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Waseem Hassan

Institute of Chemical Sciences, University of Peshawar, Peshawar

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NEUROSURGERY RESEARCH IN PAKISTAN: AN ANALYSIS OF PUBLICATIONS, CITATIONS, AND GENDER DISPARITIES

Waseem Hassan¹

¹*Institute of Chemical Sciences, University of Peshawar, Peshawar*

Correspondence Author: Waseem Hassan *Institute of Chemical Sciences, University of Peshawar, Peshawar* **Email:** waseem_anw@yahoo.com

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The persistent challenges of gender disparity in neurosurgery have been a focus of recent research, underscoring ongoing inequities within the field.¹ Addressing these challenges is critical, particularly in the context of neurosurgical research in Pakistan, where systemic barriers continue to hinder equitable participation.

Recently a comprehensive investigation involved 2,353 medical students (where 63.4% were women and 36.5% were men). Among the female respondents, 40.3% strongly affirmed the presence of gender biases in neurosurgery.² This data highlights the perceived inequities within the profession, making a compelling case for further exploration of gender-focused issues in neurosurgery, particularly in regions like Pakistan where these disparities remain underexplored. Such findings provide a critical foundation for addressing systemic barriers that disproportionately affect women in this field.

Building on these observations, the data was collected on April 31, 2024, from Scopus, a globally recognized database, which offered a detailed quantitative perspective on gender disparities in Pakistani neurosurgical research. Among six prominent neurosurgical journals publishing a total of 64,041 research articles, authors from Pakistan contributed only 122 papers, with 87 involving international collaboration and 35 authored independently.³ An analysis of these 35 locally authored papers revealed a significant gender imbalance: among the 128 authors, 74% were male, and only 26% were female. This stark disparity reflects the need for targeted interventions to address gender inequality in neurosurgical academia.

While the initial analysis provided valuable insights, it was confined to six journals, raising questions about the comprehensiveness of its findings. In the present note, the idea is to expand the scope to 53 neurosurgical journals, which may offer a broader perspective. This bibliometric analysis was conducted using the Scopus database, which offers extensive

coverage of peer-reviewed scientific literature. To identify relevant journals, only those with titles containing the term “neurosurg”* (e.g., “neurosurgery,” “neurosurgical”) were selected, ensuring the dataset was restricted to journals specifically focused on the neurosurgical field.

Only original articles and review papers were included in the analysis. Other types of documents such as editorials, letters, conference papers, notes, short surveys, or book chapters were excluded to maintain consistency and focus on substantial research contributions. The data was retrieved in December 2024, from Scopus database. All 53 journals published 132,064 papers (117,862 articles and 14,202 reviews).

Based on the total number of publications in the selected journals, the top five journals were *Journal of Neurosurgery* (21,965 publications), followed by *World Neurosurgery* (19,557 publications), *Neurosurgery* (15,643 publications), *Journal of Neurology Neurosurgery and Psychiatry* (14,154 publications), and *Clinical Neurology and Neurosurgery* (7,844 publications).

For the second phase of the analysis, the dataset was filtered by selecting the country “Pakistan” as the author affiliation to assess the contribution of Pakistani neurosurgical researchers within this set of journals. This process revealed that Pakistani authors contributed 255 papers, representing only 0.19% of the total publications in these neurosurgical journals. These papers were published across 27 journals containing “neurosurg*” in their titles. Among the 255 papers contributed by Pakistani authors, the highest number of documents were published in *World Neurosurgery* (101 papers), followed by *World Neurosurgery X* (21 papers), *Clinical Neurology and Neurosurgery* (19 papers), *Neurosurgical Review* (16 papers), *Interdisciplinary Neurosurgery: Advanced Techniques and Case Management* (13 papers), and

the British Journal of Neurosurgery (10 papers). These six journals accounted for a substantial proportion of the total Pakistani neurosurgical output in the dataset, highlighting the primary publication venues for Pakistani researchers within the neurosurgical domain.

For further in-depth analysis, complete bibliographic records including author names, publication years, article titles, journal information, and page numbers were downloaded in CSV format. These records were then imported into VOSviewer to quantify the total number of contributing authors. In all publications (n=255), 1,081 individuals were noted. Out of 1081 authors, 210 authors published at least two documents, where 81% were male, and only 19% were female.

Furthermore, an analysis of citation data (in the present study) revealed that papers authored by women generally received fewer citations. Of all female authors, only one—Fatima K—achieved over 100 citations. Precisely her four papers received 130 citations.⁴⁻⁷

While the data clearly indicates a gender disparity in authorship, it does not directly explain the underlying causes. Further research is needed to explore the structural, institutional, and cultural factors that contribute to this imbalance and its potential impact on citation patterns. A broader examination of Pakistani neurosurgical research was undertaken to evaluate its citation impact in comparison with global standards. For this purpose, two datasets were prepared. First, the global top 100 most cited neurosurgical documents, retrieved from Scopus to establish a benchmark of the highest-impact publications in the field. Second, the top 100 most cited neurosurgical documents authored by researchers affiliated with Pakistan, also extracted from Scopus, to assess the citation performance of Pakistani contributions against this global benchmark.

The findings showed that, among the global top 100 papers (which collectively received 147,309 citations), none originated from Pakistan. Pakistani authors contributed 255 papers, which received a total of 2,763 citations, resulting in an h-index of 25. Notably, the lowest-cited paper among the global top 100 had 665 citations, whereas the most-cited Pakistani paper received 413 citations.⁸

The relatively low citation metrics of Pakistani neurosurgical papers reflect the broader challenges faced in achieving global recognition, underscoring the importance of fostering a culture of high-quality, impactful research. The absence of international collaboration further exacerbates these challenges.

Among the 95 neurosurgical papers authored solely by Pakistani researchers, the total citation count was only 998, with an h-index of 16. The most-cited paper in this category received just 158 citations, far below global benchmarks. These findings emphasize the critical role of international partnerships in enhancing the visibility and impact of neurosurgical research. Collaborative efforts not only provide access to additional resources and expertise but also increase the likelihood of publication in high-impact journals, thereby improving the overall quality of research outputs.

The absence of Pakistani representation among the top 100 most cited neurosurgical research papers underscores a broader challenge facing the nation's neurosurgical community, rather than pointing to a specific gender disparity. This gap reflects issues such as limited research visibility, low citation impact, and a lack of overall representation within the specialty, highlighting the need to address structural and institutional barriers. The exact reasons for the low participation of female researchers in neurosurgery require detailed investigation, which lies beyond the primary focus of the present study.

While gender-focused initiatives remain important for fostering an inclusive academic environment, they should be integrated into broader strategies aimed at strengthening research performance. Key measures include promoting collaborative efforts, building research capacity, establishing mentorship programs for female researchers, and creating targeted funding opportunities. Such initiatives are essential not only to improve gender equity but also to enhance the global competitiveness of Pakistan's neurosurgical research.

Additionally, expanding the analytical scope to include a diverse range of journals and disciplines can provide a more comprehensive understanding of the systemic barriers affecting neurosurgical research in Pakistan.

This study offers several advantages, despite its focus on Pakistan as a single country. By examining gender disparities and research quality in neurosurgical academia, it provides a valuable framework for similar analyses in other regions or continents. The targeted approach highlights critical issues within a specific national context, creating a benchmark for future research to address disparities on a broader scale.

There are some limitations of this analysis. First, it relied solely on the Scopus database, which, while globally recognized for its comprehensive indexing, is not exhaustive and may miss regionally or institutionally significant studies indexed elsewhere or published in

non-indexed sources. The analysis was further restricted to journals containing the word or phrase “neurosurg”* in their title. This ensured a focused dataset directly related to neurosurgery but may have inadvertently excluded relevant interdisciplinary or multidisciplinary research published in broader medical, surgical, or neuroscientific journals. Second, the search was quantitative in nature and not qualitative. The number of publications and citations was used as the primary indicator of research

performance, which does not capture the real impact, contextual value, or quality of neurosurgical research in Pakistan. Further analysis is encouraged to complement this quantitative approach with qualitative assessments, thereby offering deeper insights into the significance and influence of neurosurgical scholarship.

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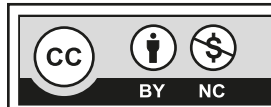
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