



Gender differences in work-life balance of European neurosurgeons

Xanthoula Lambrianou^a, Christos Tzerefos^a, Insa K. Janssen^b, Stiliana Mihaylova^c, Aysegul Esen Aydin^d, Selma Al-Ahmad^e, Marike LD. Broekman^f, Nurperi Gazioglu^g, Silvia Hernandez Duran^h, Daniela Luminita Ivanⁱ, Maria Karampouga^j, Hulda B. Magnadottir^k, Ermira Pajaj^l, Ana Rodríguez-Hernández^m, Gail Rosseauⁿ, Niina Salokorpi^o, Eleni Tsianaka^p, Pia Vayssiere^b, Mary Murphy^q, Anastasia Tasiou^{a,*}

^a Department of Neurosurgery, University Hospital of Larissa, Faculty of Medicine, School of Health Sciences, University of Thessaly, Larissa, Greece

^b Department of Neurosurgery, Hôpitaux Universitaires de Genève, Geneva, Switzerland

^c Clinic of Neurosurgery, Sv. Ivan Rilski University Hospital, Medical University of Sofia, Sofia, Bulgaria

^d Department of Neurosurgery, Arnavutkoy State Hospital, Istanbul, Turkey

^e Neurosurgery Department, Sheffield Teaching Hospitals, Sheffield, UK

^f Department of Neurosurgery, Haaglanden Medical Center and Leiden University Medical Center, Leiden, the Netherlands

^g Istinye University, Medical Faculty, Department of Neurosurgery, Istanbul, Turkey

^h Klinik für Neurochirurgie, Universitätsmedizin Göttingen, Göttingen, Germany

ⁱ Department of Neurosurgery, Bucharest Emergency University Hospital, Carol Davila University of Medicine, Bucharest, Romania

^j Neurosurgery Department, Nicosia General Hospital, Nicosia, Cyprus

^k Upper Valley Neurology Neurosurgery, Lebanon, NH, USA

^l Department of Neurosurgery, Spitali Rajonal Memorial Fier, Fier, Albania

^m Department of Neurological Surgery, Germans Trias i Pujol University Hospital, Universidad Autónoma, Barcelona, Spain

ⁿ Department of Neurosurgery, George Washington University School of Medicine and Health Sciences, Washington, DC, USA

^o Department of Neurosurgery, Oulu University Hospital, Oulu, Finland and Research Unit of Clinical Neuroscience, Medical Research Center, Oulu University, Oulu, Finland

^p Neurosurgery Department, International Hospital, Salmiya, Kuwait

^q Department of Neurosurgery, National Hospital for Neurology and Neurosurgery, Queen Square, London, UK

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ABSTRACT

Introduction: Neurosurgery is one of the most demanding medical specialties. For neurosurgeons, balancing professional activity with personal life can be challenging.

Research question: To evaluate gender differences in contribution of neurosurgeons in the household and child-rearing, as well as their impact on personal life and career.

Material and methods: An anonymous, electronic, 59-item web-based survey was administered to National Neurosurgical Societies of Europe, and European Member Societies of the European Association of Neurosurgical Societies (June–October 2021).

Results: A total of 205 European neurosurgeons (87 females and 118 males, mean age 40.7) are included in our survey. In neurosurgery, females are significantly more likely to be alone (37.9%), while males are significantly more likely to have children (66.9%). In terms of household efforts, females spend more time than males on the same tasks. Most participants (71.2%) view gender issues as a disadvantage in career pursuing. Women feel less accepted (54.3%) and having fewer opportunities (58.6%), while men believe that pregnancy/child-rearing (65.8%) and having many roles (51.3%) are the main obstacles. Both genders (77.6%) favor more convenient working conditions for young parents.

Discussion and Conclusion. In our study we found that, women neurosurgeons take more responsibilities at home, especially in the child-rearing years. Female neurosurgeons are more likely to live alone or stay childless more often compared to their male colleagues. Supportive facilities, flexible programs, universal life policies and presumably curbing of the social stereotypes are of importance to overcome gender inequities that women are still facing in neurosurgery.

* Corresponding author. Department of Neurosurgery, Building A, 3rd Floor, University Hospital of Larissa, Biopolis, Larissa, 41110, Greece.

E-mail address: ttasiou@yahoo.com (A. Tasiou).

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1. Introduction

The role of women in society has dramatically changed over the last two centuries. Women have earned voting rights, equal rights and equal opportunities in many countries. The social stereotype that women should stay at home to do the housework and to raise their children, while men should do paid work outside home has gradually been demolished around the world. Nowadays, it seems that the roles are converging. However, balancing family and work responsibilities is still challenging, irrespective of gender.

In medical schools, women outnumber men in many countries around the world (Abosch and Rutka, 2018). However, neurosurgery is still considered a male-dominated field, especially in leadership positions. Undoubtedly, the percentage of women entering into neurosurgery has been increasing over time. In 2016, the percentage of women recruited into neurosurgery across Europe was 29%, while at the same time the number of board-certified female neurosurgeons was only 9% (Steklavcova et al., 2017). Likewise, the percentage of female neurosurgery residents in the US increased from 10.7% in the 1990's to 15.5% in 2012, while the number of women finishing their residency increased from 76% in the 1990's to 83% in the 2000s (Renfrow et al., 2016). Although the neurosurgical workforce remains male-dominated, it is clear that there is now a positive trend for women to be attracted towards a career in neurosurgery.

Neurosurgery is one of the most demanding specialties. Irrespective of gender, neurosurgeons have to combine the exhausting professional program during training or practice, with their personal lives, family, and child-rearing responsibilities. In our communication, we would like to outline gender differences, if any, in neurosurgery and with this opportunity to trigger a discussion about undersurface and sensitive gender equality issues that could shed light on existing social stereotypes across Europe and around the globe.

1.1. Methods

1.1.1. Study methodology

An anonymous, digital, 59-item web-based survey was distributed using the Google Forms platform, from June 24, 2021, to October 31, 2021. The survey was administered to the National Neurosurgical Societies of Europe, and the European Member Societies of the European Association of Neurosurgical Societies (EANS). The purpose of the survey was to identify and outline any gender differences in the contribution of a neurosurgeon, in the household and childcare and its impact on personal life and career pursuit.

The web link of the survey was circulated via emails to the target group. The first 20 questionnaires were used to check the feasibility of the survey. After pilot testing, the final version was formed (supplementary material). Three reminders were launched after the initial release for maximizing the participation in our survey.

An introductory letter describing the purpose of the survey was sent and recipients who voluntarily decided to participate had to click on the web link access the survey. Residents, consultants/attending, and retired neurosurgeons were eligible to fill out the questionnaire. Responses from EANS Individual Members were also included in our survey (Table 1). Incomplete responses were excluded from our analysis. Selected questions allowed participants to reply through a multiple-choice responding system and add comments in text boxes, if necessary. Questions were categorized in to three groups: demographics, personal life/daily routine and experience in neurosurgery. The respondents could optionally provide their email addresses.

1.1.2. Statistical analysis

The statistical analysis was independently conducted by two authors, a female and a male neurosurgeon (AEA and CT, respectively). The analysis was performed using the IBM SPSS v.20 package (IBM Corp, 2011). Age was presented as a continuous variable using mean value and

standard deviation, while categorical survey answers were summarized using counts and proportions. Survey answers were analyzed based on the participants' gender. The results of specific questions between women and men respondents were compared using Pearson's chi-square or Fisher's exact test. For statistical analysis purposes the participants were further separated into registrars/residents and consultants/attending neurosurgeons according to their professional status. A univariate analysis, using logistic and ordinal regression analysis, was performed to investigate the role of age, gender, and professional status, as determinants in certain questions, while a multivariate analysis was conducted, when necessary. Odds ratios (ORs) and 95% confidence intervals (95% CIs) obtained from the logistic regression analysis were presented. For all the performed tests, the threshold for statistical significance was set at $p < 0.05$.

1.2. Results

1.2.1. Overview

A total of 205 eligible responses were received. Questions were divided into three categories, as described in the Methods section, and responses were slightly modified or excluded during statistical analysis for homogeneous analysis purposes.

1.2.2. Demographics

Participants of the survey represented 19 European countries, including Turkey. Our study population was assigned using the gender binary: women and men. There were 87 females and 118 males (42.4% and 57.6%, respectively). The participants' age ranged between 26 and 65 years, while the mean age was 40.7 years (SD: 9.4, Table 1).

The majority of respondents answered that they work in a public hospital (86.3%), being full-time employees (96.1%). Most of them were consultants/attending neurosurgeons (65.4%), while 71 (34.6%) were registrars/residents. The collected data regarding the neurosurgical experience of our participants was summarized in Table 2.

Fifty participants (24.4%) stated that they live alone. Females were significantly more likely to be alone (37.9%) than males (14.4%, $p < 0.05$). Univariate analysis showed that the probability of living alone is negatively associated with both determinants, age [$p < 0.001$, OR = 0.91, 95% CI (0.88, 0.96)] and higher professional status [consultants/attending neurosurgeons, $p < 0.001$, OR = 0.30, 95% CI (0.15, 0.58)].

Table 1
Neurosurgeons' demographic characteristics.

Variables	Mean (Standard Deviation)	
	Number	Percentage (%)
Age	40.7 (9.4)	
Gender		
Male	118	57.6
Female	87	42.4
Country		
Albania	11	5.4
Bulgaria	8	3.9
Croatia	1	0.5
Cyprus	10	4.9
France	2	1.0
Germany	5	2.4
Greece	55	26.8
Iceland	2	1.0
Italy	21	10.2
Montenegro	1	0.5
Netherlands	1	0.5
Portugal	1	0.5
Romania	4	2.0
Serbia	3	1.5
Spain	9	4.4
Sweden	2	1.0
Switzerland	17	8.3
Turkey	13	6.3
United Kingdom	39	19.0

Table 2
Our data in regards to work-life status of neurosurgeons and their partners in life.

Questions	Gender		Total	p-value
	Female	Male		
Serve in:				0.453 ^a
Public Section	78 (89.7%)	99 (83.9%)	177 (86.3%)	
Private Section	9 (10.3%)	17 (14.4%)	26 (12.7%)	
I prefer not to answer	0 (0.0%)	2 (1.7%)	2 (1.0%)	
Professional status:				0.072
Resident	36 (41.4%)	35 (29.7%)	71 (34.6%)	
Attending neurosurgeon/ Consultant	43 (49.4%)	57 (48.3%)	100 (48.8%)	
Head of the Department/ Chair	3 (3.5%)	10 (8.5%)	13 (6.3%)	
Professor	5 (5.8%)	16 (13.6%)	21 (10.2%)	
Retired neurosurgeon	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Current experience in neurosurgery?				0.013 ^a
Resident	36 (41.4%)	35 (29.7%)	71 (34.6%)	
0–10 years post-residency	33 (37.9%)	32 (27.1%)	65 (31.7%)	
11–20 years post- residency	11 (12.6%)	29 (24.6%)	40 (19.5%)	
21–30 years post- residency	7 (8.1%)	21 (17.8%)	28 (13.7%)	
More than 30 years post- residency	0 (0.0%)	1 (0.9%)	1 (0.5%)	
Employment:				0.853 ^a
Full time	83 (95.4%)	114 (96.6%)	197 (96.1%)	
Part time	3 (3.5%)	3 (2.5%)	6 (2.9%)	
I prefer not to answer	1 (1.2%)	1 (0.9%)	2 (1.0%)	
Household status				0.000139
I live alone	33 (37.9%)	17 (14.4%)	50 (24.4%)	
I live with a spouse/partner	54 (62.1%)	101 (85.6%)	155 (75.6%)	
Your partner's/spouse's profession:^b				0.001 ^a
Neurosurgeon	6 (11.1%)	6 (5.9%) (7.7%)	12 (7.7%)	
Medical doctor	15 (27.8%)	30 (29.7%)	45 (29.0%)	
Scientist	2 (3.7%)	11 (10.9%)	13 (8.4%)	
Self-employed	8 (14.8%)	4 (4.0%) (7.7%)	12 (7.7%)	
Health worker	3 (5.6%)	20 (19.8%)	23 (14.8%)	
Housewife/househusband	1 (1.9%)	12 (11.9%)	13 (8.4%)	
Other	19 (35.2%)	18 (17.8%)	37 (23.9%)	
How many hours per week on average do you work?				0.896 ^a
Less than 40 h	3 (3.5%)	6 (5.1%)	9 (4.4%)	
40–60 h	47 (54.0%)	62 (52.5%)	109 (53.2%)	
61–80 h	27 (31.0%)	39 (33.1%)	66 (32.2%)	
More than 80 h	10 (11.5%)	11 (9.3%)	21 (10.2%)	
How many hours per week on average does your partner/spouse work? ^b				0.070 ^a
Less than 40 h	20 (37.1%)	58 (57.4%)	78 (50.3%)	
40–60 h	25 (46.3%)	35 (34.7%)	60 (38.7%)	
61–80 h	7 (13.0%)	6 (5.9%) (8.4%)	13 (8.4%)	
More than 80 h	2 (4.0%)	2 (2.0%)	4 (2.6%)	

Table 2 (continued)

Questions	Gender		Total	p-value
	Female	Male		
Who is gaining more money?^b				0.000 ^a
Me	20 (37.0%)	74 (73.3%)	94 (60.7%)	
My spouse/partner	22 (40.7%)	5 (5.0%) (17.4%)	27 (17.4%)	
Equally	11 (20.4%)	15 (14.9%)	26 (16.8%)	
I prefer not to answer	1 (1.9%)	7 (6.9%)	8 (5.2%)	

^a Fisher exact test was applied.

^b The total number of participants living with a partner/spouse is 155.

However, only the association with gender remained significant after the multivariate analysis. More than half of respondents who do not live alone (51.5%) reported that the profession of their partner/spouse is health care associated, including neurosurgeons, medical doctors of other specialty, or other kind of health professionals (7.7%, 29.0% and 14.8%, respectively).

Moreover, our survey revealed that most neurosurgeons (109/205, 53.2%) work on average 40–60 h per week (h/w), while their partners/spouses (78/155) work on average less than 40 h/w (50.3%, Table 2). Many of our participants (60.7%) stated that they earn more money than their partners/spouses (Table 2). After further gender-based analysis, we found that male neurosurgeons are the bread winners (73.3%) while female neurosurgeons earn less money than their partners/spouses (37.1%). This difference was statistically significant ($p < 0.05$).

1.2.3. Personal life and daily routine

One hundred eighteen participants (57.6%) reported that they have children (Table 3). It is noteworthy that men in neurosurgery are significantly more likely to have children than women (66.9% vs. 44.8%, $p < 0.05$). Among neurosurgeons with no children, 36.8% answered that childbirth is not their main priority, while 33.3% supported that it is not in their family plan. Long working hours (19.5%), dedication to career (13.8%), and lack of support (9.2%) were also reported as strong concerns for not having children. Importantly, more than half of respondents (53.2%) reported that they have only once a week spare time for lifestyle (Table 3). However, 89 (43.5%) of our population expressed their satisfaction in terms of lifestyle-work balance, while 75 (36.6%) emphasized that they feel frustrated (Table 3). Gender did not affect these responses ($p > 0.05$). Nonetheless, univariate ordinal regression analysis demonstrated that male gender [$p = 0.05$, OR = 1.64, 95% CI (1.01, 2.70)], older age [$p = 0.007$, OR = 1.03, 95% CI (1.01, 1.06)] and advanced professional status [$p = 0.003$, OR = 2.21, 95% CI (1.31, 3.73)] increases the possibility of reporting satisfied with the current amount of spare time.

The majority of neurosurgeons who do not live alone described their partners/spouses as generally supportive and helpful in personal decision-making and career pursuit (Table 4). Decision-making is usually a matter for both mates in a couple (56.1%, Table 4). We found that males feel more supported by their partners/spouses in terms of personal life issues compared to their female counterparts ($p < 0.05$, Table 4). Additionally, most of the participants reported that they have significant help with housework and home duties (Table 4). In terms of household efforts, male neurosurgeons' partners/spouses spend more time than female neurosurgeons' partners/spouses on the same tasks ($p < 0.05$). However, regression analysis model showed that age and professional status do not play any co-founding role ($p > 0.05$).

Table 5 depicts the daily routine of a neurosurgeon. According to gender association, females spend much more time cleaning (44.8%) and cooking (59.8%) in comparison to males (11.0% and 17.0%, respectively, Table 5). Additionally, 38.0% of females spend more than 6 h on housekeeping compared to only 25.3% of males. Male neurosurgeons

Table 3
General information in regards to neurosurgeons' personal life.

Questions	Gender		Total	p-value
	Female	Male		
Do you have children?				0.002
Yes	39 (44.8%)	79 (66.9%)	118 (57.6%)	
No	48 (55.2%)	39 (33.1%)	87 (42.4%)	
How many children do you have?^a				0.065 ^b
1	18 (46.2%)	18 (22.8%)	36 (30.5%)	
2	14 (35.9%)	45 (56.9%)	59 (50.0%)	
3	5 (12.8%)	12 (15.2%)	17 (14.4%)	
4+	2 (5.1%)	4 (5.1%)	6 (5.1%)	
Please provide the reason for not having children:^c				
Lack of support	6 (12.5%)	2 (5.1%)	8 (9.2%)	0.288 ^b
Long working hours	11 (22.9%)	6 (15.4%)	17 (19.5%)	0.426
Dedicated into my career	7 (14.6%)	5 (12.8%)	12 (13.8%)	1.000
Not my current priority	17 (35.4%)	15 (38.5%)	32 (36.8%)	0.825
Not in family plan yet	16 (33.3%)	13 (33.3%)	29 (33.3%)	1.000
I prefer not to answer	2 (4.2%)	8 (20.5%)	10 (11.5%)	0.038 ^b
Other	8 (16.7%)	7 (18.0%)	15 (17.2%)	1.000 ^b
How often do you have spare time to satisfy your lifestyle considerations?				0.380 ^b
Once a week	45 (51.7%)	64 (54.2%)	109 (53.2%)	
2-3 times per week	30 (34.5%)	44 (37.3%)	74 (36.1%)	
Most days	11 (12.6%)	7 (5.9%)	18 (8.8%)	
Every day	1 (1.2%)	3 (2.5%)	4 (2.0%)	
Are you satisfied with your professional/personal life balance?				0.271 ^b
Very satisfied	8 (9.2%)	20 (17.0%)	28 (13.7%)	
Somewhat satisfied	24 (27.6%)	37 (31.4%)	61 (29.8%)	
Neither satisfied nor dissatisfied	19 (21.8%)	22 (18.6%)	41 (20.0%)	
Somewhat dissatisfied	23 (26.4%)	30 (25.4%)	53 (25.9%)	
Very dissatisfied	13 (14.9%)	9 (7.6%)	22 (10.7%)	

^a The total number of participants having children is 118.
^b Fisher exact test was applied.
^c The total number of participants with no children is 87.

stated that their partners/spouses are burdened more with household tasks (Table 5, Fig. 1). Interestingly, advanced age predisposes to more housekeeping hours [p < 0.001, OR = 1.06, 95% CI (1.03, 1.10)].

Most neurosurgeons reported that their partners/spouses are essentially involved in child-rearing. However, we found a significant gender difference (p < 0.05, Table 6). Daily preparation of children for school, transportation to school and caring at night, if necessary, is mostly mother's responsibility (Table 6). Similarly, gender played a significant role in child-rearing tasks, such as homework/play and also in the case of an emergency at work or child sickness (Table 6). Seven neurosurgeons (5.9%) identified themselves as single parents. Interestingly, all of them were mothers (18.0% of female population).

Most participants agreed that pursuit of clinical or academic career

Table 4
Our data regarding neurosurgeons' help and support by their partners in life.

Questions	Gender		Total	p-value
	Female	Male		
Is your partner/spouse supportive in general?^a				0.391 ^b
Always	25 (46.3%)	53 (52.5%)	78 (50.3%)	
Often	19 (35.2%)	38 (37.6%)	57 (36.8%)	
Sometimes	9 (16.7%)	8 (7.9%)	17 (11.0%)	
Rarely	1 (1.9%)	2 (2.0%)	3 (1.9%)	
Never	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Does your partner/spouse help you in your personal life (planning, decisions, etc)?^a				0.005 ^b
Always	21 (38.9%)	32 (31.7%)	53 (34.2%)	
Often	18 (33.3%)	55 (54.5%)	73 (47.1%)	
Sometimes	11 (20.4%)	5 (5.0%)	16 (10.3%)	
Rarely	2 (3.7%)	8 (7.9%)	10 (6.5%)	
Never	2 (3.7%)	1 (1.0%)	3 (1.9%)	
Does your partner/spouse help you with your career?^a				0.316 ^b
Always	16 (29.6%)	33 (32.7%)	49 (31.6%)	
Often	14 (25.9%)	37 (36.6%)	51 (32.9%)	
Sometimes	17 (31.5%)	17 (16.8%)	34 (21.9%)	
Rarely	4 (7.4%)	8 (7.9%)	12 (7.7%)	
Never	3 (5.6%)	6 (5.9%)	9 (5.8%)	
Does your partner/spouse help you with housework?^a				0.000040 ^b
Always	16 (29.6%)	66 (65.5%)	82 (52.9%)	
Often	18 (33.3%)	21 (20.8%)	39 (25.2%)	
Sometimes	16 (29.6%)	7 (6.9%)	23 (14.8%)	
Rarely	2 (3.7%)	5 (5.0%)	7 (4.5%)	
Never	2 (3.7%)	2 (2.0%)	4 (2.6%)	
Does your partner/spouse help you with home supplies?^a				0.025 ^b
Always	20 (37.0%)	49 (48.5%)	69 (44.5%)	
Often	16 (29.6%)	37 (36.6%)	53 (34.2%)	
Sometimes	14 (25.9%)	8 (7.9%)	22 (14.2%)	
Rarely	4 (7.4%)	5 (5.0%)	9 (5.8%)	
Never	0 (0.0%)	2 (2.0%)	2 (1.3%)	
Who is the main decision maker?				0.628 ^b
Me, most of the times	31 (35.6%)	42 (35.6%)	73 (35.6%)	
My spouse/partner, most of the times	4 (4.6%)	10 (8.5%)	14 (6.8%)	
Equally	50 (57.5%)	65 (55.1%)	115 (56.1%)	
I prefer not to answer	2 (2.3%)	1 (0.9%)	3 (1.5%)	

^a The total number of participants living with a partner/spouse is 155.
^b Fisher exact test was applied.

Table 5
Neurosurgeons' contribution at home.

Questions	Gender		Total	p-value
	Female	Male		
Who is cleaning?				0.000000 ^a
Me, most of the times	39 (44.8%)	13 (11.0%)	52 (25.4%)	
My spouse/partner, most of the times	7 (8.1%)	50 (42.4%)	57 (27.8%)	
Equally	11 (12.6%)	17 (14.4%)	28 (13.7%)	
A hired-assistant	28 (32.2%)	32 (27.1%)	60 (29.3%)	
Someone else	2 (2.3%)	6 (5.1%)	8 (3.9%)	
Who is cooking?				0.000000
Me, most of the times	52 (59.8%)	20 (17.0%)	72 (35.1%)	
My spouse/partner, most of the times	15 (17.2%)	70 (59.3%)	85 (41.5%)	
Equally	7 (8.1%)	14 (11.9%)	21 (10.2%)	
A hired-assistant	7 (8.1%)	5 (4.2%)	12 (5.9%)	
Someone else	6 (6.9%)	9 (7.6%)	15 (7.3%)	
Who goes to the super-market?				0.085 ^a
Me, most of the times	46 (52.9%)	45 (38.1%)	91 (44.4%)	
My spouse/partner, most of the times	18 (20.7%)	39 (33.1%)	57 (27.8%)	
Equally	18 (20.7%)	31 (26.3%)	49 (23.9%)	
A hired-assistant	1 (1.2%)	1 (0.9%)	2 (1.0%)	
Someone else	4 (4.6%)	2 (1.7%)	6 (2.9%)	
How many hours per week do you spend for housework?				0.032 ^a
0-5 h	54 (62.1%)	88 (74.6%)	142 (69.3%)	
6-10 h	22 (25.3%)	24 (20.3%)	46 (22.4%)	
11-15 h	10 (11.5%)	3 (2.5%)	13 (6.3%)	
More than 15 h	1 (1.2%)	3 (2.5%)	4 (2.0%)	
How many hours per week does your spouse/partner spend for housework?^b				0.000000 ^a
0-5 h	37 (68.5%)	14 (13.9%)	51 (32.9%)	
6-10 h	16 (29.6%)	43 (42.6%)	59 (38.1%)	
11-15 h	1 (1.9%)	20 (19.8%)	21 (13.6%)	
More than 15 h	0 (0.0%)	24 (23.8%)	24 (15.5%)	
Do you have a hired-assistant?				0.258
Yes	38 (43.7%)	62 (52.5%)	100 (48.8%)	
No	49 (56.3%)	56 (47.5%)	105 (51.2%)	
How many hours per week does the hired-assistant spend for housework?				0.008 ^a
0-5 h	11 (29.0%)	30 (48.4%)	41 (41.0%)	
6-10 h	11 (29.0%)	13 (21.0%)	24 (24.0%)	
11-15 h	0 (0.0%)	7 (11.3%)	7 (7.0%)	
More than 15 h	16 (42.1%)	12 (19.4%)	28 (28.0%)	
Do you have elderly relatives?				0.023
Yes	47 (54.0%)	82 (69.5%)	129 (62.9%)	

Table 5 (continued)

Questions	Gender		Total	p-value
	Female	Male		
No	40 (46.0%)	36 (30.5%)	76 (37.1%)	
Who is looking after elderly relatives?				0.021 ^a
Me, most of the times	17 (36.2%)	12 (14.6%)	29 (22.5%)	
My spouse/partner, most of the times	2 (4.3%)	13 (15.9%)	15 (11.6%)	
Equally	14 (29.8%)	26 (31.7%)	40 (31.0%)	
Other family member	10 (21.3%)	26 (31.7%)	36 (27.9%)	
In-home care provider	3 (6.4%)	5 (6.1%)	8 (6.2%)	
Nursing home	1 (2.1%)	0 (0.0%)	1 (0.8%)	
Do you have pets?				0.435
Yes	30 (34.5%)	47 (39.8%)	77 (37.6%)	
No	57 (65.5%)	71 (60.2%)	128 (62.4%)	
Who is looking after pet(s)?				0.018 ^a
Me, most of the times	15 (50.0%)	8 (17.0%)	23 (29.9%)	
My spouse/partner, most of the times	5 (16.7%)	15 (31.9%)	20 (26.0%)	
Equally	8 (26.7%)	21 (44.7%)	29 (37.7%)	
Someone else	2 (6.7%)	3 (6.4%)	5 (6.5%)	

^a Fisher exact test was applied.

^b The total number of participants living with a partner/spouse is 155.

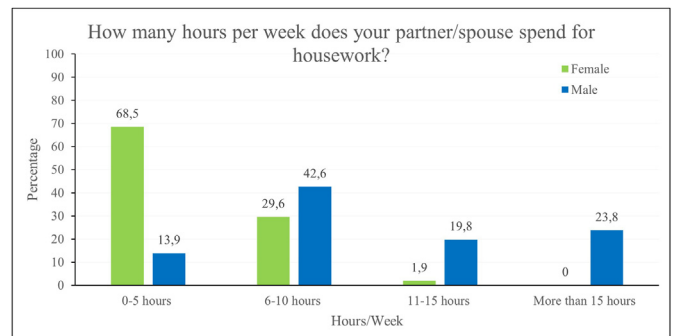


Fig. 1. Bar chart depicting the time (hours/week) spent for housework by neurosurgeons' partners/spouses. The chart depicts that male neurosurgeons have more help at home by their partners compared to their female colleagues based on the hours spent. Although 68.5% of female neurosurgeons' partners spend less than 5 h for housework, only 13.9% of male neurosurgeons' partners spend the same time. This difference is statistically significant ($p < 0.05$).

are negatively affected by childbirth (45.5% and 45.8% respectively, Table 6). Notably, this belief is strongly supported by females; 70.1% and 60.9% of females believe that childbirth has a negative impact on clinical and academic career, respectively ($p < 0.05$, Table 6). Furthermore, the age of the participants negatively affects the result of these questions, while this statement is mainly supported by residents. Most women in neurosurgery (65.5%) strongly believe that maternity/paternity is an obstacle to career pursuit ($p < 0.05$, Table 6). Both genders (77.6%) favor more convenient working conditions for young parents (Table 6).

1.2.4. Experience in neurosurgery

Participants were asked if they would mind having a neurosurgeon-partner. Most of them (69.8%) stated that this would not be a problem. Perceived lack of time, excessive stress and mental and physical fatigue were the main reasons for those who minded living with a neurosurgeon. When asked whether they would choose neurosurgery as a specialty if

Table 6
Responsibilities after childbirth.

Questions	Gender		Total	p-value
	Female	Male		
Does your partner/spouse help you with child-rearing?^a				0.000 ^b
Always	16 (41.0%)	59 (74.7%)	75 (63.6%)	
Often	9 (23.1%)	15 (19.0%)	24 (20.3%)	
Sometimes	7 (18.0%)	3 (3.8%)	10 (8.5%)	
Rarely	4 (10.3%)	1 (1.3%)	5 (4.2%)	
Never	3 (7.7%)	1 (1.3%)	4 (3.4%)	
Who is preparing children for school every day?^a				0.000 ^b
Me, most of the times	15 (38.5%)	6 (7.6%)	21 (17.8%)	
My spouse/partner, most of the times	5 (12.8%)	52 (65.8%)	57 (48.3%)	
Equally	5 (12.8%)	18 (22.8%)	23 (19.5%)	
Someone else (babysitter, in-home childcare provider)	13 (33.3%)	2 (2.5%)	15 (12.7%)	
Other family member	1 (2.6%)	1 (1.3%)	2 (1.7%)	
Who is transporting children to school?^a				0.003 ^b
Me, most of the times	7 (18.0%)	20 (25.3%)	27 (22.9%)	
My spouse/partner, most of the times	9 (23.1%)	37 (46.8%)	46 (39.0%)	
Equally	9 (23.1%)	14 (17.7%)	23 (19.5%)	
Someone else (babysitter, in-home childcare provider)	13 (33.3%)	6 (7.6%)	19 (16.1%)	
Other family member	1 (2.6%)	2 (2.5%)	3 (2.5%)	
Who is getting up in the nights to look after babies/children?^a				0.000 ^b
Me, most of the times	28 (71.8%)	6 (7.6%)	34 (28.8%)	
My spouse/partner, most of the times	3 (7.7%)	45 (57.0%)	48 (40.7%)	
Equally	7 (18.0%)	27 (34.2%)	34 (28.8%)	
Other family member	1 (2.6%)	1 (1.3%)	2 (1.7%)	
Who is helping children with their homework?^a				0.000 ^b
Me, most of the times	21 (53.9%)	6 (7.6%)	27 (22.9%)	
My spouse/partner, most of the times	1 (2.6%)	38 (48.1%)	39 (33.1%)	
Equally	13 (33.3%)	32 (40.5%)	45 (38.1%)	
Someone else (babysitter, in-home childcare provider)	2 (5.1%)	2 (2.5%)	4 (3.4%)	
Other family member	2 (5.1%)	1 (1.3%)	3 (2.5%)	
Who takes children to the playground or to their friends for having fun?^a				0.000 ^b
Me, most of the times	18 (46.2%)	7 (8.9%)	25 (21.2%)	
My spouse/partner, most of the times	5 (12.8%)	39 (49.4%)	44 (37.3%)	
Equally	15 (38.5%)	33 (41.8%)	48 (40.7%)	
Other family member	1 (2.6%)	0 (0.0%)	1 (0.9%)	
In case of emergency in your work who will take care of the children?^a				0.112 ^b
My spouse/partner, most of the times	22 (56.4%)	57 (72.2%)	79 (67.0%)	
Someone else (babysitter, in-home childcare provider)	8 (20.5%)	10 (12.7%)	18 (15.3%)	
Other family member				

Table 6 (continued)

Questions	Gender		Total	p-value
	Female	Male		
	7 (18.0%)	12 (15.2%)	19 (16.1%)	
Day care	2 (5.1%)	0 (0.0%)	2 (1.7%)	0.000 ^b
Who is taking care of child sickness in your household?^a				
Me, most of the times	16 (41.0%)	1 (1.3%)	17 (14.4%)	
My spouse/partner, most of the times	5 (12.8%)	45 (57.0%)	50 (42.4%)	
Equally	13 (33.3%)	29 (36.7%)	42 (35.6%)	
Someone else (babysitter, in-home childcare provider)	2 (5.1%)	2 (2.5%)	4 (3.4%)	
Other family member	3 (7.7%)	2 (2.5%)	5 (4.3%)	
Have you ever used a parental leave of absence?^a				0.560
Yes	19 (48.7%)	34 (43.0%)	53 (44.9%)	
No	20 (51.3%)	45 (57.0%)	65 (55.1%)	
How long did you leave from clinical duties?				0.000 ^b
Less than 1 month	1 (5.3%)	27 (79.4%)	28 (52.8%)	
1–3 months	7 (36.8%)	5 (14.7%)	12 (22.6%)	
4–6 months	3 (15.8%)	2 (5.9%)	5 (9.4%)	
7–12 months	4 (21.1%)	0 (0.0%)	4 (7.6%)	
More than 12 months	4 (21.1%)	0 (0.0%)	4 (7.6%)	
Has your spouse/partner ever used a parental leave of absence?^a				0.000 ^b
Yes	13 (33.3%)	58 (73.4%)	71 (60.2%)	
No	26 (66.7%)	21 (26.6%)	47 (39.8%)	
How long did your spouse/partner leave from clinical duties?				0.026 ^b
Less than 1 month	6 (46.2%)	9 (15.5%)	15 (21.1%)	
1–3 months	4 (30.8%)	15 (25.9%)	19 (26.8%)	
4–6 months	2 (15.4%)	5 (8.6%)	7 (9.9%)	
7–12 months	0 (0.0%)	15 (25.9%)	15 (21.1%)	
More than 12 months	1 (7.7%)	14 (24.1%)	15 (21.1%)	
Are you a single parent?^a				0.000084 ^b
Yes	7 (18.0%)	0 (0.0%)	7 (5.9%)	
No	31 (79.5%)	79 (100%)	110 (93.2%)	
I prefer not to answer	1 (2.6%)	0 (0.0%)	1 (0.9%)	
Do you believe that your career pursuing will be negative affected after childbirth?				0.000
Strongly agree	20 (23.0%)	7 (5.9%)	27 (13.3%)	
Agree	41 (47.1%)	25 (21.2%)	66 (32.2%)	
Neither agree nor disagree	17 (19.5%)	38 (32.2%)	55 (26.8%)	
Disagree	4 (4.6%)	31 (26.3%)	35 (17.1%)	
Strongly disagree	5 (5.8%)	17 (14.4%)	22 (10.6%)	

(continued on next page)

Table 6 (continued)

Questions	Gender		Total	p-value
	Female	Male		
Do you believe that pursuing an academic career will be negatively affected after childbirth?				0.005
Strongly agree	14 (16.1%)	9 (7.6%) (11.2%)	23 (11.2%)	
Agree	39 (44.8%)	32 (27.1%) (34.6%)	71 (34.6%)	
Neither agree nor disagree	14 (16.1%)	37 (31.4%) (24.9%)	51 (24.9%)	
Disagree	12 (13.8%)	27 (22.9%) (19.0%)	39 (19.0%)	
Strongly disagree	8 (9.2%)	13 (11.0%) (10.2%)	21 (10.2%)	
Is maternity/paternity an obstacle in career pursuing?				0.000
Yes	57 (65.5%)	42 (35.6%) (48.3%)	99 (48.3%)	
No	22 (25.3%)	68 (57.6%) (43.9%)	90 (43.9%)	
I prefer not to answer	8 (9.2%)	8 (6.8%) (7.8%)	16 (7.8%)	
Would you support more favorable conditions for colleagues with babies/children?				0.059 ^b
Strongly agree	40 (46.0%)	37 (31.4%) (37.6%)	77 (37.6%)	
Agree	35 (40.2%)	47 (39.8%) (40.0%)	82 (40.0%)	
Neither agree nor disagree	10 (11.5%)	23 (19.5%) (16.1%)	33 (16.1%)	
Disagree	2 (2.3%)	9 (7.6%) (5.4%)	11 (5.4%)	
Strongly disagree	0 (0.0%)	2 (1.7%) (2.1.0%)	2 (1.0%)	

^a The total number of participants having children is 118.

^b Fisher exact test was applied.

starting over, the majority (71.7%) answered positively. According to our participants, the most common reason for not choosing to be a neurosurgeon again was lifestyle and work/life balance (58.6%, Table 7). Gender inequity and lack of support were important factors mainly for women (51.6% and 54.8%, respectively). Although in univariate analysis age and professional status had an effect on these findings, they were not persistent in the multivariate model. Interestingly, 71.2% of participants view gender issues as a disadvantage in career pursuing. This hypothesis was mostly supported by females (80.5% of female neurosurgeons, $p < 0.05$), while age and professional status were not associated ($p > 0.05$). The most common reason for this consideration was pregnancy/child-rearing (59.6%, Table 7). After subgroup analysis, female neurosurgeons stated that they feel less accepted (54.3%) and have fewer opportunities (58.6%) than their male counterparts (36.8% and 27.6%, respectively, $p < 0.05$). On the contrary, male neurosurgeons supported that pregnancy/child-rearing (65.8%) and having many roles (51.3%) are the main factors for viewing gender issues as a disadvantage in career pursuing (Table 7, Fig. 2). These responses were not affected by any other factor in the multivariate regression model. In our study, the only parameter that could make a neurosurgeon's career easier, regardless of gender, was more free time (56.6%, Table 7). Most participants would recommend neurosurgery to a medical student (Table 7). Neurosurgeons would recommend neurosurgery to both a female (60%) and more so to a male (80%) medical student. However, although most women neurosurgeons (71.3%) would recommend neurosurgery to a female medical student, only half of men (51.7%) would support this idea ($p < 0.05$).

Table 7

Experience in neurosurgery.

Questions	Gender		Total	p-value
	Female	Male		
Would you mind your partner/spouse to be a neurosurgeon?				0.832
Yes	27 (31.0%)	35 (29.7%) (30.2%)	62 (30.2%)	
No	60 (69.0%)	83 (70.3%) (69.8%)	143 (69.8%)	
If you had a chance would you consider being a neurosurgeon again?				0.045
Yes	56 (64.4%)	91 (77.1%) (71.7%)	147 (71.7%)	
No	31 (35.6%)	27 (22.9%) (28.3%)	58 (28.3%)	
Please provide a reason:				
Gender inequity	16 (51.6%)	1 (3.7%) (29.3%)	17 (29.3%)	0.000 ^a
Lack of support	17 (54.8%)	6 (22.2%) (39.7%)	23 (39.7%)	0.011
Long working hours	8 (25.8%)	11 (40.7%) (32.8%)	19 (32.8%)	0.227
Concerns about work/life balance	15 (48.4%)	19 (70.4%) (58.6%)	34 (58.6%)	0.090
Other	8 (25.8%)	7 (25.9%) (25.9%)	15 (25.9%)	0.134
Are gender issues a disadvantage in career pursuing?				0.012
Yes	70 (80.5%)	76 (64.4%) (71.2%)	146 (71.2%)	
No	17 (19.5%)	42 (35.6%) (28.8%)	59 (28.8%)	
Please provide a reason:				
Less accepted	38 (54.3%)	28 (36.8%) (45.2%)	66 (45.2%)	0.034
Fewer opportunities	41 (58.6%)	21 (27.6%) (42.5%)	62 (42.5%)	0.000
Many roles (scientist/spouse/parent/friend)	31 (44.3%)	39 (51.3%) (48.0%)	70 (48.0%)	0.396
Pregnancy/child rearing	37 (52.9%)	50 (65.8%) (59.6%)	87 (59.6%)	0.112
Patients often prefer a female neurosurgeon	4 (5.7%)	1 (1.3%) (3.4%)	5 (3.4%)	0.194 ^a
Patients often prefer a male neurosurgeon	30 (42.9%)	27 (35.5%) (39.0%)	57 (39.0%)	0.364
Other	5 (5.8%)	5 (4.2%) (4.9%)	10 (4.9%)	0.011 ^a
What would make your career easier?				
More money	40 (46.0%)	51 (43.2%) (44.4%)	91 (44.4%)	0.695
More time	50 (57.5%)	66 (55.9%) (56.6%)	116 (56.6%)	0.826
More help (household, cleaning, cooking, children, etc)	36 (41.4%)	34 (28.8%) (34.2%)	70 (34.2%)	0.061
Another professional environment	33 (37.9%)	36 (30.5%) (33.7%)	69 (33.7%)	0.266
Working in another country	23 (26.4%)	30 (25.4%) (25.9%)	53 (25.9%)	0.870
Other	3 (0.1%)	7 (0.1%) (0.1%)	10 (0.1%)	0.523 ^a
Would you recommend neurosurgery to a female medical student?				0.005
Yes	62 (71.3%)	61 (51.7%) (60.0%)	123 (60.0%)	
No	25 (28.7%)	57 (48.3%) (40.0%)	82 (40.0%)	
Would you recommend neurosurgery to a male medical student?				0.230
Yes	73 (83.9%)	91 (77.1%) (80.0%)	164 (80.0%)	
No	14 (16.1%)	27 (22.9%) (20.0%)	41 (20.0%)	

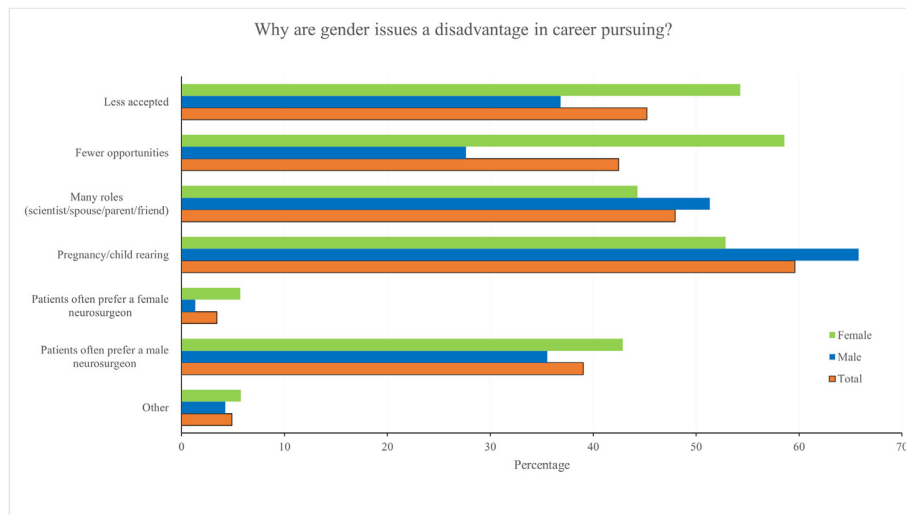


Fig. 2. Gender-associated factors negatively affecting the career pursuing. The most important parameter is pregnancy and child-rearing. However, after subgroup analysis, as it is illustrated by the chart, female neurosurgeons believe that less acceptance and fewer opportunities mainly contribute to this issue ($p < 0.05$), while males support that the presence of many roles and pregnancy are the main contributors ($p > 0.05$).

1.3. Discussion

1.3.1. The role of women in neurosurgery

Over the past century, neurosurgery has evolved and expanded in various directions. The doctrine that women should be stay-at-home mothers to raise their children, and manage their household has been slowly eroded over time. Knowing that more women than men are graduating from medical schools, it is interesting that the number of women entering traditionally male-dominated professions, such as neurosurgery, is consequently increased (Abosch and Rutka, 2018). Despite the rapidly increasing number of female neurosurgeons, the percentage of women neurosurgeons rising to leadership positions and pursuing an academic career still remains low. The first European women neurosurgeons, emerged in the 1920s (Hernández-Durán et al., 2021). Currently, 12% of the European neurosurgical workforce is female, while only 6% of the leadership position is held by women (Steklacova et al., 2017; Wolfert et al., 2019). Thus, neurosurgeon's personal lifestyle and work-family balance have recently come into sharp focus, as a potential contributing factor to the existent mismatch between the increasing number of female neurosurgeons and the stagnant number of female leaders in neurosurgery.

In our study we found that, neurosurgeons are supportive and helpful at home and work. However, women neurosurgeons take more responsibilities at home, especially in the child-rearing years. Furthermore, female neurosurgeons are more likely to live alone or stay childless more often compared to their male colleagues. The probability of living alone was negatively associated with age and advanced professional status in univariate analysis. However, only the association with gender remained significant in multivariate analysis. Supportive facilities, flexible programs, universal life policies and presumably curbing of the social stereotypes are of importance to overcome gender inequities that women may still face in neurosurgery.

1.3.2. Work-life balance

Despite the social stereotypes that have contributed to this situation, many factors encourage men to be disproportionately more attracted to neurosurgery than women. Lifestyle is one of these factors. In 2016, Renfrow et al. analyzed all residents who matched into neurosurgery between 2000 and 2009 according to the databases from the American Association of Neurological Surgeons (AANS) and the American Board of Neurological Surgery (ABNS) (Renfrow et al., 2016). The authors found

17% attrition rate for female residents, compared with only 5.3% for males. They also noticed that the majority left the field within the first three years of training but stayed in medicine, pursuing anesthesia, neurology or radiology (Renfrow et al., 2016). However, this study did not attempt to ascertain reasons for attrition (Renfrow et al., 2016). Previously published studies showed that lifestyle considerations were regarded as the main reason for attrition among women in general surgery (Jr Aufses et al., 1998; Dodson and Webb, 2005). Similar studies implicate work-life balance as an essential factor, irrespectively of gender (Everett et al., 2007; Lambert and Holmboe, 2005). Gadjaradj et al. stated that female neurosurgeons are less satisfied with work-life balance than males ($p < 0.001$) (Gadjaradj et al., 2020). In our study, 43.5% of the respondents stated satisfaction in terms of lifestyle-work balance, while 36.6% felt frustrated. Gender did not affect these findings in our study ($p > 0.05$). However, in univariate analysis male gender, older age and advanced professional status increased the probability for considering spare time adequate and satisfactory. Interestingly, our survey results identified lifestyle and work-life balance as the reasons for not choosing again neurosurgery, if starting over (58.6%). The importance of the work-life balance may become even more important in both genders in the near future. The geometrically increasing resignation rate of high-salary employees occurring mainly in the USA may well be a reflection of a new trend for considering quality of life more important than a high salary or a sacrificing career.

When it comes to what men and women value most in a job, most men prioritize having a high-paying job. On the other hand, most women are more concerned with having a flexible schedule with respect to lifestyle. The gender pay gap is well known (Lean, 2022). Even in the same job, women are still less paid than men in many countries. It has been estimated that full-time, year-round workers, women in the U.S. make 17% less than men, although among all workers the gender pay gap is an alarming 27% (Institute for women's policy research and JobsStalled Progress, 2021). Likewise, in 2021 E. Cooney found that the salary gap between male and female physicians adds up to \$2 million in lifetime earnings (Cooney, 2021). In our data we found that male neurosurgeons are the bread winners (73.3%), while females are not (37.0%), and this difference reached the levels of statistical significance ($p < 0.05$). The fact that females mainly prefer part time jobs and flexible working-hour programs or the stereotype that it is socially accepted for a woman to have a complementary role in the household income could be the reason for this finding.

1.3.3. Gender inequities

Several factors play a vital role in specialty choice. It is widely known that neurosurgery is one of the most demanding surgical subspecialties. Perceived biological differences between men and women may have a negative impact on retention and/or deter them from choosing a neurosurgery career. Pregnancy and child-rearing can be a perception of weakness. A recent survey, in which all continents were represented, reported that female neurosurgeons do not feel they are equally treated by their supervisors (Gadjradj et al., 2020). The authors found that 83.3% of women strongly believe that their gender is a disadvantage in career progression, while only 10.3% of men shared the same feeling (Gadjradj et al., 2020).

In our current study, 71.2% of participants answered that gender issues constitute a disadvantage in the pursuit of a neurosurgical career. This statement was mainly expressed by females (80.5%). The most common reason for this consideration was pregnancy and child-rearing (59.6%). Women neurosurgeons are more likely to be unmarried (37.9%) or childless (55.2%), have fewer children (46.2%) or postpone having children due to lack of support (12.5%) compared with their male counterparts (14.4%, 33.1%, 22.8%, and 5.1%, respectively). In 2021, Kösedagli et al. described that the careers of women and men working in the financial sector evolve in parallel until the birth of their first child. Their career trajectories then sharply diverge immediately after child-birth, and never converge again (Kösedagli et al., 2021). Gadjradj et al. presented that female neurosurgeons were less likely to be married and have children and also be of older age when having children ($p < 0.001$) (Gadjradj et al., 2020). We found that 65.5% of women and 35.6% of men neurosurgeons report parenthood as an obstacle in career pursuing and academic productivity.

Certain groups in the neurosurgical workforce, remain underrepresented owing to systemic barriers based on social identities and categorizations, including gender, race, ability status, and others (Kim et al., 2021). In his 2004 bestseller, "Moneyball", Michael Lewis wrote: "What begins as a failure of the imagination ends as a market inefficiency: when you rule out an entire class of people from doing a job simply by their appearance, you are less likely to find the best person for the job" (Lewis, 2022). Diversity may well strengthen neurosurgery. Undoubtedly, attracting people with different strengths, qualities, experience, and backgrounds unleashes new sources of talent and creativity.

1.3.4. Legislation and policies

Most of the modifiable factors that impede neurosurgeons from having children, especially during residency, are associated with policies, including lack of universal leave policy and lack of flexibility (Gadjradj et al., 2020; Altieri et al., 2019). Personnel issues, such as strain on the residency program and lack of support from peers/faculty are of importance. In 2019, Altieri et al. noted that many residents in the surgical field do not feel support in taking parental leave by either other residents or the faculty (>60%) (Altieri et al., 2019). The authors pointed out that the lack of a universal leave policy, strain and lack of flexibility in the residency program, loss of education/training time, and lack of support are the main obstacles to taking a parental leave during residency (Altieri et al., 2019). In our survey, most participants would support more favorable conditions for colleagues with babies/children (77.6%). In a recent study, only 34.9% of participants reported having formal surgical program maternity leave policies (Rangel et al., 2018). Measures like these are of importance especially for single parents. The competing demands at work and at home for solo parents are even greater. Frequently, single parents have to stay up late with a sick child or stay longer at work, face an emergency, undertake home responsibilities and enforce house rules, alone. Gadjradj et al. found that female neurosurgeons are more likely to break-up or divorce ($p < 0.001$) (Gadjradj et al., 2020). Medical training (44.6%) and/or career (48.6%) demands mainly contributed to this situation (Gadjradj et al., 2020). Seven neurosurgeons (5.9%) in our study indicated that they were single parents, while all of them, most probably by coincidence, single mothers.

Difficulties with pregnancy, breastfeeding, and childcare issues may all contribute to surgeon burnout, affect job satisfaction, and contribute to challenges in maintaining the future surgical workforce. We found that women neurosurgeons seem to have more childcare responsibilities than men. However, recent studies have shown that men value parenting and are actively involved in their children's care (Huerta et al., 2014). Although 43% of fathers had never changed a diaper/nappy two decades ago, today this is true for only 3% of fathers (Jones and Mosher, 2013). Therefore, there has been increasing interest in paternity leave. It seems that fathers who take paternity leave are more actively involved in the child's care (Huerta et al., 2014). Although historically there has been more emphasis on maternity leave, parental leave is also important for both parents. We found that regardless of gender, 44.9% used a parental leave of absence. However, while most of men took time out from clinical duties for less than one month, the majority of their spouses/partners used a quite longer maternity leave of at least seven-month duration ($p < 0.05$).

1.3.5. Contribution in household responsibilities

Housework obligations constitute another parameter resulting in strain, frustration, and displeasure with work-life balance. Women spend more time performing household duties than men. We found that female neurosurgeons spend much more time cleaning, cooking, and house-keeping than men (Table 5). Moreover, male neurosurgeons admitted that their partners/spouses are burdened more (Table 5). To our knowledge this is the first study assessing the contribution of neurosurgeons in household activities. Increased home and family responsibilities, work environment biases and harassment, long years of difficult training, endless hours in the operating theatre, and inflexible work environment are common factors that negatively affect personal lifestyle, overall job satisfaction and life success. Therefore, they influence work-family balance and promote burnout.

1.3.6. Social obstacles and stereotypes - the glass ceiling

Women surgeons potentially face gender issues not only during training but also in practice. They often express thoughts of not feeling recognized or being less accepted and less appreciated by their supervisors and patients. They also feel they have fewer opportunities to get leadership positions or pursue an academic career. In certain parts of the world, women are still less paid than men when working in similar jobs, while they receive different rewards for similar achievements (Gadjradj et al., 2020; Furnas et al., 2018; Halperin et al., 2010; Jagsi et al., 2006; Jonasson, 2002; Venes and Parent, 2006). In 2008, the white paper emphasized that gender disparities are magnified in traditionally male-dominated environments, such as neurosurgery, and underscored that women are rarely advanced into leadership or chair positions within neurosurgery (WINS White Paper Committee: et al., 2008). Many of these problems are not exclusive to neurosurgery but are ingrained and escalated over time. To overcome these obstacles, the authors focused on leadership training, negotiating skills, networking, defined policies on harassment and discrimination, and development of female role models and mentors. They believe that these recommendations are likely to benefit all neurosurgeons, irrespective of gender, and ensure the viability of neurosurgery in the future (WINS White Paper Committee: et al., 2008; Wright et al., 2003).

Role strain for female professionals, academic responsibilities, discrimination and harassment, socio-psychological issues because of persistent gender stereotypes, mentoring, and role models are also factors responsible for the glass ceiling (Woodrow et al., 2006). We found that men held leadership and academic positions more frequently than women (Table 2); however, this finding was not statistically significant. In our data, most neurosurgeons stressed that there is still a theme of gender inequity in career pursuit. This hypothesis was mainly supported by women (80.5%) in our study. Gadjradj et al. reported that female neurosurgeons were less likely to choose again a career in neurosurgery (Gadjradj et al., 2020). They also found that all respondents in their study

were less likely to recommend a neurosurgical career to a daughter than to a son ($p < 0.001$) (Gadjradj et al., 2020). In our communication, gender inequity was among the main reasons for not choosing a career as neurosurgeon, especially among females. We also found that although most women neurosurgeons (71.3%) would recommend neurosurgery to a female medical student, only half of men (51.7%) would do so ($p < 0.05$).

It remains controversial if gender discrimination in neurosurgery constitutes a well-preserved myth. The observed underrepresentation of women in the neurosurgical community could be related to social factors other than gender discrimination itself. Potentially addressable social issues in different countries and different cultures are often ignored.

1.3.7. Study limitations

Our study has certain limitations. Firstly, the total number of participants is relatively small and some countries have a limited representation. Thus, subgroup analysis based on nationality was not performed due to the limited number of participants. Despite that the heterogeneity of our study population could be a selection bias, the current data is sufficient to give a general picture of European neurosurgeons' perspectives, and a broad spectrum of opinions is presented, highlighting exactly our study's contribution to the pertinent literature.

Secondly, we could not calculate the actual response rate due to the questionnaire's distribution on social media. Moreover, the female to male ratio in our study was much higher than the reported one worldwide. The fact that half of our participants were women possibly introduces a selection bias.

It also needs to be pointed out that, this survey was conducted during the Covid-19 pandemic. The psychological impact of the pandemic cannot be accurately accounted but is likely to be significant and may affect some groups or one gender more than another. Therefore, we should state that this situation might indirectly affect answers to questions dealing with feelings, emotions, and perspectives.

1.4. Conclusions

In our study we found that neurosurgeons contribute a lot to housework and child-rearing. Females have more responsibilities at home and are in greater need of support and spare time to organize and plan the work and home activities, especially during the child-rearing years.

Also, we found that female neurosurgeons more often live alone, and are less likely to have children compared to their male colleagues. It is accepted that career-pursuing females usually have fewer children and are more likely to be of older age when having them. The early middle age/child-rearing years are remarkably stressful as they are crucial for a neurosurgeon's career and simultaneously intensive at home.

Women in neurosurgery seem to be still facing gender inequities. The value of our study is to trigger a broad and frank discussion regarding gender issues in the neurosurgical community. It has to be emphasized, however, that gender inequities in neurosurgery represents just the tip of the iceberg. Actually, it is just a part of an international, wide-spectrum, perplex problem based on a variety of socio-economic, cultural, and religious factors among different countries, around the world. We believe that a thorough and sincere discussion of the problem may well lead to its solution.

Disclosure

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.bas.2022.101100>.

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