Women In Neurosurgery: A Critical Assessment of The State of The Specialty in Turkey

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Abstract

BACKGROUND: Although at least half of medical students are women, neurosurgery is not often preferred by women, and the proportion of female neurosurgeons who can participate in the academic platform is very low.

OBJECTIVE: In this study, we aimed to show the role of female neurosurgeons in the Turkish Neurosurgical Society.

METHODS: We examined the age, academic rank, years of work in the profession, membership rate in society subgroups, h-index parameters, and relationships of certificated female neurosurgeons registered in the Turkish Neurosurgical Society. We examined gender rate differences between society subgroups using chi-square tests. A $P$ value $< 0.05$ was considered statistically significant.

RESULTS: There are currently 94 board-certified female neurosurgeons between the ages of 31 and 92 years; 10 are full professors (10.6%), 16 are associate professors (17 %), 5 are assistant professors (5.3 %), and 63 are neurosurgery specialist physicians (67 %). Female neurosurgeons are present among six of the subfields categorized by the Turkish Neurosurgical Society: 7 in pediatric neurosurgery (11.47%); 8 in spinal and peripheral nerve surgery (2.4%); 3 in neurovascular surgery (2.02%); 7 in functional neurosurgery (5.8%); 11 in neuroanatomy (9.2%); and 23 in neurooncology (6.9%).

CONCLUSIONS: The number of female neurosurgeons in Turkey continues to grow each year. To increase the proportion of women in this field, it is important to support female neurosurgeons and enable them to take on more tasks.

Introduction

In the past, a minority of physicians in the field of neurosurgery were women. Moreover, the history of women in working life is one of very slow and small progress, not only in medicine but also throughout the entire workforce.

Today, women comprise more than half of medical school students. In contrast, only 17.5% of medical school students choose neurosurgery residency, and only 5.9% of practicing neurosurgeons are women, despite the predominance of female medical students.[1] According to published studies, the reasons that women are less likely to choose to enter to neurosurgery field include family life, social obligations due to other work, and women perceive it would be hard to balance having children while having a career as a neurosurgeon.[17]

Based on the information available in the literature, regrettably, there is a striking worldwide disproportion between men and women in neurosurgery.[14] Based on data from the World Federation of Neurosurgeons database, only 29% of committee positions are held by female neurosurgeons.[13] Unfortunately, this situation is also currently valid in Turkey. As women become involved in academic
neurosurgery and rise to leadership positions, they will serve as role models for female doctors who want to choose neurosurgery. In this article, we present the first data in the literature to analyze and report the career paths of female neurosurgeons in Turkey. Our aim is to describe the number and the place of female neurosurgeons in Turkey.

**Materials And Methods**

We obtained the number and names of certified female neurosurgeons from 1985 to 2021 from the Turkish Neurosurgeon Society.

Our parameters included the age, academic rank, years of working in the profession, membership rate in society subgroups, and h-index of female neurosurgeons. To determine all factors, we used the Turkish Neurosurgeon Society database and social media accounts, such as Researchgate, Publons, Google Semantic, and Google Scholar.

**Statistical Analyses**

Data were collected in Microsoft Excel (Microsoft Corporation, Redmond, WA, USA) and analyzed using SPSS version 22.0 (IBM Corporation, Armonk, NY, USA). Gender rate differences between society subgroups were examined using chi-square tests. A $P$ value < 0.05 was considered statistically significant.

**Results**

According to the year-end 2020 data of the Turkish Neurosurgery Society, 94 (5.5%) of the 1,699 neurosurgery specialists registered in Turkey are women. There are currently 94 board-certified female neurosurgeons between the ages of 31 and 92 years; 10 are full professors (10.6%), 16 are associate professors (17%), 5 are assistant professors (5.3%), and 63 are neurosurgery specialist physicians (67%) (Table 1). Between 1960 and 1980, there were 4 specialists among those who were professionally doctors of neurosurgery, whereas between 1981 and 2000, there were 9 full professors, 6 associate professors, 1 assistant professor, and 28 specialists (Table 1). Between 2001 and 2021, there were 1 full professor, 10 doctors as associate professors, 4 doctors as assistant professors, and 31 doctors as specialists (Table 1). There are currently 9 academics doctors with an h-index greater than 10 (9.5%).

Female neurosurgeons are present within six of the subfields categorized by the Turkish Neurosurgical Society (Table 2): 7 in pediatric neurosurgery (11.47%); 8 in spinal and peripheral nerve surgery (2.4%); 3 in neurovascular surgery (2.02%); 7 in functional neurosurgery (5.8%); 11 in neuroanatomy (9.2%); and 23 in neurooncology (6.9%). (Table 3–4). Of these groups, the highest rate of female members was in pediatric neurosurgery education and training group, with 11.47% (7/61), whereas the lowest rate was in the neurovascular surgery group with 2.02% (3/148). A statistically significant difference in gender was observed between the pediatric and spinal groups ($P$ = 0.0035), pediatric and neurovascular groups ($P$ = 0.0107), spinal-peripheral and neuroanatomy groups ($P$ = 0.0044), neurovascular and neuroanatomy...
groups ($P = 0.0186$), and neurovascular and neurooncology groups ($P = 0.0479$). No significant difference was found in the other groups.

**Discussion**

There has been a marked increase in the number of women graduating from medical schools. As a result, the number of female neurosurgeons has increased relatively in the 21st century.[11] However, despite this numerical increase, the number of female neurosurgeons is still disproportionately low, as supported by other studies conducted in the literature.[1, 4]

In the 15th century, Serefeddin Sabuncuoğlu (1385–1470) was the author of the first illustrated Turkish surgical textbook in the Turkish literature.[3] His book *Cerrahiyetü'l-Haniyye* (*Imperial Surgery*) contains the first illustrations depicting female surgeons.[3] The miniatures he painted featured female surgeons known as *Tabibe*. The first evidence that Turkish women were also involved in neurosurgery even at that time are the drawings shown in miniatures applied to the treatment of a dead fetus with fetal hydrocephalus and macrocephaly[16] (Figure 1).

Turkey's first female neurosurgeon, Dr. Aysima Altınok (1929–), received her expertise in 1959 (Figure 2). She was born in Erzincan in 1929. Aysima Altınok, the first female neurosurgeon in Turkey, took up her post at Bakırköy Mental and Nervous Diseases Hospital and continued her position as clinical chief. [4] She holds an honorary membership in the foundation of the Turkish Neurosurgical Society since 1996 and the Association of Brain and Neurosurgery since December 1, 2005. She left her official post in 1992 after more than 38 years.

The second female neurosurgeon in Turkey was Dr. Yıldız Yalcınlar.

Other pioneering women neurosurgeons followed, including Nilgün Alp who is the third female neurosurgeon she received the title of a neurosurgeon at Bakırköy mental and Nervous Diseases Hospital, and Dilek Könü-Leblebicioğlu, Hamiyet Camuşçu, and Nurperi Gazioğlu.[4]

Nurperi Gazioğlu is the first female professor of neurosurgery in Turkey. She became an associate professor in 2000 and a professor in 2008 at Cerrahpaşa Faculty of Medicine. She was chosen as the first woman neurosurgeon president of the Central Nervous System Surgery Society in Turkey in 2013. Back in 1984, she was presented the Balkan Medical Union Award. She was named “Leading Woman Scientist” by the Turkish Association of University Women. She worked Istanbul University's Cerrahpaşa Faculty of Medicine until 2017. Since 2017, Gazioğlu has chaired the Department of Neurosurgery at Demiroğlu Bilim University in Istanbul.

Although the Turkish Neurosurgical Society has had 22 neurosurgery presidents over 36 years,[9] in 2021, for the first in the history of the Society, Emel Avci, a female, has been elected as the president of the society. She was born in Malatya, in 1987. Her first professional position in Turkish Neurosurgical Society was as a member of the committee of young neurosurgeons in 2000. In 2008, Dr. Avci studied as
a research fellowship in Skullbase and Neuroanatomy Laboratory in Department of Neurosurgery at University of Wisconsin–Madison. She worked mainly in the areas of neuroanatomy and the skullbase. She was the head of the Neuroanatomy Group of Turkish Neurosurgical Society between 2016-2017. She is now the first female president of the Turkish Neurosurgical Society.

One of our authors, Prof. Dr. Pınar Akdemir Ozişık, a pediatric neurosurgeon, was the first woman to serve on the Board of Directors of the Turkish Neurosurgical Society. She is the first female neurosurgeon who became dean for the first time in 2021.

Female neurosurgeons in Turkey, with 10 professors, 16 associate professors, 5 assistant professors, and 63 specialists are a very strong and growing formation every day.

The world’s first female neurosurgeon was the British doctor Diana Beck (1943).[9] Unfortunately, the situation around the world is very similar. For example, in the United States in 2016, women neurosurgeons comprised only 16.3% of total neurosurgery residents (232/1417) and 6.1% of board-certified neurosurgeons (259/4178).[12]

In 2009 in Brazil, only 97 of the 1,758 members of the the Brazilian Society of Neurosurgery were women (5.5%).[17] When we examined the literature, we found that 4% of neurosurgery specialists in the United Kingdom and only 2.3% of neurosurgeons in Canada were women.[6, 9]

When we looked at the field of neurosurgery in Germany, we found that only two universities had female neurosurgeons in executive positions, despite the fact that in 2017, 24% (496/2097) of certified neurosurgeons were female.[8] Germany is the country with the highest number of female neurosurgeons in the world. In fact, even this is an indicator of how few women participate in neurosurgery.

In their study, Ganju et al reported that between 2000 and 2020 within the leadership of five neurosurgical organizations (Congress of Neurological Surgeons, American Association of Neurological Surgeons, Society of Neurological Surgeons, American Board of Neurological Surgery, Council of State Neurosurgical Societies), only 5 (11.1%) of a total of 45 doctors were female.[15]

According to the data obtained in our study, the number of female neurosurgeons still lags behind the desired number in neurosurgery, with a rate of 5.5% (94/1699). However, especially recently, the number of female doctors in neurosurgery has started to increase. This can be explained by the fact that the female doctors in the platform support each other and that the new doctors look to them as an example.

The number of female neurosurgeons pursuing academic careers or holding executive positions is almost nonexistent worldwide.[5] This situation is referred to as the “glass ceiling,” a metaphor used to indicate (Figure 3).[18] The number of female neurosurgeons can be increased through organization and assistance. The joint work of mentor female neurosurgeons and young female neurosurgeons will help to ensure endurance and continuity within the profession. Looking at the literature, it is possible to see results that support the preference of the female-to-female work ratio. Among the journals articles examined by Aslan et al, it was found that 518 of 3247 (16.0%) female neurosurgeons were the first
named author and 352 of 3247 (10.8%) female neurosurgeons were the senior author; accordingly, young doctors in particular preferred to work with female neurosurgeons as mentors.\[2\] They indicated that the reason for this was that female neurosurgeons sympathized with their struggles and could relate to their difficulties.\[2\] As a result of their research on a large data set of 68,737 published articles in 16 journals, Taha et al also reported an increase in the number of first and senior-level authors in female neurosurgery over the past years. They also concluded that articles with a female senior author were more likely to have a female first author as well.\[7\] Especially with the increased awareness in recent years, initiatives such as the Women’s Association of Neurosurgery mentoring program will provide a significant contribution to the advancement of young women neurosurgeons in their academic careers.\[10\]

The number of female neurosurgeons continues to increase each year in Turkey, as well as worldwide. However, despite this increase, it is not yet at sufficient levels.

In Turkey, the doors opened in 1959 with Aysima Altinok, and the field continues to grow every day with an increasing number for female neurosurgeons.

**Conclusion**

In this study, we reported on women’s progress in neurosurgery today as well as the growing future role for women in this speciality in Turkey. The number of female neurosurgeons has especially grown more than ever in the last 20 years.

We believe that this progress in our country will continue to increase in the coming years and that the number of female neurosurgeons will increase even more.

**Declarations**

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**Conflict of interest**

The authors declare that they have no conflict of interest.

**Availability of data and material**

We have obtained permission from the female neurosurgeons mentioned to use all materials for this article, and we have obtained the necessary permissions from the relevant people within the photographs used.

**Code availability**
Ethics approval and consent to participate

Not applicable

Consent to participate

PK., DE., EG., PO., AG. have read and approved the manuscript declare that they have no conflict of interest.

Consent for publication

We have verbal obtained consent to publish for this article.

Authors' contributions

PK. writing, original draft, Review & Editing,
DE. Writing - Review & Editing,
EG. Material support
PÖ. Writing - Review & Editing, Supervision
AG. Conceptualization, Writing - Review & Editing, Supervision

All authors read and approved the manuscript.

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References

1. __, Benzil DL, Abosch A, Germano I, Gilmer H, Maraire JN, Muraszko K, Pannullo S, Rosseau G, Schwartz L, Todor R, Ullman J, Zusman E (2008) The future of neurosurgery: a white paper on the recruitment and retention of women in neurosurgery. Journal of Neurosurgery. 109, 3 (Sep. 2008), 378–386. DOI:https://doi.org/10.3171/JNS/2008/109/9/0378

2. Aslan A, Kuzucu P, Karaaslan B, Börcek A (2020) Women in Neurosurgery: Gender Differences in Authorship in High-Impact Neurosurgery Journals through the Last Two Decades. World Neurosurgery. 138, (Jun. 2020), 374–380. DOI:https://doi.org/10.1016/j.wneu.2020.03.017
3. Bademci G (2006) First illustrations of female “Neurosurgeons” in the fifteenth century by Serefeddin Sabuncuoglu. *Neurocirugia (Asturias, Spain)*. 17, 2 (Apr. 2006), 162–165. DOI:https://doi.org/10.1016/s1130-1473(06)70362-1

4. Balak N, Elmaci I (2007) A pioneering female neurosurgeon: Dr. Aysima Altinok. *Acta Neurochirurgica*. 149, 9 (2007), 943–948; discussion 948. DOI:https://doi.org/10.1007/s00701-007-1252-8

5. Freischlag JA (2008) Women surgeons–still in a male-dominated world. *The Yale Journal of Biology and Medicine*. 81, 4 (Dec. 2008), 203–204

6. Gilkes CE (2008) An account of the life and achievements of Miss Diana Beck, neurosurgeon (1902–1956). *Neurosurgery*. 62, 3 (Mar. 2008), 738–742; discussion 738–742. DOI:https://doi.org/10.1227/01.neu.0000317324.71483.e5

7. Increases in female academic productivity and female mentorship highlight sustained progress in previously identified neurosurgical gender disparities in: Neurosurgical Focus Volume 50 Issue 3 (2021) https://thejns.org/ focus/view/journals/neurosurg-focus/50/3/article-pE3.xml. Accessed: 2021-04-01

8. Lawson McLean A (2020) Women in German Neurosurgery: Status and Representation at Annual National Meetings. *Acta Neurochirurgica*. 162, 2 (Feb. 2020), 231–236. DOI:https://doi.org/10.1007/s00701-019-04164-0

9. Participation of Women Neurosurgeons in the National Congresses and in the Education and Training Groups of Turkish Neurosurgical Society [: https://www.journalagent.com/z4/vi.asp? pdir=iksst&plng=eng&un=IKSST-35582&look4=. Accessed: 2021-02-24

10. Pastor-Cabeza M, Torné R, García-Armengol R, Menéndez-Osorio B, Mosteiro-Cadaval A, Bollar A, Rimbau JM, Sarabia R, Rodríguez-Hernández A (2021) Women's role in neurosurgical research: is the gender gap improving? Neurosurg Focus 50:3. DOI:https://doi.org/10.3171/2020.12.FOCUS20911. (Mar. 2021) ., E6.

11. Renfrow JJ, Rodriguez A, Liu A, Pilitsis JG, Samadani U, Ganju A, Germano IM, Benzil DL, Wolfe SQ (2016) Positive trends in neurosurgery enrollment and attrition: analysis of the 2000–2009 female neurosurgery resident cohort. *Journal of Neurosurgery*. 124, 3 (Mar. 2016), 834–839. DOI:https://doi.org/10.3171/2015.3.JNS142313

12. Renfrow JJ, Rodriguez A, Wilson TA, Germano IM, Abosch A, Wolfe SQ (2018) Tracking Career Paths of Women in Neurosurgery. *Neurosurgery*. 82, 4 (Apr. 2018), 576–582. DOI:https://doi.org/10.1093/neuros/nyx251

13. Shaikh AT, Farhan SA, Siddiqi R, Fatima K, Siddiqi J, Khosa F (2019) Disparity in Leadership in Neurosurgical Societies: A Global Breakdown. *World Neurosurgery*. 123, (Mar. 2019), 95–102. DOI:https://doi.org/10.1016/j.wneu.2018.11.145

14. Silva N, Cerasiello S, Semonche A, Sotayo A, Luis J, Shao B, Richardson A, Eloy JA (2019) Gender Representation at Neurological Surgery Conferences. *World Neurosurgery*. 129, (Sep. 2019), 453–459. DOI:https://doi.org/10.1016/j.wneu.2019.06.062
15. Slow progress in the visibility of women in neurosurgery in the United States: opportunity for improvement in: Neurosurgical Focus Volume 50 Issue 3 (2021) https://thejns.org/focus/view/journals/neurosurg-focus/50/3/article-pE10.xml. Accessed: 2021-04-01

16. Women in neurosurgery: where does the United Kingdom stand? in: Neurosurgical Focus Volume 50 Issue 3 (2021) https://thejns.org/focus/view/journals/neurosurg-focus/50/3/article-pE14.xml. Accessed: 2021-04-01

17. Zanon N (2011) Women in neurosurgery: a challenge to change history—Brazil, São Paulo. Child's Nervous System. 27, 3 (Mar. 2011), 337–340. DOI:https://doi.org/10.1007/s00381-010-1380-y

18. Zhuge Y, Kaufman J, Simeone DM, Chen H, Velazquez OC (2011) Is there still a glass ceiling for women in academic surgery? Annals of Surgery. 253, 4 (Apr. 2011), 637–643. DOI:https://doi.org/10.1097/SLA.0b013e3182111120

Tables

Tables 1-4 are not available with this version.

Figures

Figure 1

A illustration of a Tabibe miniature showing the removal of a dead fetus due to fetal hydrocephalus.

Figure 2

Photograph of Aysima ALTINOK. Published with permission.

Figure 3

An illustration describing the glass ceiling syndrome.