Publication Trends in Pediatric Stone Disease: A Bibliometric Analysis

Tendencias de publicación en la litiasis pediátrica: Un análisis bibliométrico

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Abstract

Introduction In the pediatric population, the prevalence of stone disease has increased in recent years. We aim to analyze the bibliometric characteristic of available literature on the management of stones in this population.

Methods We performed a search for articles published until December 2019 on the Scopus, Google Scholar, PubMed, Embase, and Web of Science databases using the keywords *children*, *lithiasis*, and *stones*. We excluded articles involving patients older than 18 years of age and those with non-urological lithiasis. Then, we performed a bibliometric analysis using the original language, year of publication, impact factor (yearly number of citations), and absolute citation count as variables to calculate the impact index (number of sources adjusted for the time since publication).

Results We included 291 articles published between 1940 and December 2019 for analysis. The average number of citations per manuscript was of 15.3 ($\pm$ 21.9), and the average impact index was of 502 ($\pm$ 976.4). A total of 4 articles were published before 1970. The evaluation of historical landmarks that could affect citation counts, such as the launch of a journal specialized in pediatric urology (*Journal of Pediatric Urology*), showed a mean citation count of 23.29 before the first edition, and of 14.96 after ($p = 0.0006$). The variation on the impact index with the same criteria was of 539.6 before the first edition of the *Journal of Pediatric Urology*, and of 316.32 after ($p = 0.001$). The average number of citations before internet access was of 17.9,

Keywords
- urolithiasis
- pediatrics
- systematic review
- journal impact factor
- bibliometrics
- urologic diseases

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and, after the internet, of 15.1 ($p = 0.17$). We also observed a difference in counts regarding languages of publication.

Conclusions The proportional academic productivity on pediatric stone disease demonstrates that citation counts do not reflect the true academic impact of subspecialized topics.

Resumen

Introducción La prevalencia de la urolitiasis en la población pediátrica ha venido aumentando en los últimos años. Este manuscrito busca analizar las características bibliométricas de la literatura disponible sobre el manejo de la urolitiasis pediátrica.

Métodos Realizamos una búsqueda por artículos publicados hasta diciembre de 2019 en las bases de datos Scopus, Google Scholar, PubMed, Embase y Web of Science con las palabras *children*, *lithiasis*, y *stones*. Excluimos artículos con pacientes mayores de 18 años y litiasis no urológica. Posteriormente, realizamos un análisis bibliométrico utilizando el idioma original, el año de publicación, el factor de impacto (número de citas anuales), y el recuento absoluto de citas para calcular el índice de impacto (número de fuentes ajustadas por el tiempo desde la publicación).

Resultados Analizamos 291 artículos publicados desde 1940 hasta diciembre de 2019. El promedio de citas por artículo fue de 15,3 ($\pm$ 21,9), y el índice de impacto fue de 502 ($\pm$ 976,4). Un total de 4 artículos fueron publicados antes de 1970. La evaluación de hitos históricos que pudieran afectar el recuento de citas, como el lanzamiento de una revista de urología pediátrica (*Journal of Pediatric Urology*), mostró un recuento medio de citas de 23,29 antes de la primera edición, y de 14,96 después ($p = 0{,}0006$). La variación del índice de impacto con los mismos criterios fue de 539,6 antes de la primera edición de esta revista, y de 316,32 después ($p = 0{,}001$). El promedio de citas antes del acceso a la internet fue de 17,9, y después, de 15,1 ($p = 0{,}17$). Observamos también una diferencia en los recuentos respecto a los idiomas de publicación.

Conclusiones La productividad académica sobre la litiasis pediátrica demuestra que los recuentos de citas no reflejan el verdadero impacto académico de los temas subespecializados.

Palabras clave
- urolitiasis
- pediatría
- revisión sistemática
- factor de impacto de la revista
- bibliometría
- enfermedades urológicas

Introduction

In the pediatric population, stone disease (SD) is considered a rare condition. However, the prevalence has increased to 2% to 3% in recent years, with the age at presentation varying from 5 to 15 years in most series.[1–3] Nevertheless, there is insufficient evidence to manage urinary SD in children because of the lack of clinical trials that include adequate sample sizes.[4]

Due to the rapid growth in research, there is a deficit concerning the production, application, and publication of studies providing this type of scientific information. One of the main issues is the quality and impact of the papers published in medical journals. To assess the traits and quantity of scientific production tools that enable an objective measurement, such as the bibliometric analysis, are required.[5] A bibliometric analysis is a statistical evaluation of published scientific articles that assesses the influence of a publication in the scientific community.[6]

As literature production depends on the topic's prevalence, pediatric urological publications are limited compared with those related to urology in adults. Stone disease is a relatively new and subspecialized field, and the literature on it is scarce. We aimed to describe and analyze the bibliometric characteristics of available literature that supports the management of stones in pediatric patients. For this evaluation, we performed a literature review and bibliometric analysis using indicators such as the impact factor (yearly number of citations), the impact index (number of citations adjusted for the time since publication), and the number of citations per article.[7,8]

Methods

A systematic literature search was performed by our librarian on May the 8, 2020. It was conducted on the Scopus, Google Scholar, PubMed, Embase, and Web of Science databases using the following medical subject headings (MeSH): *children*, *lithiasis*, and *stones*, as well as the connector *AND*.

Articles and journal reviews published between January 1940 and December 2019 were included, with no language restrictions. Articles written in 2020 were excluded because their final versions had not been formally published, leading to an incorrect citation number. All press articles and books were also excluded. The results obtained from every database were combined in an Excel (Microsoft Corp. Redmond, WA, United States) file, and duplicated publications were screened by title and merged. All manuscripts about non-urological stones were excluded.

After this initial screening, a more stringent evaluation of the selected manuscripts was performed by reading the available abstracts. All abstracts were read by three of the authors (N.F., D.V., and J.V.) Abstracts describing patients older than 18 years of age or patients with non-urological lithiasis were excluded. Articles with abstracts that did not include information about the study population were read entirely and included in the search for further analysis.

We accessed the full text and reviewed the articles selected, and the final evaluation and bibliometric analysis were performed with a total of 291 articles. Data about each manuscript was then collected and tabulated for analysis. The variables were: original language, year of publication, citations up to when the literature search was performed, calculated impact index (number of citations adjusted for the time since publication) based on the number of citations at the moment the search was performed, and names of the first author and institution.[7] The first authors' sex, affiliation, and country were also registered. The articles were classified by type of the study (case series, case reports, systematic reviews, non-systematic reviews, case-control studies, cohorts, and clinical studies) and level of evidence, following the US Preventive Services Task Force. The main topic discussed in each manuscript was also included for final analysis. Finally, journal data was collected (impact factor, Scimago Journal & Country Rank (SJR), H-index, and quartile index.

The articles were organized following the citation counts per manuscript. The bibliometric analysis was performed using the absolute count of citations for each publication, along with the impact index previously published by one author,[9] a recently-developed indicator that aims at reducing the bias of time since publication; the impact index is defined as the number of citations adjusted for the time since publication, and it is calculated as follows: inlin-111 the lower the index, the higher the impact.[7]

Results

The initial search returned 742 articles, and 291 were included in the final analysis. Only 4 articles had been published before 1970. The literature concerning urolithiasis in the pediatric population increased substantially in the last decade, with 133 articles (45.7%) published from 2011 to 2020. The journals with the greatest number of publications in this topic were *Pediatric Nephrology* (impact factor 2.23; SJR 0.83; H-index 107; Q1), *Urology* (2.64; 0.86; 177; Q2), *Journal of Pediatric Urology* (1.27; 0.72; 46; Q2), *Journal of Endourology* (2.94;1.12; 92; Q1), *Journal of Urology* (7.45; 2.4; 256; Q1), and *International Urology and Nephrology* (2.19; 0.62; 52; Q2). The distribution by type of articles was as follows: case series – 55% (161); non-systematic literature reviews – 15% (44); case reports – 12% (35); case-control studies – 7% (21); cohorts – 6% (16); clinical trials – 3% (9); and systematic reviews – 2% (5) (►**Fig. 1**).

The 56.01% of first authors are men, while women represent 13.4%. Unfortunately, the sex of the remaining authors could not be identified, either because of only registration of name initials or because of names whose sex is not easily categorized. Most of the authors' affiliations were from Turkey, followed by the United States, India, Spain, and Iran (►**Fig. 2**). A similar distribution was found on women affiliation; 8 Turkish, 4 Spanish, 3 Canadian, Italian, and Irani. The institutions with more publications were Dicle University (Turkey), Gaziantep University (Turkey), University Hospital of Monastir (Tunisia).

The average number of citations per article was of 15.3 ($\pm$21.9) (►**Fig. 2**), and the impact index was of 502 ($\pm$976.4) (►**Fig. 3**). The analysis of the absolute citation count showed that the most cited articles were those published in the last twenty years. Of the top ten cited articles, nine have a male for the first author, and the only one with a female author is in 5th place. Also, it is striking that most cited articles come from developed countries. The evaluation of historical landmarks that could affect citation counts, such as the launch of a journal specializing in pediatric urology (*Journal of Pediatric Urology*), showed a mean citation count of 23.29 before the first edition, and of 14.96 after ($p = 0.0006$). Using the same criteria, the variation in the impact index was of 539.6 before the first edition, and of 316.32 after ($p = 0.001$). A similar analysis was performed for the beginning of internet access and the effect of the access to online journals. Most journals were already being published online by 1990; the citation average before internet access was of 17.9, and after it, of 15.1 ($p = 0.17$). The impact index was of 745.9 prior to the advent of the internet, and of 315.1 after it ($p > 0.000$). The most cited article had 148 citations, while there were 45 articles without citations. However, when the number of citations and the impact index were compared in terms of language, the average number of English articles was of 16.8, against 2.2 articles in Spanish ($p > 0.000$).

Based on our search, the first publication concerning pediatric SD was about urinary obstruction as a disease complication. The most discussed topics were clinical management (125 publications) and predisposing risk factors (95 publications). The top 10 most cited manuscripts discussed risk factors. The top 5 most cited authors were pediatric urologists, followed by pediatric nephrologists. The main topic of the articles in our search follows a pattern according to the decade of publication. Risk factors were more commonly discussed in the 1970s and 1980s, while management was the trending topic in publications from the 1990s.

Discussion

Pediatric SD is a very specialized topic, with a small readership. Therefore, the use of simple citation counts to evaluate the

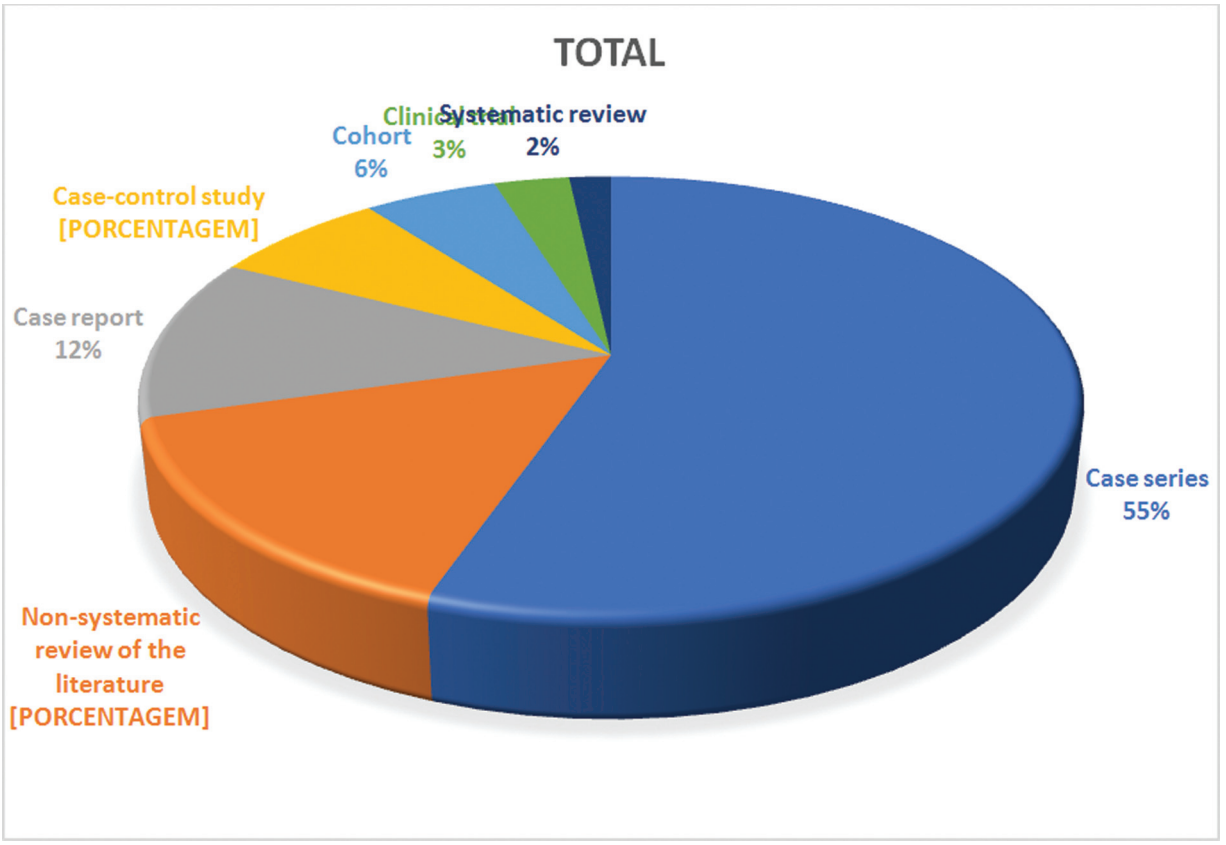

Fig. 1 Distribution of studies by type of article.

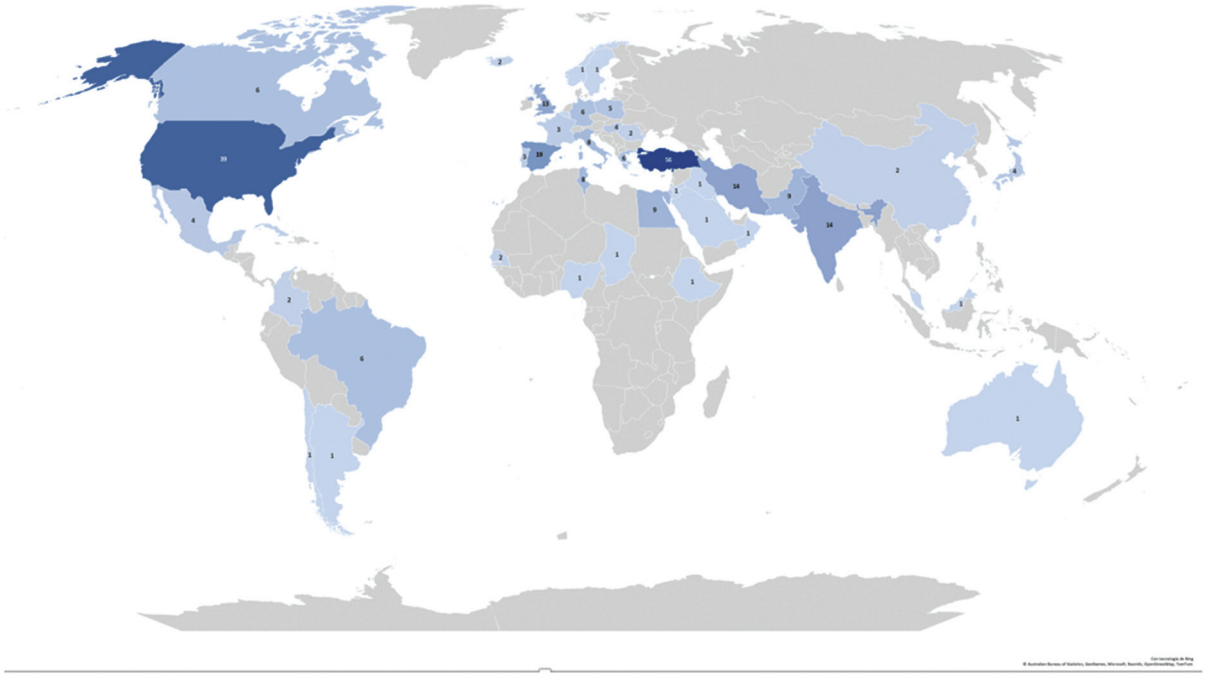

Fig. 2 World distribution of the institutions to which the first authors are affiliated.

academic impact in this field may not necessarily reflect the importance of the published literature. Based on our results, the average citations per manuscript of 15.3 in this field reflect how big of a difference there is compared with more general topics. Thus, we believe an adjusted citation metric based on the potentially-interested readership is needed.

The impact index previously used by one of our authors was recently implemented to adjust the effect of time of

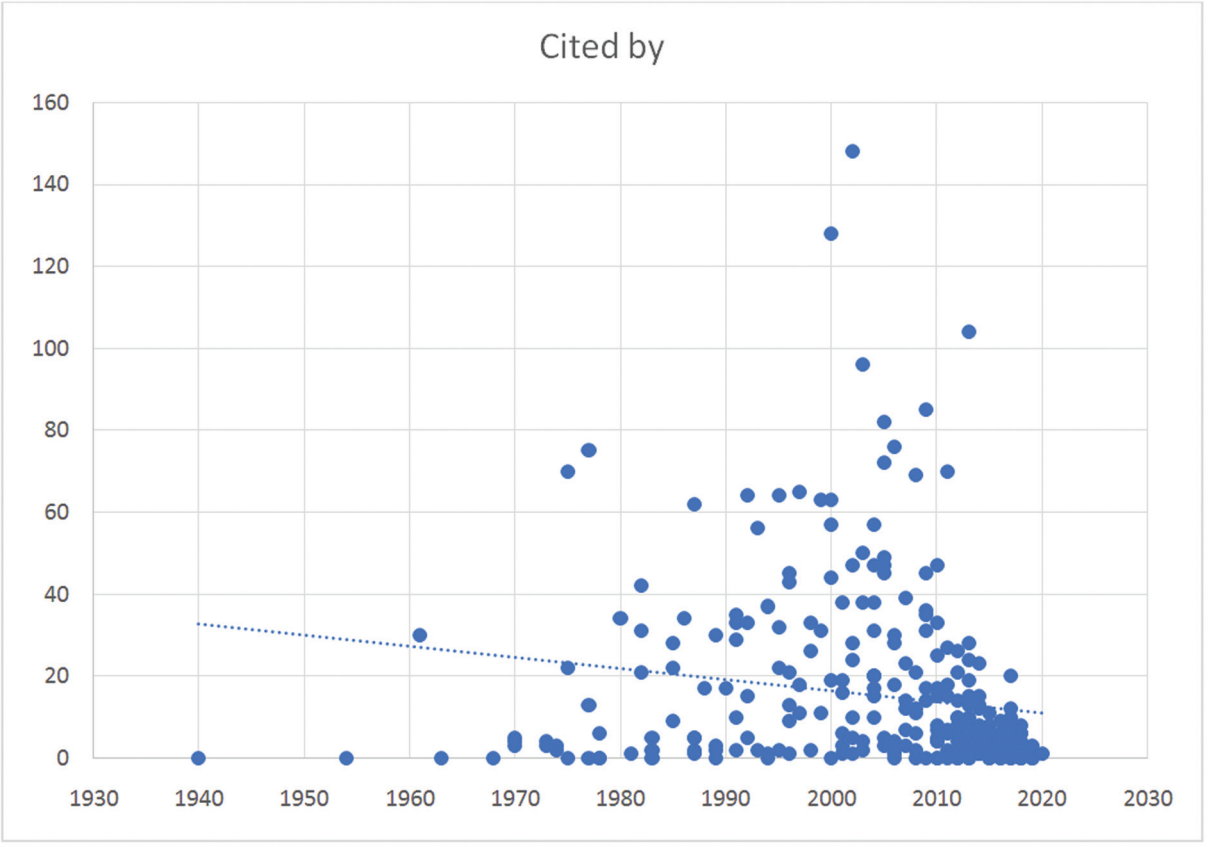

Fig. 3 Citations distribution per year.

publication on a manuscript. In his paper,[7] he acknowledges that the most consumed and cited manuscripts tend to be the most recent ones. However, we believe that raw citations do not reflect the real academic impact of published literature, and the impact factor does not correlate with the quality of the publication.[8]

Our results show that additional variables need to be considered when performing bibliometric analyses to evaluate the impact of published literature. At first sight, only considering the absolute citation count, the introduction of a highly-specialized journal (on pediatric urology) and the advent of the internet did not accurately show the impact on literature. However, when analyzed using the impact index, we saw a significant difference after the first edition of the journal and the massive use of the internet, meaning that "niche", highly specialized journals may have similar behavior with their impact factor.

When comparing the impact factor of the *Journal of Pediatric Urology* (1.578), the *Journal of Urology* (5.157), and *European Urology* (17.581), one may falsely interpret these impact factors by not considering the target readership, which will decrease as the journal becomes more specialized. For example, if we use the American Urological Association's (AUA) 2018 census to know the target population of each journal, we can adjust the impact factor by the readership; the ratio for the *Journal of Pediatric Urology* would be 380.8 (for 601 pediatric urologists), 2,454 for the *Journal of Urology* (for 12,660 urologists), and 720 for *European Urology*.[10] Furthermore, the impact factor attempts to represent the publication's reputation by assuming that the journal will have greater recognition in the scientific community with more citations. However, as the creator of the impact factor, Eugene Garfield, said: "impact simply reflects the ability of the journals and editors to attract the best paper available".[5] Taking this into account, articles with the most citations are more recent; therefore, they have a greater impact.

Even within specialized topics in pediatric urology, there is a big difference in citation counts. For example, vesicoureteral reflux, which may have a broader readership beyond pediatric urology, has an impact index between 1.8 and 49.4, which differs significantly from that of SD with an impact index ranging from 6.7 to 3,900.[6] Similar findings can be observed for kidney transplant: the average number of citations is of 80 ($\pm$40), and the impact index is of 25 ($\pm$13) compared with 15.3 ($\pm$21.9) and 502 ($\pm$976.4) for articles on SD.[11]

As authors, we believe the rise in literature productivity may be linked to the availability of novel surgical technologies that enable the management of pediatric SD. Nonetheless, the productivity still extrapolates the evidence that currently exists from studies performed on adult subjects.[12] Moreover, SD is a topic that has been gaining relevance and importance due to the increased incidence in the past twenty years, which is mirrored by the rise in publications about this pathology, which peaked in the previous decade. Robotic

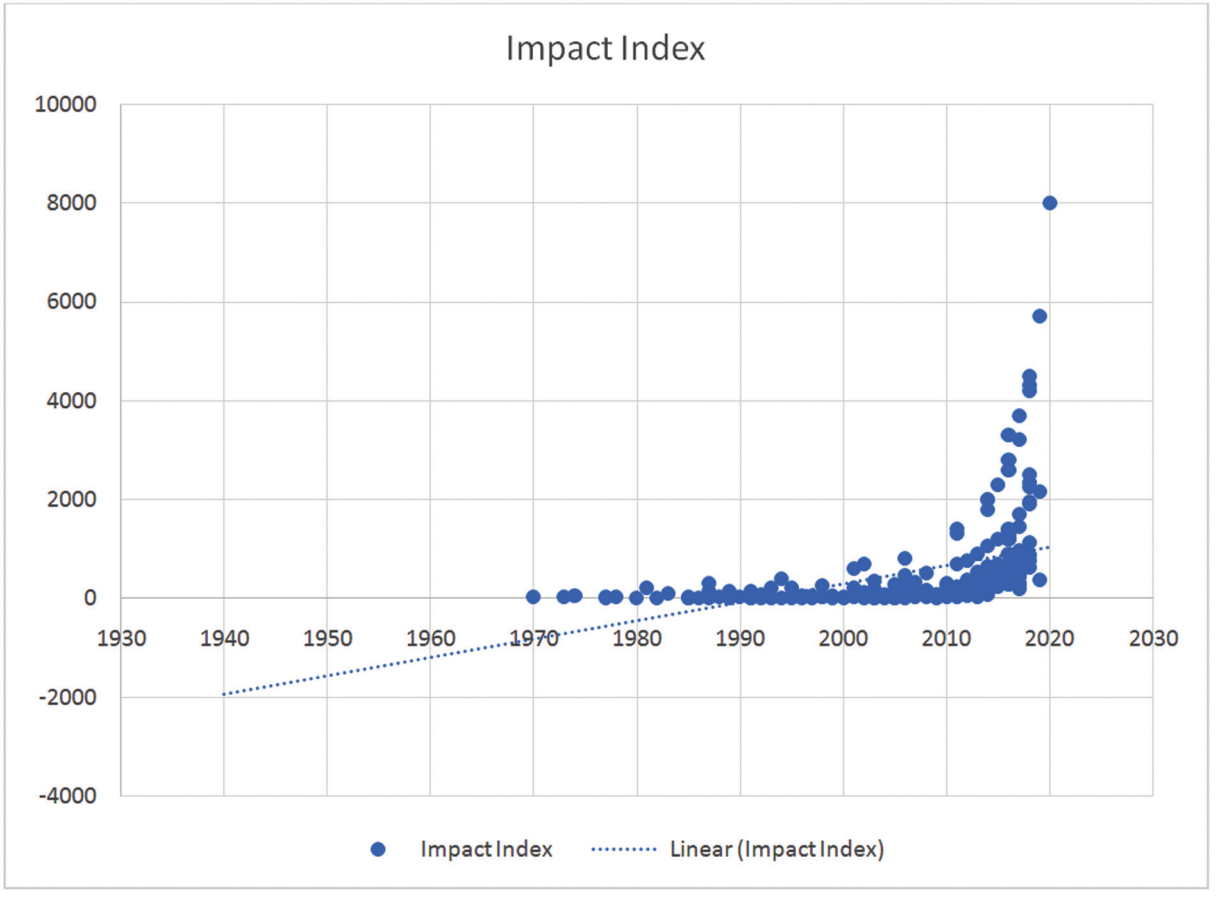

Fig. 4 Impact index distribution per year.

surgery in the pediatric population is a quickly-evolving topic, with exponential growth in publications over the years.[13] However, most of the publications have a low level of evidence. The same has been identified in the literature regarding hypospadias.[14] This phenomenon is also reproduced in pediatric SD. We found that most of the 291 publications are case series or reports, which are experimental designs of questionable validity, which cannot be extrapolated to create recommendations for diagnostic and management strategies for the pediatric population.

Although we believe the gender gap in the authorship of medical literature exceeds this paper's objectives, our findings correlate with other research results. We found women are less likely to be published, and their publications have fewer citation counts than men. In 2021, Suarez et al. found that first female authors represent only 21% of first authors in specialized urology journals, were significantly less published in high impact journals, and female representation increased with double-blinded reviews.[15] Reasons for discrepancy should be explored with further investigations.

Additionally, our results show that the language of publication plays an important role when citations and literature consumption are bibliometrically analyzed. A good example is how most metanalyses exclude articles written in languages other than English.[7] Authors need to acknowledge this and submit their results to journals that are only published in English. However, an effort by journals and editorial boards to support and offer services in other languages could be considered.

The variability in citations limits the structure of the present manuscript over time and how this impacts the interpretation of our results. Nonetheless, we firmly believe in the importance of questioning how citation counts are interpreted at a given point in time.

Conclusions

The proportional academic productivity regarding pediatric SD demonstrates that citation counts do not reflect the true academic impact of subspecialized topics. Future efforts will need to address the impact of published literature by using adjusted metrics according to the potential size of the readership.

Availability of Data and Material

All the data obtained as well as the analysis, are available if requested to the corresponding author.

Authors' Contributions

Conceptualization: NF; methodology: NF, JVC, DV; formal analysis and investigation: NF, NV, JVC, JC, GT; writing – original draft, review, and editing: NF, DV, JVC, JC, GT; and supervision: NF.

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Conflict of Interests
One of the authors has published an article on a similar topic before the submission of the present manuscript.

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