

# Plastic Surgery Research From Low- and Middle-income Countries Over a Decade: A Web of Science Analysis

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**Background:** Research publications from low- and middle-income countries (LMICs) are underrepresented in the plastic surgery literature. Identifying trends in impactful research publications from LMICs can help guide strategies for more equitable contributions to the field from nations facing similar barriers to success.

**Methods:** Using Web of Science, the top 100 most-cited plastic surgery articles published by researchers from LMICs over the past decade were collected. Trends in various factors, such as authorship contribution, country affiliation, and institutional affiliation were analyzed. Coauthorship collaborations were illustrated using VOSviewer.

**Results:** The top 100 articles had a combined total of 3398 citations, ranging from 16 to 157 citations per article. India and Egypt accounted for 81% of publications, likely attributable to the research collaborations between these nations and high-income countries. Craniofacial surgery, which is performed at disproportionately higher rates in LMICs, was the main research focus in 22 of 100 publications.

**Conclusions:** As plastic surgery continues to evolve worldwide, promoting the formation of partnerships between underrepresented LMICs and high-income countries will drastically improve the field. These findings provide a snapshot of key LMIC-based contributors to the plastic surgery literature, offering a resource that may be referenced by potential collaborators. (*Plast Reconstr Surg Glob Open* 2025;13:e6821; doi: [10.1097/GOX.0000000000006821](https://doi.org/10.1097/GOX.0000000000006821); Published online 22 May 2025.)

## INTRODUCTION

Researchers from low- and middle-income countries (LMICs) have historically faced significant barriers in contributing to medical research, including high article processing fees, insufficient research infrastructure, and limited funding opportunities.<sup>1,2</sup> To mitigate these challenges in the field of plastic surgery, interventions such as journal fee waivers and collaborations with high-income countries (HICs) for both educational guidance and financial support have been introduced over the past several decades.<sup>3,4</sup> Despite these efforts, LMICs only account for one-fifth of publications in leading plastic surgery

journals.<sup>5</sup> Increasing the representation of LMIC-authored research within the plastic surgery literature is essential for improving various aspects of plastic surgery practice for other LMICs and disadvantaged areas within HICs. For example, LMIC-authored research that comparatively evaluates novel surgical techniques may be used to inform the adoption of these alternative approaches worldwide.

Bibliometric analyses examine research trends over time within a specific field by investigating factors such as authorship, institutional affiliations, and citation counts. Articles that are highly cited generally spotlight top trending subjects or groundbreaking research findings within a field at the time of publication, and these articles tend to remain influential for years afterward.<sup>6</sup> These types of studies can evaluate how interest in specific research topics within a field changes over time. Although a bibliometric analysis of collaborations between HICs and LMICs in global reconstructive surgery literature was conducted in January 2023, no bibliometric study to date has specifically

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examined the characteristics of top-cited plastic surgery research originating from LMICs.<sup>7</sup> Growing awareness of research disparities in plastic surgery suggests the need for this focused analysis, which may help identify gaps and guide strategies for more equitable research contributions to the field from underrepresented nations.

The objective of this study is to analyze the contributions by LMICs to plastic surgery research over the past decade. By investigating key trends in publication output, authorship patterns, journals, and citation trends, this analysis will offer a comprehensive overview of the current state and recent evolution of plastic surgery research from LMICs. We hypothesize that the total publication output of LMICs is dominated by select countries that have strong collaborations with HICs.

## METHODS

### Search Methodology

The 2023 Journal Citation Reports from Clarivate Analytics was used to identify 35 major journals within the field of plastic surgery (Table 1). In addition, studies by

**Table 1. Journals Included in Initial Web of Science Search**

Title	Impact Factor
<i>Aesthetic Plastic Surgery</i>	2.0
<i>Aesthetic Surgery Journal</i>	3.0
<i>Annals of Plastic Surgery</i>	1.4
<i>British Journal of Oral and Maxillofacial Surgery</i>	1.7
<i>Burns</i>	3.2
<i>Burns and Trauma</i>	6.3
<i>Cleft Palate Craniofacial Journal</i>	1.2
<i>Clinics in Plastic Surgery</i>	1.8
<i>Dermatologic Surgery</i>	2.5
<i>European Journal of Plastic Surgery</i>	0.6
<i>Facial Plastic Surgery</i>	1.1
<i>Facial Plastic Surgery Clinics of North America</i>	1.9
<i>Hand Clinics</i>	0.9
<i>Hand Surgery and Rehabilitation</i>	0.9
<i>International Journal of Oral and Maxillofacial Surgery</i>	2.2
<i>JAMA Facial Plastic Surgery</i>	4.7
<i>Journal of Burn Care &amp; Research</i>	1.5
<i>Journal of Cosmetic and Laser Therapy</i>	1.7
<i>Journal of Cosmetic Dermatology</i>	2.3
<i>Journal of Cranio-Maxillofacial Surgery</i>	2.1
<i>Journal of Craniofacial Surgery</i>	1.0
<i>Journal of Hand Surgery (American Volume)</i>	2.1
<i>Journal of Hand Surgery (European Volume)</i>	2.0
<i>Journal of Plastic Surgery and Hand Surgery</i>	1.0
<i>Journal of Plastic, Reconstructive &amp; Aesthetic Surgery</i>	2.0
<i>Journal of Reconstructive Microsurgery</i>	2.2
<i>Journal of Stomatology, Oral and Maxillofacial Surgery</i>	1.8
<i>Microsurgery</i>	1.5
<i>Ophthalmic Plastic and Reconstructive Surgery</i>	1.2
<i>Oral and Maxillofacial Surgery Clinics</i>	1.3
<i>Plastic and Reconstructive Surgery</i>	3.2
<i>Plastic and Reconstructive Surgery Global Open</i>	1.5
<i>Plastic Surgery</i>	0.7
<i>Seminars in Plastic Surgery</i>	2.3
<i>Wounds</i>	1.4

### Takeaways

**Question:** How have researchers from low- and middle-income countries (LMICs) contributed to the corpus of plastic surgery research over the past decade, and which nations contribute most significantly?

**Findings:** The vast majority of high-impact publications come from India and Egypt, large nations with established research connections to high-income countries. Craniofacial research is thoroughly discussed in the top 100 most-cited LMIC-authored plastic surgery articles.

**Meaning:** Although publications from LMICs are under-represented among the top-cited articles in plastic surgery, perspectives from these nations are crucial to the development of this field, and collaborations with high-income countries can help mitigate these disparities.

Asaad et al<sup>8</sup> and Zeng et al<sup>9</sup> that have previously identified top plastic surgery journals were referenced. Qualifying journals demonstrated a primary focus on topics relating to plastic surgery or a plastic surgery subspecialty. On August 20, 2024, all articles published in these journals over the last decade (January 1, 2014, to August 20, 2024) were identified using Web of Science. Articles published by first authors from nations classified by The World Bank Group as “low-income economies” or “lower middle-income economies” were eligible for inclusion.<sup>10</sup> The Web of Science “countries/regions refine tool” was used to include articles published only by authors from these nations. This search yielded 4616 articles. Publications were then ordered from highest to lowest by citation number.

Manual screening of each article was performed to assess if each publication addressed one of the following criteria: (1) discussion of procedures performed by plastic surgeons, as defined by the Accreditation Council for Graduate Medical Education Program Requirements for Graduate Medical Education (integrated plastic surgery residency, independent plastic surgery residency, and plastic surgery-related fellowships); (2) discussion of the ethics, economics, or business of plastic surgery; (3) discussion of standards of practices, emerging techniques, or evidence-based medicine in plastic surgery; and (4) discussion of plastic surgery trends in research literature or social media. Article selection and data extraction were performed independently by the primary author. The methodology and search results were reviewed and approved by the senior author.

### Data Collection and Analysis

Data for the top 100 articles were extracted from Web of Science into an Excel datasheet for extensive analysis. The following variables were examined: article title, publication year, author names, first-author nation, institutional affiliations, number of citations (total and averaged per year), funding agencies, journal, journal impact factor, open access (yes/no), Hirsch index (*h*-index), Eigenfactor score, and Altmetric Attention Score (AAS). The *h*-index measures author productivity by scoring 1 point for each publication

that has been cited at least the same number of times as the author's total number of publications.<sup>11</sup> The ratio of citations to the number of published articles is calculated by the Eigenfactor score, which differs from the impact factor in that self-citations are excluded, and citations are increasingly weighted based on time spent by researchers accessing the journal.<sup>12</sup> The AAS is an engagement metric used to determine the attention received by a research article from a variety of sources.<sup>13</sup> A coauthorship map was created using the VOSviewer software (Centre for Science and Technology Studies, Leiden University, Netherlands) to depict collaborations between all authors cited in the top 100 articles.

## RESULTS

The top 100 most-cited plastic surgery articles published in the past 10 years by first authors from LMICs were identified from the initial 4616 publications (Table 2). (See table, Supplemental Digital Content 1, which displays the list of top 100 cited plastic surgery articles by LMICs, <https://links.lww.com/PRSGO/E71>.) There was a combined total of 3398 citations. Article citation counts ranged from 16 to 157, with an average of 33.97 (SD = 21.43) and

a median of 24.5 (interquartile range = 21–40). The average annual citation counts, after adjustment for time since publication, ranged from 1.42 to 26.17, with a mean of 4.02 (SD = 2.82) and a median of 3.33 (interquartile range = 2.55–4.70). (See figure, Supplemental Digital Content 2, which displays the number of citations per year for the top 100 cited articles in plastic surgery by LMICs, <https://links.lww.com/PRSGO/E72>.) The years 2018, 2019, and 2014 produced the most published articles (n = 22, 17, 15, respectively). (See table, Supplemental Digital Content 3, which displays total publications per year for the top 100 cited plastic surgery articles by LMICs, <https://links.lww.com/PRSGO/E73>.) From this list, 7 articles were open access publications (Supplemental Digital Content 1, <https://links.lww.com/PRSGO/E71>).

A total of 320 authors contributed to the top 100 cited articles. The most common contributing authors published 6 articles among the top 100 (Table 3). First authors were from 7 different nations. Egypt accounted for the most articles in the top 100 (n = 45), followed by India (n = 36) and Lebanon (n = 7). (See table, Supplemental Digital Content 4, which displays contributing first-author

**Table 2. List of Top 10 Cited Plastic Surgery Articles by LMICs**

Rank	Title	Authors	Journal	Publication Year	Total Citations	Average per Year	Alt-metric Score	Country
1	Non-suturing microvascular anastomosis in maxillofacial reconstruction—a comparative study	Mudigonda SK, Murugan S, Velavan K, et al	<i>Journal of Cranio-Maxillofacial Surgery</i>	2020	157	26.17	0	India
2	Autologous platelet rich plasma: topical versus intradermal after fractional ablative carbon dioxide laser treatment of atrophic acne scars	Gawdat HI, Hegazy RA, Fawzy MM, et al	<i>Dermatologic Surgery</i>	2014	104	8.67	10	Egypt
3	Combined autologous platelet-rich plasma with microneedling verses microneedling with distilled water in the treatment of atrophic acne scars: a concurrent split-face study	Asif M, Kanodia S, Singh K	<i>Journal of Cosmetic Dermatology</i>	2016	100	10	38	India
4	Intralesional botulinum toxin type A equally effective and better tolerated than intralesional steroid in the treatment of keloids: a randomized controlled trial	Shaarawy E, Hegazy RA, Hay RMA	<i>Journal of Cosmetic Dermatology</i>	2015	76	6.91	3	Egypt
5	Ablative CO2 fractional resurfacing in treatment of thermal burn scars: an open-label controlled clinical and histopathological study	El-Zawahry BM, Sobhi RM, Bassiouny DA, et al	<i>Journal of Cosmetic Dermatology</i>	2015	71	6.45	17	Egypt
6	Microneedling for acne scars in Asian skin type: an effective low cost treatment modality	Dogra S, Yadav S, Sarangal R	<i>Journal of Cosmetic Dermatology</i>	2014	67	5.58	23	India
7	Platelet-rich plasma versus cross technique with 100% trichloroacetic acid versus combined skin needling and platelet rich plasma in the treatment of atrophic acne scars: a comparative study	Nofal E, Helmy A, Nofal A, et al	<i>Dermatologic Surgery</i>	2014	67	5.58	10	Egypt
8	A systematic review and meta-analysis of the clinical outcomes for various surgical modalities in the management of temporomandibular joint ankylosis	Al-Moraissi EA, El-Sharkawy TM, Mounair RM, et al	<i>International Journal of Oral and Maxillofacial Surgery</i>	2015	67	6.09	4	Egypt
9	The effect of autologous activated platelet-rich plasma injection on female pattern hair loss: a randomized placebo-controlled study	Tawfik AA, Osman MAR	<i>Journal of Cosmetic Dermatology</i>	2018	62	7.75	55	Egypt
10	Combining autologous bone marrow mononuclear cells seeded on collagen sponge with Nano Hydroxyapatite, and platelet-rich fibrin: Reporting a novel strategy for alveolar cleft bone regeneration	Al-Ahmady HH, Abd Elazeem AF, Ahmed NEB, et al	<i>Journal of Cranio-Maxillofacial Surgery</i>	2018	57	7.13	0	Egypt

**Table 3. Authors in the Top 100 LMIC Publications**

Rank	Author*	Country	No. Top 100 Publications	No. Citations	h-index
1	Kapoor R	India	6	163	18
2	Shome D	India	6	163	17
3	Al-Moraissi EA	Yemen	5	191	24
4	El-Domyati M	Egypt	5	140	18
5	Bashir MM	Pakistan	4	111	19
6	Sohail M	Pakistan	4	111	16
7	Vadera S	India	4	107	7
8	Abdel-Wahab H	Egypt	3	121	13
9	Choudhery MS	Pakistan	3	100	16
10	Hegazy RA	Egypt	3	220	18
11	Jabbour SF	Lebanon	3	73	12
12	Khan FA	Pakistan	3	92	9
13	Moftah NH	Egypt	3	55	15
14	Nasr MW	Lebanon	3	73	10

\*An additional 306 authors contributed to  $\leq 2$  publications among the top 100 most-cited articles and were not included in this table.

country affiliations in the top 100 list, <https://links.lww.com/PRSGO/E74>.) Authors were affiliated with 87 different organizations and universities. (See table, Supplemental Digital Content 5, which displays organizations and universities contributing to the top 100 list, <https://links.lww.com/PRSGO/E75>.) The most common affiliated institutions were Cairo University (n = 10), Tanta University (n = 9), and Al-Azhar University (n = 7). There were 3 funding agencies, with King Edward Medical University (n = 2) and Jordan University of Science and Technology being the most frequent contributors (n = 2). (See table, Supplemental Digital Content 6, which displays funding agencies contributing to the top 100 list, <https://links.lww.com/PRSGO/E76>.)

The most-cited article was “Non-suturing Microvascular Anastomosis in Maxillofacial Reconstruction—a Comparative Study.” This article has 157 total citations, with an average of 26.17 citations per year. It was published in India in 2020 in the *Journal of Cranio-Maxillofacial Surgery*. The article with the highest Altmetric score (55) was “The Effect of Autologous Activated Platelet-rich Plasma Injection on Female Pattern Hair Loss: a Randomized Placebo-Controlled Study.” This was published in the *Journal of Cosmetic Dermatology* in 2018. The journals accounting for the greatest number of articles in the top 100 list were the *Journal of Cosmetic Dermatology* (n = 39) and *Dermatologic Surgery* (n = 13). (See table, Supplemental Digital Content 7, which displays journals represented in the top 100 list, <https://links.lww.com/PRSGO/E77>.) *Plastic and Reconstructive Surgery* was the journal with the highest impact factor (3.2), article influence score (1.097), and Eigenfactor (0.01025).

Collaborations between authors from LMICs are depicted on a coauthorship citation map created using VOSviewer (Fig. 1). A total of 320 researchers contributed to the top 100 articles, forming 26 clusters of at least 5 collaborating authors. The largest cluster included 20 researchers. Dr. Muhammad Mustehsan Bashir and Dr. Muhammad Sohail, 2 plastic surgeons based in Pakistan, were the most significant contributors to this cluster. Each had 16 collaboration links, with an average year of publication of 2017.

The second largest cluster included 18 researchers, with the largest circle representing Dr. Moetaz El-Domyati

from Egypt. He shared 14 collaboration links and had an average publication year of 2016. Dr. Rinky Kapoor and Dr. Debraj Shome, the 2 authors with the greatest number of article contributions in the top 100 list, were in the same cluster together with 11 total researchers. They both had 10 collaboration links and shared an average publication year of 2019.

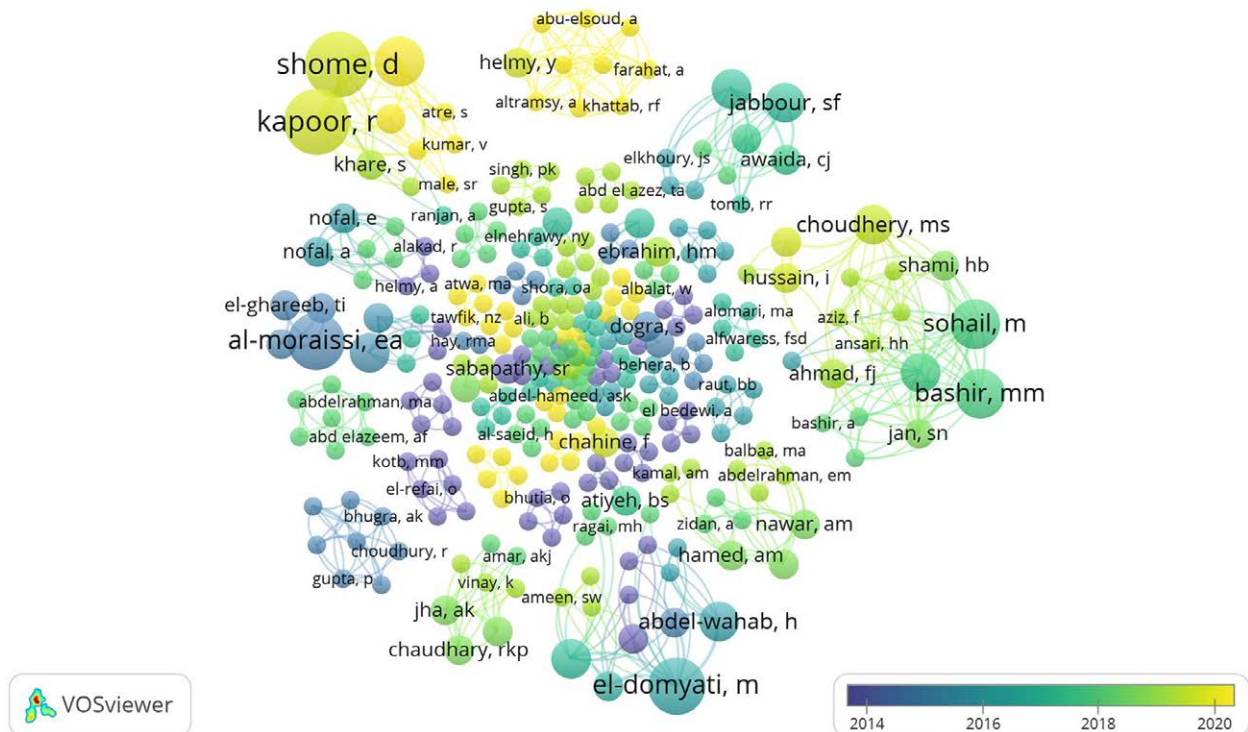
## DISCUSSION

This study represents the first assessment of the top-cited plastic surgery articles published by LMICs. These findings provide valuable insights into the evolving landscape and the emerging focal points of plastic surgery research from LMICs over the past decade. The VOSviewer coauthorship map illustrates collaboration among all contributing authors, which not only encourages further partnerships between researchers from LMICs, but also serves as a reference for those in HICs seeking to work with international colleagues.

One notable finding from these data is the high number of articles from Egypt and India, which together accounted for 81 of the 100 publications. This disproportionately large representation in the top 100 publications can be attributed to several factors, including the large national populations (India with 1.4 billion and Egypt with 111 million) and the comparatively strong research infrastructure in these countries relative to other LMICs.<sup>14,15</sup> Furthermore, these countries benefit from established academic networks with HICs such as the United Kingdom, catalyzing advancement in plastic surgery research alongside several other areas of health care.<sup>16,17</sup>

Despite this advantage, only 13% of LMIC-published plastic surgery articles since 2014 have involved collaborations with HIC authors.<sup>7</sup> Previous literature has demonstrated that highly impactful plastic surgery publications often feature diverse authorship, including institutional geography diversity, which fosters a wide array of cultural viewpoints.<sup>18</sup> Thus, strengthening collaborations with HICs, as done in India and Egypt, could serve as a model for other LMICs to follow to generate highly impactful contributions to the plastic surgery literature.





**Fig. 1.** Coauthorship citation map of the 320 authors included in the top 100 articles. Circle size represents coauthored publications with other authors. The thickness of the lines connecting each circle represents the number of shared citations between the 2 authors. The average year of publication was identified by the circle color, with reference to the associated overlay visualization key.

A relative comparison of citation counts between the articles discussed in this study and citation counts from publications produced by HICs, such as Taiwan and Hong Kong, can help better understand the mark that LMIC researchers have left on this field over the past decade. With a mean citation count of 33.97, the top 100 LMIC-published articles were cited at a higher rate than the average plastic surgery publication from Taiwan ( $n = 9.3$ ) and Hong Kong ( $n = 7.15$ ), according to a prior bibliometric study investigating a similar 10-year timeframe.<sup>19</sup> This demonstrates that the global impact of top research from LMICs supersedes the average article from HICs, further backing the need to achieve equitable access to research in these nations.

Although only 7 LMICs are represented on this list of top-cited articles, it is certainly possible that other LMICs are publishing a substantial volume of plastic surgery research, including articles that did not reach the citation threshold. Moreover, impactful research findings from LMICs are often published in local or regional journals.<sup>20</sup> Although these journals are generally more accessible and affordable for LMIC researchers, they may not be globally indexed, resulting in an underrepresentation of LMIC contributions to the plastic surgery literature. This study specifically identified LMIC contributions to the most impactful research articles as evaluated by citation metrics for Web of Science-indexed articles, rather than comprehensively assessing the cumulative research output published from these nations. Further studies may explore whether other LMICs excluded from this list are generating impactful, although less cited, plastic surgery publications.

Regardless of the underlying reasons, the lack of representation from LMICs excluded from this list hinders the diversity of perspectives and innovations in high-impact plastic surgery literature. Financial limitations often pose challenges to LMIC researchers, but funding is not always necessary to publish impactful research. In fact, only 13.3% of the most-cited plastic surgery articles over the last 50 years received funding.<sup>21</sup> Research from LMICs often addresses clinical, procedural, and educational approaches tailored to low-income areas. Even case report studies, which may not establish causal relationships, can offer valuable insights to surgeons in both LMICs and impoverished communities within HICs.<sup>22,23</sup> Findings from these studies may offer solutions to optimize patient outcomes, minimize costs for surgical techniques, promote the use of regionally accessible materials, and improve healthcare accessibility.

In addition to displaying the geographic distribution of top-cited plastic surgery articles by LMICs, these findings also highlight a strong representation of craniofacial surgery research published by LMICs. This topic is discussed in 22 of the 100 articles. This is likely due to the increased frequency of congenital defects in LMICs attributable to various factors, including the higher prevalence of nutritional deficiencies, greater exposure to teratogens, and lower rates of abortion.<sup>24,25</sup> Moreover, around 80%–90% of all global trauma cases occur in LMICs, necessitating complex microsurgical interventions.<sup>26</sup> The disproportionately high occurrence of congenital defects and craniofacial trauma in these nations likely encourages

a strong research focus on innovative surgical techniques to optimize the quality of care.<sup>27</sup>

### LIMITATIONS

There are several limitations to the methodology of this study. Given that the selection solely included articles published in the 35 plastic surgery journals, the search criteria could have resulted in the exclusion of relevant articles that were published in nonplastic surgery journals (eg, those focused on general surgery or other surgical subspecialties). Furthermore, due to the time-dependent nature of citation counts, reliance on this metric as the main inclusion criterion for the top 100 list may have introduced a time-lag effect. Older studies hold an advantage because they have had more time to build higher citation counts, potentially excluding research from underrepresented LMICs that have only recently succeeded in publishing high-impact plastic surgery articles. To address this limitation, the average number of citations per year was calculated for each article on the list. Variations in citation counts across different search engines such as Scopus and PubMed were not accounted for, likely influencing the articles selected.

Another limitation of this study is that authors who have self-cited their articles in subsequent publications may have artificially inflated citation counts, especially in LMICs with well-established academic networks. This could cause a misleading appearance of greater influence by these authors within the plastic surgery literature. To address this bias, 2 additional metrics were considered: the journal Eigenfactor, which removes self-citations, and the AAS, which quantifies online engagement from a variety of sources. Considering all of these metrics in the context of one another offers a more holistic assessment of article impact.

Because a single researcher performed the data extraction in this study, there may have been potential for selection bias. However, unlike systematic reviews, which necessitate multiple reviewers to prevent such biases, our narrative bibliometric review interprets objective citation-based metrics, mitigating potential selection biases. Finally, the authors acknowledge that this analysis is confined solely to literature published in English, and that this language barrier likely contributed to the exclusion of relevant plastic surgery articles that were published in other languages. Several LMICs in Africa, Latin America, and Asia may have published research in other languages, suggesting a need for improved research translational resources and broader database inclusivity to promote relevant plastic surgery research contributions from non-English-speaking LMICs.

### CONCLUSIONS

This bibliometric study evaluates the top-cited plastic surgery articles published in the last decade by first authors from LMICs. Findings showed a disproportionate representation from certain LMICs and a strong focus on craniofacial surgery topics. Moving forward, the prioritization of partnership formation between LMICs underrepresented in the plastic surgery literature and HICs will promote equitable contributions to plastic surgery

research and improve the field in its entirety on a global scale.

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### DISCLOSURES

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