Gender Disparities in the Academic Performance of Neurology Residents in Portugal

Disparidade de Género nas Classificações dos Médicos Internos de Neurologia em Portugal

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ABSTRACT
Implicit bias has been linked to gender disparities in medical careers, impacting not only access to leadership positions but also early career opportunities. We aimed to evaluate if there were differences in the assessment of Neurology residents according to gender. We collected publicly available grades and rankings of two major evaluations that residents are submitted to, one at the beginning and another at the end of the neurology residency program, the National Board Exam and neurology examination, respectively. The National Board Examination is a multiple-choice gender-blinded evaluation, while the neurology examination is an oral gender-unblinded evaluation. We found that 36.5% of women and 21.6% of men were in the first quartile of the National Board Examination ranking, which reflects a similar representation among top classifications when assessed through a gender-blinded examination. On the other hand, the percentage of men who were in the top classification of NE, a gender-unblinded evaluation, was more than twice as high compared to women (37.8% *vs* 18.3%, $p < 0.05$). The findings of the present study may imply that there could be a disparity in women's career progression among neurology residents in Portugal, although the recruitment seems balanced between genders.
Keywords: Gender Equity; Internship and Residency; Neurologists; Neurology; Physicians, Women; Portugal; Sexism

RESUMO
O preconceito implícito tem sido associado a disparidades de género nas carreiras médicas, influenciando o acesso a cargos de liderança e oportunidades ao longo da carreira. Pretendeu-se avaliar se existiriam diferenças na avaliação de médicos internos de neurologia de acordo com o género. Foram comparadas as classificações disponíveis publicamente de dois momentos de avaliação aos quais os médicos internos de neurologia são submetidos, no início e final do internato de neurologia, respetivamente: a Prova Nacional de Acesso à Formação Especializada e o exame final de neurologia. A Prova Nacional de Seriação é uma avaliação de escolha múltipla, com ocultação de género na atribuição da classificação. O exame final de neurologia é uma avaliação oral sem ocultação de género na atribuição da classificação. Verificou-se que 36,5% das mulheres e 21,6% dos homens estavam no quartil superior de classificação na Prova Nacional de Seriação, o que reflete uma representação semelhante entre classificações superiores quando a avaliação é dependente de um exame com ocultação de género. Pelo contrário, a percentagem de homens no quartil superior de classificação no exame final de neurologia, uma avaliação sem ocultação de género, foi mais do dobro das mulheres (37,8% *vs* 18,3%). Os resultados do presente estudo podem implicar que existe uma disparidade na progressão na carreira das mulheres entre os médicos internos de neurologia em Portugal.
Palavras-chave: Equidade de Género; Internato e Residência; Médicas; Neurologia; Neurologistas; Portugal; Sexismo

INTRODUCTION

Implicit bias may mediate unconscious discriminatory behaviors toward women in STEMM (science, technology, engineering, mathematics, and medicine) sciences. From the beginning of medical history, most clinicians were men, and until the nineteenth century, women were often vetoed from practicing medicine.[1] More recently, there has been a shift in the gender distribution of physicians, which might be too recent to overcome gender bias in medicine. The internalized stereotype of the male physician may contribute to an underestimation of women's skills usually associated with the male gender, such as productivity, leadership potential, and quality of work.[1] The gender bias might contribute to a gender gap and glass ceiling effect which prevents minorities to achieve leadership roles in medical careers. Monitoring the structure and processes of medical departments is key to acknowledging the gender gap, which might lead to the implementation of strategies to reduce it.

Recently, studies evaluating career progression in medical specialties reported conflicting results regarding gender-based disparities.[2-4] Regarding Neurology careers, there is evidence that access to leadership positions is still a challenge for women at a late-career stage.[5]

We aimed to evaluate the gender distribution of the top-ranked performers in two national examinations performed in Portugal – the National Board Examination (NBE) and the neurology examination (NE) – to understand if there were gender-based disparities during the early years of the medical career among neurologists.

METHODS

Publicly available academic milestone ratings of neurology residents in Portugal [references available in Appendix 1 (Appendix 1: https://www.actamedicaportuguesa.com/revista/index.php/amp/article/view/21637/15457)] were

compared according to gender.

All neurology residents who completed their training between 2019 and 2022 were included. This timeframe was chosen since there was a change in the structure and scoring of the NBE after 2019, and therefore scores from previous years could not be compared. The following scores were collected:

- Score 1: NBE grade. In Portugal, the selection of medical graduates into residency programs is dependent upon the grade of a yearly, standardized, gender-blinded nationwide multiple-choice test. All neurology residents that completed their Neurology training between 2019 and 2022, performed the NBE at least five years before (before 2017). Before 2019, the NBE test was based on a single Internal Medicine Medicine Book (Harrison's Principles of Internal Medicine)[6,7] and evaluated the candidate's knowledge of internal medicine focusing on the following areas: pulmonology, cardiology, nephrology, hematology and gastroenterology. The final score varied between 0 - 100. The average classification might differ according to yearly variation in the examination assessment framework.
- Score 2: NBE ranking. According to the National Ranking Test, a list ordered according to the National Ranking Test grade assigns a position that defines the priority to select the specialty/department where the candidate intends to complete his/her residency. The position of the candidate is independent of the yearly variation in the examination and is gender-blinded.
- Score 3: NE grade. After concluding the five years of residency, the residents perform a final neurology examination evaluating the portfolio, the supervisor rating, and neurology knowledge through a gender-unblinded oral examination. The examination takes place in a small number of neurology departments, other than the candidate's own department. The average classification might vary according to the assessment framework and local evaluators. Although the classification might vary between 0 – 20.00, since 2019 no candidate has had a classification lower than 18.00. We used a transformed variable: final classification -18 x 100 to improve the normality of the distribution.

- Score 4: NE ranking. According to the NE grade, a list of ranked candidates is published, that assigns neurologists a priority to select the department where they wish to develop their activity as specialists. The order is independent of the year of conclusion of the residency. We compared the gender distribution in the highest (first) quartile of each classification.

Gender was defined as the gender reported in the official reports of both examinations (NBE and NE), although this often refers to the biological sex of the individual and not to their gender identity.

A baseline analysis was performed using descriptive statistics, namely mean or median and standard deviation or interquartile range for continuous variables and absolute numbers and percentages for categorical variables. We used the chi-square test to compare percentages of categorical variables, and the Mann-Whitney test to compare continuous variables with normal distribution.

Since we analyzed only data that was available in the public domain, approval by an ethics committee was not required.

RESULTS

We evaluated scores from 108 neurology residents, of which 71 (65.7%) were women. The distribution of candidates according to the year of NE exam was the following: 29 (26.9%) candidates in 2022; 28 (26.0%) in 2021; 21 (19.5%) in 2020; 30 (27.7%) in 2019 (Appendix 1: https://www.actamedicaportuguesa.com/revista/index.php/amp/article/view/21637/15457). The median absolute and first quartile scores according to gender distribution are presented in Tables 1 and 2 respectively.

The null hypothesis that the proportion of women and men in the first quartile of the NE classification over the study period did not differ significantly was rejected. In the gender-unblinded NE ranking, the proportion of women that achieved the top classifications was lower: 18.3% *vs* 37.7%, *p*-value = 0.035

On the other hand, the null hypothesis that the proportion of women and men in the first quartile of the NBE ranking did not differ significantly was not rejected. In the gender-blinded NBE ranking, the proportion of women and men that achieved the first quartile of classification was similar: nearly one quarter of the female and male total sample.

Table 1 – Descriptive data of the study population by absolute score values

Score		All residents	Male residents	Female residents
Gender-blinded scores	NBE grade, median (IQR)	83.0 (10.0)	82.0 (12.5)	84 (10.5)
	NBE ranking, median (IQR)	243.5 (289.3)	252.0 (266.0)	237.0 (296.0)
Gender-unblided scores	NE grade, median (IQR)	177.0 (12.0)	178.0 (13.5)	177 (13.0)
	NE ranking median (IQR)	8.0 (8.8)	7.0 (9.5)	8.0 (9.0)

IQR: interquartile range; NBE: National Board Examination; NE: national examination

Table 2 – Descriptive data of the study population by superior quartiles of each score

Score		Male residents	Female residents
Gender-blinded scores	NBE grade superior quartile ≥ 88, n (%)	10 (27.0)	22 (31.9)
	NBE ranking, superior quartile ≤ 108.5, n (%)	8 (21.6)	19 (36.5)
Gender-unblided scores	NE grade, superior quartile ≥ 182, n (%)	12 (32.4)	18 (25.3)
	NE ranking, superior quartile ≤ 3.25, n (%)	14 (37.8)	13 (18.3)*

NBE: National Board Examination; NE: national examination
*: p-value < 0.05 in Q-square test

DISCUSSION

Before the neurology residency, close to one-quarter of male and female candidates were in the first quartile of the NBE, a gender-blinded evaluation. This reflects a proportional gender representation in the highest ranking of classifications.

After concluding the neurology residency, 37.8% of men were in the gender-unblinded NE ranking first quartile *versus* 18.3% of women. The proportion of male neurologists in the first quartile was more than twice that of women's.

Also, the top classifications were attributed to 36.5% of women at the start of neurology residency; however, after completing residency, the proportion of women in the top classifications dropped to 18.3%. With men, we observed the opposite: 21.6% of men occupied the higher ranking at the beginning of the neurology residency, but the proportion increased to 37.8% by the end of training.

Since NBE and NE grades are influenced by factors such as the yearly and/or local variations of the examinations, the ranking might be a more accurate measure to perceive gender differences in the milestones of a neurology resident's career.

Our findings suggest that women may have equal opportunities when evaluated through gender-blinded evaluations. The same group of candidates, however, performed worse and was underrepresented in the top classifications of the final neurology examination, a gender-unblinded examination. The differences in gender rankings may reflect differences in resident performance; however, the same group of candidates was evaluated at two different stages of their careers, and women's baseline medical knowledge was equivalent to men's.

We must acknowledge that we are comparing two different types of evaluations: one that evaluates a wide range of topics and one that evaluated solely the trainee's knowledge in neurology. Furthermore, while one is only dependent on theoretical knowledge, the other also evaluates clinical and communication skills. However, such a stark difference between genders and their representation in the top quartiles of the rankings is unlikely solely due to the worse performance of female trainees in clinical and communication tasks.

The findings of the present study may imply that there could be a disparity in women's career-perceived knowledge and clinical ability among neurology residents in Portugal when evaluated through a gender-unblinded examination, although their performance did not differ from their male peers when evaluated with a gender-blinded methodology. Further studies evaluating the existence of gender discrimination in the neurology career in Portugal are needed, and the implementation of gender equity strategies should be considered.

KEY MESSAGES

- Implicit bias has been linked to gender disparities in medical careers. We aimed to evaluate gender disparities among neurology resident classifications in Portugal.
- The proportion of men/women among the top classifications assessed through a gender-blinded examination was similar.
- The percentage of male residents in the top classification of a gender-unblinded evaluation was more than twice that of women.
- These findings may imply that there could be disparities in women's career progression among Neurology residents in Portugal.

AUTHOR CONTRIBUTIONS

All authors contributed equally to this manuscript and approved the final version to be published.

PROTECTION OF HUMANS AND ANIMALS

The authors declare that the procedures were followed according to the regulations established by the Clinical Research and Ethics Committee and to the Helsinki Declaration of the World Medical Association updated in 2013.

DATA CONFIDENTIALITY

The authors declare having followed the protocols in use at their working center regarding patients' data publication.

COMPETING INTERESTS

FL received consulting fees from Novartis and Merck; received payment or honoraria from Novartis, Biogen, Merck, Sanofi-Genzyme, Roche and AstraZeneca for lectures, presentations, speakers bureaus, manuscript writing or educational events; received payment from Novartis, Merck and Roche for expert testimony; received support from Roche, Merck, Teva, Jansen and Sanofi-Genzyme for attending meetings and/or travel; participated in Data Safety Monitoring Boards or Advisory Boards for Merck, Novartis and Roche.

MS received payment or honoraria from Merck and Novartis for lectures, presentations, speakers' bureaus, manuscript writing or educational events; received support from Janssen, Merck, Pfizer and Roche for attending meetings and/or travel; participated in Advisory Boards for Roche; is a member of the Portuguese Committee of Neurology Residents and Young Specialists and a resident and research fellow of the European Academy of Neurology.

VC received payment or honoraria from Bial for lectures, presentations, speakers' bureaus, manuscript writing or educational events; received support from Bial for attending meetings and/or travel; is a resident and research fellow of the European Academy of Neurology.

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