11.38	JIAPS	DC Aronson, P Czauderna, R Maibach, et al	The treatment of hepatoblastoma: Its evolution and the current status as per the SIOPEL trials	2014	Review article	-	Europe	91	https://www.ncbi.nlm.nih.gov/pmc/articles/pmc4204244/
34	10	JIAPS	VK Kundal, PR Debnath, A Sen	Epidemiology of pediatric trauma and its pattern in urban India: A tertiary care hospital-based experience	2017	Population survey	-	Global	50	https://www.ncbi.nlm.nih.gov/pmc/articles/pmc5217137/
35	9	JIAPS	S Solanki, V Bhatnagar, AK Gupta, et al	Crossed fused renal ectopia: Challenges in diagnosis and management	2013	Retrospective review	6	India	81	https://www.ncbi.nlm.nih.gov/pmc/articles/pmc3628252/
36	7.2	JIAPS	N Agarwal, RM Shukla, D Agarwal, et al	Pediatric ventriculoperitoneal shunts and their complications: an analysis	2017	Retrospective review	41	India	36	https://www.ncbi.nlm.nih.gov/pmc/articles/pmc5473301/
37	6.33	JIAPS	S Sharma, M Joshi, DK Gupta, et al	Consensus on the management of posterior urethral valves from antenatal period to puberty	2019	Consensus	-	India	19	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6322183/
38	6.25	JIAPS	G Cecchetto	Gonadal germ cell tumors in children and adolescents	2014	Review article	-	Italy	50	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4204242/
39	5.6	JIAPS	GR Prasad, JVS Rao, A Aziz, et al	The role of routine measurement of intra-abdominal pressure in preventing abdominal compartment syndrome	2017	Retrospective review	79	India	28	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5473297/
40	5.25	JIAPS	JS Aihole, A Gowdra, D Javaregowda, et al	A clinical study on congenital diaphragmatic hernia in neonates: Our institutional experience	2018	Retrospective review	83	India	21	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6042159/

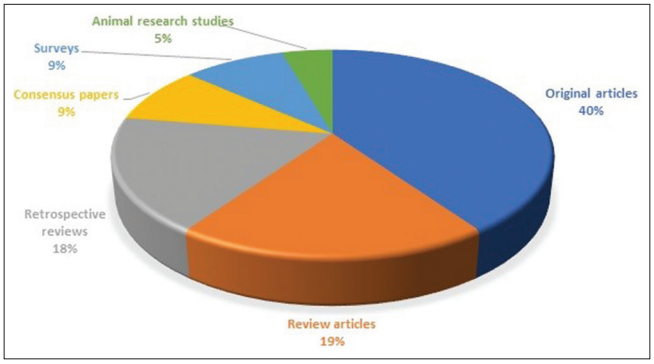

Figure 2: Distribution of the top-cited articles published in pediatric surgery between 2013 and 2022.

Table 2: Topics covered in the top cited articles.

Subject of the scientific paper	Number of articles
Esophageal atresia/Tracheo-esophageal fistula	6
Necrotizing enterocolitis	5
Acute appendicitis	4
Hirschsprung's associated enterocolitis	2
Hirschsprung's disease	2
Congenital diaphragmatic hernia	2
Tissue engineering	1
Vascular anomalies	1
Enhanced recovery protocol	1
Pediatric thyroidectomy	1
Neuroblastoma	1
Post-operative opioid prescription	1
Telemedicine in the pediatric surgery	1
Biliary atresia	1
Choledochal cyst	1
The global initiative for children's surgery	1
Formulation of research question–Stepwise approach	1
Anorectal malformation	1
Hepatoblastoma	1
Pediatric trauma	1
Crossed fused renal ectopia	1
Pediatric ventriculo-peritoneal shunts	1
Posterior urethral valves	1
Gonadal germ cell tumors	1
Abdominal compartment syndrome	1

The various topics covered in these 40 articles are summarized in [Table 2].

DISCUSSION

EA-TEF, NEC, acute appendicitis, HD and CDH were the conditions in the most cited publications. The overwhelming attention received by neonatal surgical conditions is not surprising reflecting the overall improved survival rate of neonates with advances in treatment. Hence, despite the fact that these are common neonatal surgical afflictions with decades of research and well-laid protocols of management, these still form the bulk of the published material that are widely read and cited worldwide. We also see a lower priority of recent advances like telemedicine, ERP and tissue engineering as reflected by the relatively few cited clinical manuscripts despite being the state-of-the-art advances in pediatric surgery, probably because these are practically relevant in very few centres all over the world.

Pediatric surgery is now a firmly established field and JIAPS is the flagbearer pediatric surgical journal in India.[2] A comparison of the number of original and review articles in the three leading international pediatric surgery journals with those in JIAPS, highlight a significant difference. Journals with higher IF and those with international repute have a higher number of review articles and original articles compared to retrospective series and case reports which are more in JIAPS.

The scientific community receives longer exposure toward older publications which, thereby, amass a large number of citations irrespective of their scientific significance.[3] We have eliminated that bias (arising from the differences between the publication dates of manuscripts) by taking the citations per year into account rather than the total citation count. However, it was not possible to do away with biases such as self-citation, institutional bias, language bias, and powerful person bias in our study. As suggested by several other studies, manuscripts originating from the USA continue to receive a high number of citations which may be reflective of preferential citation of "local research."[4]

There are various databases from which bibliometric data of an article may be obtained, all of which have different catchment areas, and hence, have varying citation counts. The user base also varies, for example, "Google Scholar" is a free resource in contrast to the "Web of Science" which is a paid service. The "Google Scholar" citation count is usually higher as it incorporates citations beyond peer-reviewed articles (books, websites, dissertations and open-access online journals) and hence, bibliometric analyses obtained from "Google Scholar" are expected to be more realistic than the other sources.[5]

Our observations on citation analysis have shown essential insights into what it takes to be read widely amongst your

peers and be cited. Articles on areas that have a long-standing effect in the practice and research of pediatric surgery are the ones that gather the most citations. To become more meaningful, these analyses need to be repeated in certain intervals to project a trend rather than just a snapshot.

CONCLUSION

The most cited manuscripts as found in this study relate to etiology, diagnosis, and management of common surgical conditions, more so in neonates. Scientific articles on advances in surgical techniques were few. Journals with higher IF and those of international repute publish a higher number of review articles and original articles compared to the Indian journal, JIAPS, which publishes more of retrospective series and case reports.This information would be of value to young pediatric surgeons, especially those in training, to choose their prospective research and create a lasting impact on the field of pediatric surgery. In addition to being a reference of what could be considered as influential, this study also provides reference for researchers as to what makes a "citable" paper in pediatric surgery. For the editorial team, it provides insight into the kind of articles that are of interest to pediatric surgeons worldwide, and this would help develop ideas to further improve penetrance and quality of the journal in the long run.

Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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