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Review Article

PubMed-indexed neurosurgical research productivity of Iraq-based neurosurgeons

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ABSTRACT

Background: Research is a central component of neurosurgical training and practice and is increasingly viewed as a quintessential indicator of academic productivity. In this study, we focus on identifying the current status and challenges of neurosurgical research in Iraq.

Methods: An online PubMed Medline database search was conducted to identify all articles published by Iraq-based neurosurgeons between 2003 and 2020. Information was extracted in relation to the following parameters: authors, year of publication, author's affiliation, author's specialty, article type, article citation, journal name, journal impact factor, and topic. This data were then tabulated and analyzed.

Results: Between 2003 and 2021, a total of 52 PubMed indexed papers were published from Iraq. All publications have been clustered in the period of 2012–2020. From 2012 to 2016, only four papers were published, one per year. The number of publications increased from 2017 to 2021, with an average of 12 publications per year. The most common article type was "case reports" (n = 14). Neurotrauma (n = 10) and vascular neurosurgery (n = 10) were the two most common topics. Most of the studies came from the city of Bagdad (n = 46), with just nine studies coming from peripheral governorates. The Neurosurgery Teaching Hospital in Bagdad was the neurosurgery center with the highest research output (n = 38).

Conclusion: The number of publications per year has been showing a, relatively, promising trend since 2012. However, to promote sustained growth in academic productivity, a strategic plan that acknowledges the political, financial, and health-system-related challenges are urgently needed.

Keywords: Iraq, Neurosurgery, PubMed, Research papers

INTRODUCTION

Clinical research is attracting growing attention worldwide, with a staggering number of studies continuously fuelling the literature. Each year, approximately 800,000 papers are added to PubMed, the comprehensive database of medical articles compiled by the US National Library of Medicine.[68] Neurosurgery is one of the fields that have witnessed

substantial growth over the past few decades, with a proportionate rise in the number of landmark studies published each year.[60]

In Iraq, contemporary neurosurgery was founded in 1966. Over the past few decades, the population demands for neurosurgical care has increased enormously, in conjunction with the ongoing war and armed conflict in the region. This review was designed with the following questions in mind: (1) what is the current status of neurosurgery publications from Iraq? (2) What are the current trends? (3) What is the most common type of neurosurgical research conducted in Iraq (design and topic wise)? (4) Are there regional disparities in the output of neurosurgery research? (5) Are there differences in research productivity between neurosurgery centers around the country?

To the best of our knowledge, this is the first paper on this topic. Our purpose is not only to estimate the academic productivity of neurosurgeons in Iraq over the past two decades but also to underline the current challenges facing clinical research in general and neurosurgical research in particular in Iraq and to suggest potential solutions.

MATERIALS AND METHODS

An online PubMed Medline database search was conducted by the first and second authors of the paper using various combinations of the following keywords: "Neurosurgery" "Neurosurgeon" "Neurological surgery" "Iraq," "Iraqi." The search results were filtered to include only studies published between May 2003 and October 2021. Next, a PubMed search by author name was done for all neurosurgeons and neurosurgery residents practicing in Iraq, based on the registry data available from the Iraqi association of neurological surgeons, to retrieve further studies not covered by the search terms.

The inclusion criteria were (1) papers describing neurosurgery research (2) research conducted in Iraq-based neurosurgery services, and (2) papers with, at least, one of the coauthors being a neurosurgeon practicing in Iraq.

The exclusion criteria were (1) research conducted on non-Iraqi patients, and (2) commentaries, and news accounts. A search for the specialty and affiliation of all coauthors was then carried out to account for Iraq-based coauthors, including neurosurgeons, neurosurgery residents, and medical students [Figure 1]. Information was extracted in relation to the following parameters: authors, year of publication, author's affiliation, author's specialty, type of article, article type, article citation, journal name, journal impact factor, and topic. This data were then tabulated and analyzed.

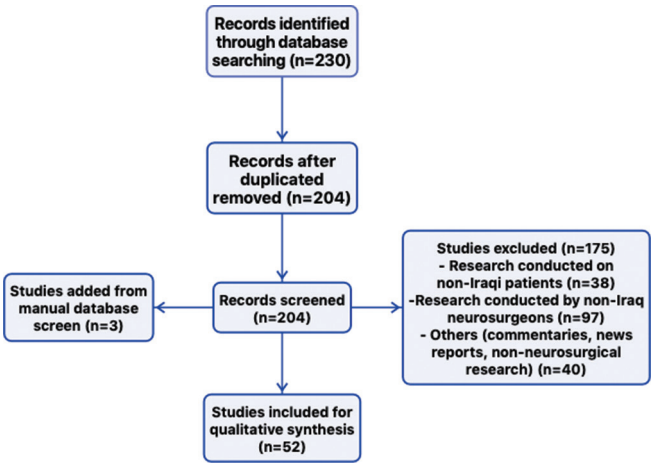

Figure 1: The search methodology

RESULTS

Between 2003 and 2021, a total of 52 PubMed indexed papers were published from Iraq.[1,2,4-10,35-17,20,24,26-64,21-34] All publications have been clustered in the period of 2012–2021. From 2012 to 2016, only four papers were published, one per year. The number of publications increased from 2017 to 2021, with an average of seven papers per year.

The most common type of articles was "case report" (n = 14), followed by "letter-to-editor," (n = 13), "prospective cohort" (n = 4), "case series" (n = 4), and "case-control studies" (n = 4). Only one randomized controlled trial has been published.

Neurotrauma (n = 10) and vascular neurosurgery (n = 10) were the two most common topics followed by general neurosurgery (n = 8), cranial/tumor (n = 6), and spine (n = 6). Four papers on neuroimaging and endoscopic neurosurgery were written, each with two publications. A paper was published on each of the following topics: functional neurosurgery, radiosurgery, stem cell research, and neurosurgery applications for gene therapy [Table 1].

The 40 papers were produced by a total of 30 authors, including three neurosurgery residents. The number of publications per author ranged between 1 and 21 (median = 1). Most of the studies came from the city of Bagdad (n = 46), with just nine studies coming from peripheral governorates. The Neurosurgery Teaching Hospital in Bagdad was the neurosurgery center with the highest research output (n = 38).

DISCUSSION

This review is the first to assess the academic productivity of neurosurgeons and neurosurgery residents in Iraq from 2003 to 2021. It focuses on neurosurgical research but also seeks to shed light on the disadvantaged place of clinical research in

Table 1: PubMed-indexed Neurosurgery papers published by Iraq-based neurosurgeons between 2003 and 2020.

S. No.	Article	Year	Study type	Neurosurgical topic	Journal	Impact factor	Citations
1.	Hammadi *et al.*[32]	2012	Prospective	Stem cells research	Int J Stem Cells	2.020	6
2.	Shamran *et al.*[64]	2014	Case control	Gene therapy	Int J Med Sci	2.399	10
3.	Shamran *et al.*[63]	2015	Case–control	Gene therapy	Int J Med Sci	2.399	8
4.	Khazendar *et al.*[57]	2016	Case report	Spine	World Neurosurg	1.723	4
5.	Al-Baldawi[5]	2017	Technical note	Cranial/endoscopic	Acta Neurochir (Wien)	2.122	0
6.	Al-Tameemi *et al.*[14]	2017	Cross-sectional retrospective study	Neuroimaging/Spine	Asian Spine Journal	1.300	3
7.	Baba-Rasul *et al.*[17]	2017	Case report	Pediatrics	World Neurosurg	2.399	3
8.	Hoz *et al.*[36]	2017	Letter	Neurotrauma	J Neurosci Rural Pract	0.740	10
9.	Satyarthee *et al.*[62]	2017	Case report	Pediatric	J Pediatr Neurosci	0.52	3
10.	Abdali *et al.*[1]	2018	Letter	Neurotrauma	J Neurosci Rural Pract	0.740	2
11.	Al-Azzawi *et al.*[4]	2018	Prospective	Functional	Arab Journal of Urology	0.940	2
12.	Alhillo *et al.*[6]	2018	Case report and literature review	Neurotrauma	J Clin Neurosci	1.593	3
13.	Alhillo *et al.*[7]	2018	Case report	Vascular	BMJ Case Rep	0.44	0
14.	Darwazeh *et al.*[19]	2018	Retrospective	Neuroimaging	World Neurosurg	2.399	4
15.	Dimitrov *et al.*[20]	2018	Letter	Cranial/tumor	Neurol India	2.708	0
16.	Essa *et al.*[26]	2018	Case control	Spine	J Clin Neurophysiol	1.982	2
17.	Faraj *et al.*[29]	2018	Prospective	Skull base/endoscopic	Neurosciences (Riyadh, Saudi Arabia)	N/A	0
18.	Hoz *et al.*[40]	2018	Case report and literature review	Cranial/tumor	Sao Paulo Med J	0.955	3
19.	Hoz *et al.*[41]	2018	Letter	Vascular	J Neurosci Rural Pract	0.740	2
20.	Hoz *et al.*[50]	2018	Case report	Cranial/Tumor	Bull Emerg Trauma	0.600	2
21.	Arkawazi *et al.*[15]	2019	Prospective	Radiosurgery	Open Access Maced J Med Sci	0.238	1
22.	Duarte-Valdivieso *et al.*[24]	2019	Case report	Vascular	Neurol India	2.708	0
23.	Hamawandi *et al.*[30]	2019	RCT	Spine	Pain Res Manag	1.685	1
24.	Hoz *et al.*[51]	2019	Case series and literature review	Pediatric/ Neurotrauma	Br J Neurosurg	0.96	5
25.	Aktham *et al.*[2]	2020	Case report	Vascular	Neurol India	2.708	2
26.	Aljuboori *et al.*[8]	2020	Case series	Spine	Surg Neurol Int	0.97	0
27.	Fahad *et al.*[27]	2020	Case control	Spine	Int J Crit Illn Inj Sci	0.364	0
28.	Hoz *et al.*[43]	2020	Historical vignette	General	World Neurosurg	2.399	0
29.	Hoz *et al.*[42]	2020	Letter	General	Surg Neurol Int	0.97	1
30.	Hoz *et al.*[39]	2020	Case series	Neurotrauma	World Neurosurg	2.399	2
31.	Kadhim *et al.*[55]	2020	Case series	Neurotrauma	Br J Neurosurg	0.96	0
32.	Hoz *et al.*[35]	2020	Retrospective	Neurotrauma	World Neurosurg	2.399	0
33.	Hoz *et al.*[44]	2020	Retrospective	Neurotrauma	Br J Neurosurg	0.96	0
34.	Al-Sharshahi *et al.*[13]	2020	review	General	Chin Neurosurg J	0.4	0
35.	Hoz *et al.*[47]	2020	review	Vascular	World Neurosurg	2.399	0
36.	Al-Khafaji *et al.*[10]	2020	review	Vascular	Surg Neurol Int	0.97	0
37.	Hoz *et al.*[49]	2020	Letter	General	World Neurosurg	2.399	0
38.	Faraj *et al.*[28]	2020	Retrospective	Vascular	Surg Neurol Int	0.97	0
39.	Hoz *et al.*[52]	2020	Letter	General	Surg Neurol Int	0.97	0
40.	Hoz *et al.*[37]	2021	Survey	General	Surg Neurol Int	0.97	0
41.	Dimitrov *et al.*[21]	2018	Letter	Cranial/tumor	Neurol India	2.708	0
42.	Hamawandi *et al.*[31]	2020	Retrospective	Spine	BMC Musculoskelet Disord.	2.054	2
43.	Hoz *et al.*[46]	2020	Retrospective	Neurotrauma	World Neurosurg	2.399	0
44.	Hoz *et al.*[60]	2020	Letter	General	World Neurosurg	2.399	0
45.	Lafta *et al.*[59]	2020	Case report	Cranial/tumor	Int J Surg Case Rep	0.57	1

(Contd...)

Table 1: *(Continued)*

46.	Al-Khafaji *et al*.[9]	2021	Letter	History	Surg Neurol Int	0.97	0
47.	Al-Sharshahi *et al*.[12]	2021	Letter	History	Surg Neurol Int	0.97	0
48.	Arnaout *et al*.[16]	2021	Case report	General	Neurol India	2.708	0
49.	Dolachee *et al*.[22]	2021	Case report	Cranial/tumor	Clin Case Rep	0.50	0
50.	Hoz *et al*.[45]	2021	Letter	Neurotrauma	Surg Neurol Int	0.97	0
51.	Hoz *et al*.[38]	2021	Letter	Vascular	Br J Neurosurg	0.96	0
52.	Hoz *et al*.[34]	2021	Case report	Vascular	Surg Neurol Int	0.97	0

the country. PubMed was used to achieve the objective of this study. PubMed is a reputable, reliable database that is playing an important role in the current scholarly communication landscape.[68] The timeframe was set for the war in 2003 to the present as this represents a different era in terms of documentation, logistics, and health system set-up. The analysis found that only 30 out of a total of 200 neurosurgeons currently practicing in Iraq and three out of 100 neurosurgery residents had PubMed-indexed publications. Despite the absence of a standard minimum, this number is small, not only when compared with international research productivity but also when viewed in the context of a country that has been a war zone for decades and is, hence, a fertile ground for clinical research.[54,61] Participating in clinical research is one of the board certification requirements, and each resident has to have at least one original paper. However, such research rarely gets published. At present, no Iraqi neurosurgery journal exists and none of the local journals have been indexed in PubMed.

Of the published studies, neurotrauma was chosen more often than other topics, perhaps not surprisingly, given the frequency of neurotrauma cases in the country. The reporting of such cases is still strikingly scarce, however, especially when viewed in the context of a war-afflicted country. In Iraq, neurosurgical case volume and profile are different from those encountered in other "traditional" war zones. A series of injures that are foreign to most neurosurgeons is witnessed daily, including blast bombings and severe penetrating craniofacial injuries caused by unusual grenades such as tear gas canisters.[1,6,39] More attention needs to be paid to the reporting, collection, and documentation of these cases, as they have the potential to refine trauma management protocols nationally and globally. However, before this potential can be harnessed the challenges facing neurosurgical research need to be identified and addressed.

Importantly, this low status of clinical research is not unique to neurosurgery but is likely a universal problem across other specialty surgeries. Factors that are hindering neurosurgical research in Iraq are manifold: (i) poor health system infrastructure, (ii) human resource shortages, including insufficient cadre of research expertise, (iii) absence of comprehensive patient data recording systems, (iv) difficulties around outcome measurement and patient follow-up, (v) deficits in research funding, (vi) deprioritization of research, (vii) regulatory and bioethical considerations, (viii) lack of international research collaborations, (ix) inadequate opportunities for training and capacity building, (x) limited access to current evidence, and (xi) under-representation in editorial and decision-making process.[3,11,18,23,25,56,65-67]

The eroded health-care system infrastructure and inadequate human resources in hospitals are two of the main challenges facing clinical research in Iraq. Decades of war, sectorial violence, terrorism, and political instability have stretched our health-care system to its limits, leaving understaffed, cash-starved, and overcrowded hospitals in conducive to establishing any sustainable clinical research activity.[11,66] To address some of these challenges, health system recovery must be a top priority in the country's infrastructure repair agenda. The solution to the human resource shortage is not a straightforward one. This shortage is primarily due to the steady exodus of well-trained doctors, which may serve as the proximal cause of the system's collapse.[11,23] The key driver for this trend is the security threats to health workers who are being killed, abducted, or targeted, forcing them to flee the country to safer places.[65] In an attempt to antagonize this trend and rejuvenate the field of neurosurgery, a nation-wide mentorship program aimed at attracting medical students and junior doctors to neurosurgery was established in 2018 by the primary author of this article; the long-term impact of this program and similar initiatives is yet to be seen.

The lack of comprehensive patient information systems is further compounding the situation. Non-standardized, paper-based, and hand-written clinical notes are often inaccurate, mostly illegible, and difficult to trace as they may be located in various hospital departments, making them a hazard to patient safety and a dissuasive barrier to clinical research. As such, more systematic steps need to be undertaken to standardize data collection and computerize patient records taking into account the technical difficulties, time limitations, and specifications of the local health system.

Inadequate outcome measures and follow-up systems represent another hindrance to clinical research in the country. Factors contributing to this problem include understaffing, overload, lack of detailed handover documentation, incomprehensive discharge plans, and

non-systemized task delegation. As such, outcomes such as infection rates, morbidity, and long-term mortality are difficult to ascertain. Addressing this problem calls for a multi-level action plan involving the participation of regulatory, administrative, and senior staff with a view to developing reliable patient follow-up systems.

Funding is another critical challenge facing clinical research. Iraq is, by definition, a resource-rich country.[3,25] However, the widespread corruption in the government system ensures that little, if any, of the national funds reach their designated targets.[3,25]As such, research funding has been deprioritized over the decades to further hinder any genuine research efforts. Much of the current research is being self-funded, with researchers resorting to research designs with minimal funding requirements. Our review shows that case reports and Letter-to-editor papers were collectively the most chosen research design, with only one randomized controlled trial and no systematic reviews. International partnerships and research collaborations may provide a temporary solution to this problem, besides their potential role in building research capacity, encouraging and facilitating research reporting, and providing adequate training opportunities.[58]

On the brighter side, efforts to revive the specialty are being made by our local neurosurgeons, harnessing available resources to "do more with less." Many examples evidence this; in 2017, the country has witnessed the birth of the first neurosurgery book to be authored by an Iraq-based neurosurgeon, the primary author of this manuscript. The book has received international recognition, inspiring further successful attempts.[35,33,53] Another step forward is the establishment of the association of neurological surgeons in Iraq in 2013. Furthermore, as shown in this review, a previously unwitnessed involvement of junior doctors and medical students in neurosurgery research is being noticed.

Despite the multitude of challenges faced by neurosurgical research in Iraq, there is a definite, although sluggish, rate of progress, relative to the previous decade. Nonetheless, critical, multi-level, and restorative steps are required to promote and enable research reporting at an internationally-comparable rate.

Study *limitations*

Many articles not published in PubMed-indexed journals were not captured in this review. Likewise, theses, dissertations, and essays were not included. The use of PubMed as the primary search engine was justified by the fact that high levels of corruption in the country could lead to the publication of several papers in predatory, temporary-cited, or local journals. However, the study should serve as an initial guide to the current state of neurosurgical research in the country and encourage more action to invest in the field at the national and international levels.

CONCLUSION

The number of publications per year has been showing a, relatively, promising trend since 2012. However, to promote sustained growth in academic productivity, a strategic plan that acknowledges the political, financial, and health-system-related challenges are urgently called for.

Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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