



Status of Women in Neurosurgery: Results from a National Survey in Italy

Alba Scerrati^{1,2}, Chiara Angelini^{1,2}, Alba Madoglio^{1,2}, Daniela Lucidi³, Sara Parini⁴, Daunia Verdi⁵, Andrew A. Gumbs⁶, Gaya Spolverato⁷

■ **BACKGROUND:** Gender inequity in surgery has increasingly been a matter of debate. Contributions of female neurosurgeons to academic medicine and societies are poorly highlighted. The aim of this study was to evaluate several aspects of the professional and work-life balance of female neurosurgeons in Italy.

■ **METHODS:** Data of the female neurosurgical population were extracted from a general 83-item questionnaire administered to a total of 3242 respondents. The survey was composed of multiple-choice questions investigating demographics, surgical training and practice, satisfaction, mentorship, discrimination, and harassment.

■ **RESULTS:** A total of 98 female neurosurgeons were included. Most responders were married or cohabiting (49%). Thirty-nine (43%) were planning to have children, and 15 of them (44%) stated the reason they still didn't have any was because of professional constraints. Seventy (71%) women were neurosurgeons with an academic position (residents or academics) and 28 (29%) were full-time attendings. Most of the female neurosurgeons are satisfied with their work: sometimes (35%), often (20%), and always or almost always (20%). Most of them (45%) stated they are rarely victims of harassment, but 66% think that they are treated differently because they are women. A similar rate for a poor and fulfilling work-life balance (34% and 35%, respectively) was detected. The majority of participants

(89%) had encountered a role model during their career, but in only 11% of cases was that person female.

■ **CONCLUSIONS:** Even though the rate of satisfaction among female neurosurgeons in Italy is high, some of them experienced gender discrimination, including incidents of sexual harassment and microaggressions. Policies including job sharing paradigms, consistent and meaningful options for parental leave, mentorship programs, equal and fair remuneration for equal work, and zero tolerance for harassment should be encouraged.

INTRODUCTION

Gender inequity in surgery has increasingly been a matter of debate over the last few decades. Currently, a more positive attitude toward women in surgery seems to be developing.¹ Conversely, although attitudes are changing, women still represent a significantly lower percentage of surgeons in most countries.²

Contributions of female neurosurgeons to academic medicine and societies as a whole are poorly highlighted, as are their challenges in this traditionally male-dominated specialty.³ In fact, considering the worldwide scenario among neurosurgical associations such as the Congress of Neurological Surgeons, the European Association of Neurological Surgeons or the Italian Society of Neurological Surgeons, no one has ever had a woman

Key words

- Female neurosurgeons
- Gender bias
- Gender inequity
- Harassment
- Neurosurgery
- Surgery
- Women

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as president.⁴ In 2018 Dr. Shelly Timmons was the first woman to be elected president of the American Association of Neurological Surgeon in its 86-year history. Pioneers like Dr. Timmons have encountered serious challenges (such as the inflexible work environment of neurosurgical practices, unconscious bias and harassment, increased home and family responsibilities, and the lack of adequate mentoring and role models) yet have become role models for the next generation. These women have paved the way and facilitated neurosurgical training and practice for more female surgeons. The gradual increase in the number of female neurosurgical residents leads to the expectation that women will play a more prominent role in the future as leaders in neurosurgery.⁵

There is no Italian literature available regarding gender related challenges in neurosurgery. The aim of this study was to evaluate several aspects of the professional and work-life balance of female neurosurgeons in Italy. In particular, we sought to assess the perception of gender-based issues and satisfaction in a cohort of female neurosurgeons practicing in Italy.

MATERIALS AND METHODS

Data of the female neurosurgical population were extracted from a 83-item questionnaire administered to a total of 3242 female respondents from all surgical specialties (see Parini et al.⁶). The survey was composed of multiple-choice questions investigating the following issues: demographics, surgical training and practice, satisfaction, mentorship, discrimination, and harassment. Pretest cognitive interviews were conducted with surgeons from multiple institutions to assess clarity, coherence, and the balance of the survey. The first draft of the questionnaire underwent iterative revisions and retesting by the board members of “Women in Surgery Italia.” The survey was composed of multiple-choice questions, and some items were scored using a 5-point Likert scale. Questions judged as involving private or sensitive issues were optional. The final questionnaire was approved by the Women in Surgery Italia executive committee.

The online survey was conducted from November 1 to December 31, 2020, using Research Electronic Data Capture electronic data capture tools.^{7,8} All responses were voluntary and anonymous. Responders gave an electronic informed consent, which was stored through the Research Electronic Data Capture e-Consent Framework. The survey could only be taken once because the link expired when used.

Overall, 2781 emails of female surgeons were collected from different databases (Women in Surgery Italia memberships, Google searches, institutions of employment, and surgical department websites). Additional invitations were sent to the chairpersons of 310 surgical training programs (20 neurosurgical training programs), 1887 surgical units, 98 surgical societies (4 neurosurgical societies), and 107 medical regional boards. Moreover, the survey was shared on the Women in Surgery Italia social media pages (Facebook, LinkedIn, Twitter, and Instagram). Inclusion criteria were female neurosurgeons, trainees and faculty members actively working in Italian academic and non-academic hospitals, and respondents who entered at least >50% of the answers.

Descriptive statistics were reported for each variable. Categorical data were reported as relative and absolute frequencies.

RESULTS

Overall, among the 3242 respondents, 98 female neurosurgeons (out of 163 contacted) were included in the analysis. The median age was 43 years.

Demographics and Family Status

Most responders (55 of 98, 56%) were from Northern Italy. Most responders were married or cohabiting (49%); of the remaining, 40% were single and 11% were divorced at the time of the survey. Fourteen people (15%) stated that they had at least 1 child and 18 (19%) had more than one child. Thirty-nine (43%) participants, already mothers, were planning to have children; 15 of them (44%) stated that the main reason why they still did not have any was because of professional constraints. Eleven people (13%) reported that they did not have children and did not plan to have any. Fifty respondents (51%) reported that their partners were the main caregivers and were responsible for the majority of household duties (see [Table 1](#) and [Figure 1](#) for further details).

Professional and Income Status

Years of surgical activity (including residency) averaged 15.2 (min 1–max 52). Training abroad was performed by 61% of respondents during or after residency.

Seventy (71%) women were neurosurgeons with an academic position (residents or academics) and 28 (29%) were full-time attendings. Most respondents (61%) worked in a public hospital, with only 11% (10/93) working in a private one. Out of 70 neurosurgeons/residents who responded, 60% were full-time attendings, 13% part-time attending surgeons, 11% private practice, 9% (6) head of surgical unit, 6% (4) head of a department, and 1% (1) described as an outpatient specialist ([Table 1](#)). Only 1 person had a tenured academic position.

The majority of participants (62%) work in outpatient clinics 5%–20% of work time (of the weekly working timetable), 23% work less than 5% of work time, and the remaining equally 20%–50% or more than 50% of work time (13% and 12%, respectively). Similarly, the amount of % of work time spent in operating room are 20%–50% for 43% (34) of surgeons, 5%–20% for 34% (27) and equally less than 5% or more than 50% for the others (9% and 14%, respectively) ([Table 1](#) and [Figure 2](#)).

The annual income of female neurosurgeons looks extremely heterogeneous. Our data show that 22% of female neurosurgeons earn from 60.000 to 80.000 euros/year, 23% earn from 45.000 to 60.000 euros/year and 21% earn less than 30.000 euros/year. In addition, 14% earn from 80.000 to 100.000 euros/year and 12% earn from 30.000 to 45.000 euros/year. A minority earns from 100.000 to 150.000 euros/year (3%) or more than 150.000 euros/year (1%). No data on annual income of male neurosurgeons are available in our country.

Work Satisfaction

Fulfillment was investigated in terms of frequency (always/almost always, often, sometimes, rarely, never/almost never). Most of the female neurosurgeons in Italy are satisfied with their work: sometimes (35%), often (20%), and always or almost always (20%). Just 9% of them are rarely satisfied and 3% never or almost never satisfied ([Table 1](#), [Figure 3](#)).

Table 1. Summary Table of Survey Items With % of Response

Item	Number	%	Tot
Area of practice			98
Northern Italy	55	56%	
Central Italy	21	21%	
Southern Italy	22	23%	
Years of surgical activity (including residency)			
Mean	15.2		
Min	1		
Max	52		
Type of hospital			
Public	57	61%	93
University hospital	25	27%	
Private	10	11%	
Others	1	1%	
Position			
Academic/Residency	70	71%	98
Full time attending	28	29%	
Type of academic position			
Resident	23	82%	28
PhD student	1	4%	
Research grant	2	7%	
Structured researcher	1	3%	
Associate Professor	1	4%	
Full Professor	0	0%	
Abroad training			
Yes	56	61%	92
No	36	39%	
Partner			
Single	37	40%	93
Cohabitee	16	17%	
Married	30	32%	
Divorced	10	11%	
Children			
No, and I don't want to	11	13%	91
No, but I want to	39	43%	
No, and I'm undecided about the future	9	10%	
One child	14	15%	
More than 1 child	18	19%	
Reason of not having kids			
Personal	10	29%	34
Economic	2	6%	
Professional	15	44%	
Other	7	21%	
Continues			

Table 1. Continued

Item	Number	%	Tot
Home care			
Me	48	49%	98
Others	50	51%	
% of work time in outpatient clinic			
<5%	18	23%	77
5%–20%	48	62%	
20%–50%	10	13%	
>50%	1	12%	
% of work time in OR			
<5%	7	9%	80
5%–20%	27	34%	
20%–50%	34	43%	
>50%	12	14%	
Salary			
<30.000 euros	16	21%	77
30–45.000 euros	9	12%	
45–60.000 euros	18	23%	
60–80.000 euros	17	22%	
80–100.000 euros	11	14%	
100–150.000 euros	2	3%	
>150.000 euros	1	1%	
Prefer no answer	3	4%	
Satisfaction			
Never/almost never	2	3%	75
Rarely	7	9%	
Sometimes	26	35%	
Often	25	33%	
Ever/almost ever	15	20%	
Different treatment than men			
No	15	20%	74
Yes	49	66%	
I don't know	10	14%	
Which kind of different treatment			
Better mentoring	1		
Worse mentoring	17		
Less rewarding assignments	23		
More rewarding assignments	0		
Less often taken into consideration	21		
More often taken into consideration	0		
Being teased	9		
Continues			

Table 1. Continued

Item	Number	%	Tot
Less is expected from me	4		
More is expected from me	17		
Worse assignments	10		
Best assignments	0		
Victim of harassment			
Never	29	41%	71
Yes, very rarely	32	45%	
Yes, frequently	10	4%	
Work-life balance			
Lacking	7	9%	75
Poor	25	34%	
Neutral	13	17%	
Fulfilling	26	35%	
Very good	4	5%	
Role models			
Yes	65	89%	73
No	8	11%	
Men	58	89%	65
Women	7	11%	

The participants were also asked about harassment. Most of them (45%) stated they are rarely victims of harassment but that it had happened at least one time in their careers, while 41% said they have never suffered from harassment and 10% that it was a recurring problem (Figure 4).

Most respondents (66%) think that they are treated differently because they are women. Regarding inequalities most women reported to be given less-rewarding assignments (23%), to be taken in less consideration (21%), to experience worse mentoring (17%), and to be asked for more expectations (17%). In addition, 10% reported they were given worse assignments and 9% to be teased (Figure 5).

Work-Life Balance

We collected 75 answers regarding work-life balance, with a similar rate for a poor and fulfilling work-life balance (34% and 35%, respectively) (see Table 1 for further details).

Role Models

Most participants (89%) had encountered a role model during their career, but in only 11% of cases that person was female.

DISCUSSION

Our study is the first one analyzing female neurosurgeons' work satisfaction and working environment in Italy with the aim to fill the gap in the literature regarding the Italian perspective on the international debate on gender disparities in surgery.

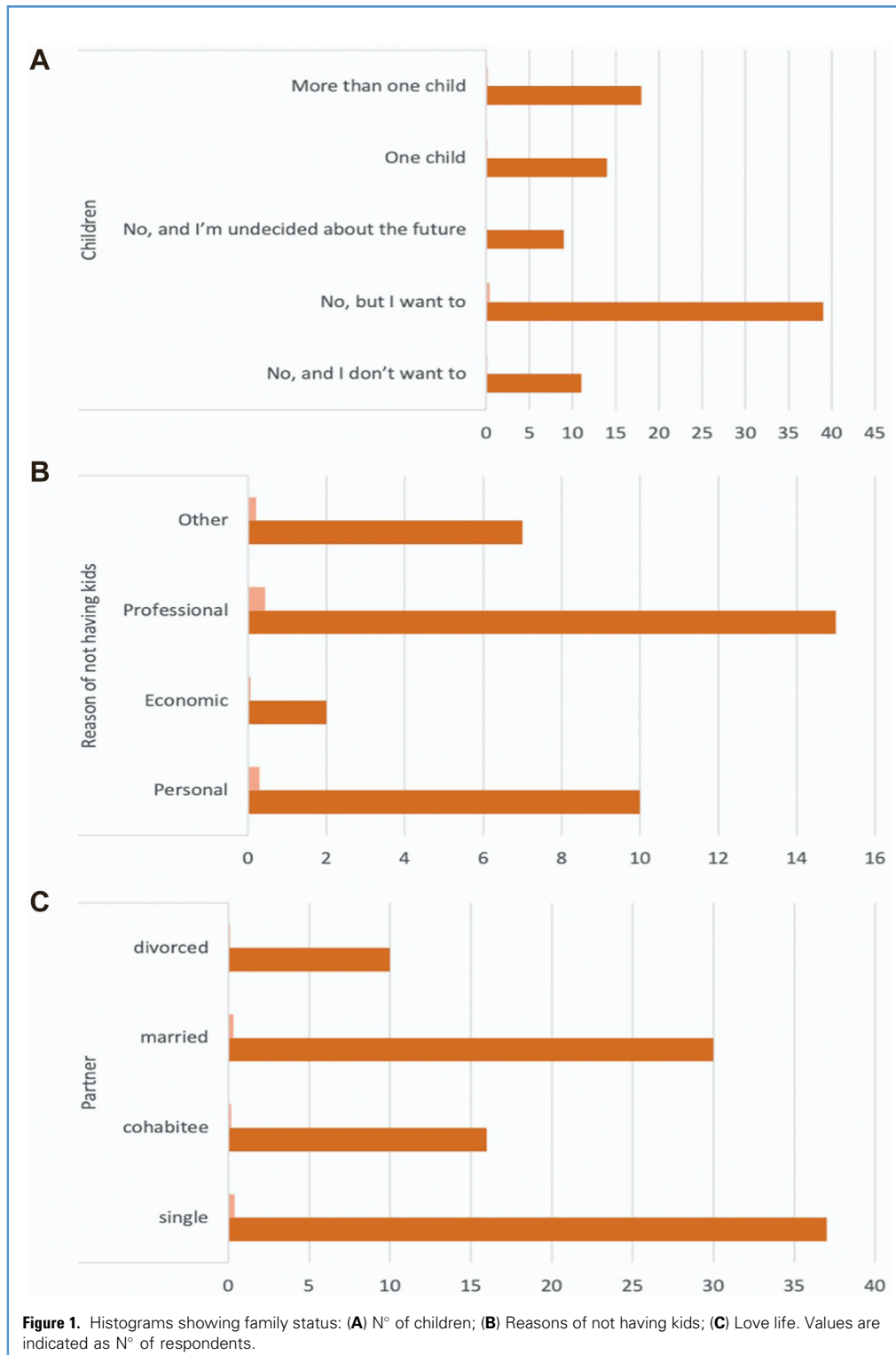
We decided to focus our attention on this subset of data because female neurosurgeons are constantly increasing in number, and no survey regarding their work conditions is available for our country. The results highlight key perceptions and gaps in mentorship and leadership and provide ideas to improve the working environment.

Our results are similar to Parini's et al.,⁶ analyzing the full sample of female surgeons from all surgical specialties. Indeed, this study's data are a subset of data collected in the study by Parini et al. In terms of social and relational life, almost half of female neurosurgeons have a partner; however, almost half do not have kids because of professional restraints and almost half take care of the house-keeping work. These results are in line with Gadraj et al.,⁹ reporting on 205 female neurosurgeons. Garjradi et al. showed that female respondents were less likely (22.8% vs. 6.1%, $P < 0.001$) to be married and also more likely (36.5% vs. 25.7%, $P < 0.006$) to have been through a break-up than male respondents.

In terms of gender disparity, our results show that two-third of respondents are treated in a different way than men. Indeed, most of them report fewer rewarding assignments, less consideration, worse mentoring, and more expectations from them; some of them report worse assignments and teasing (see Table 1). These worrisome findings mean that only 1 woman out of 3 currently feels that she is receiving the same treatment as men. In a survey by Wolfert et al.,¹⁰ the largest obstacle the surveyed women perceived in their careers as neurosurgeons was in 30% of cases the prevailing inequality in opportunities, in 24% obstacles to obtaining leadership positions, in 21% of cases social expectations, and in 10% of cases the lack of mentorship. It has been postulated that the lack of progression in female careers has resulted from organizational male-dominated cultures, with women excluded from the necessary networking and mentoring required for professional advancement. For this reason, we need to encourage and promote female mentorships, developing specific programs with dedicated associations, in order to strengthen professional core values, technical and nontechnical skills, attitudes, and dispositions required to be qualified and competent neurosurgeons.

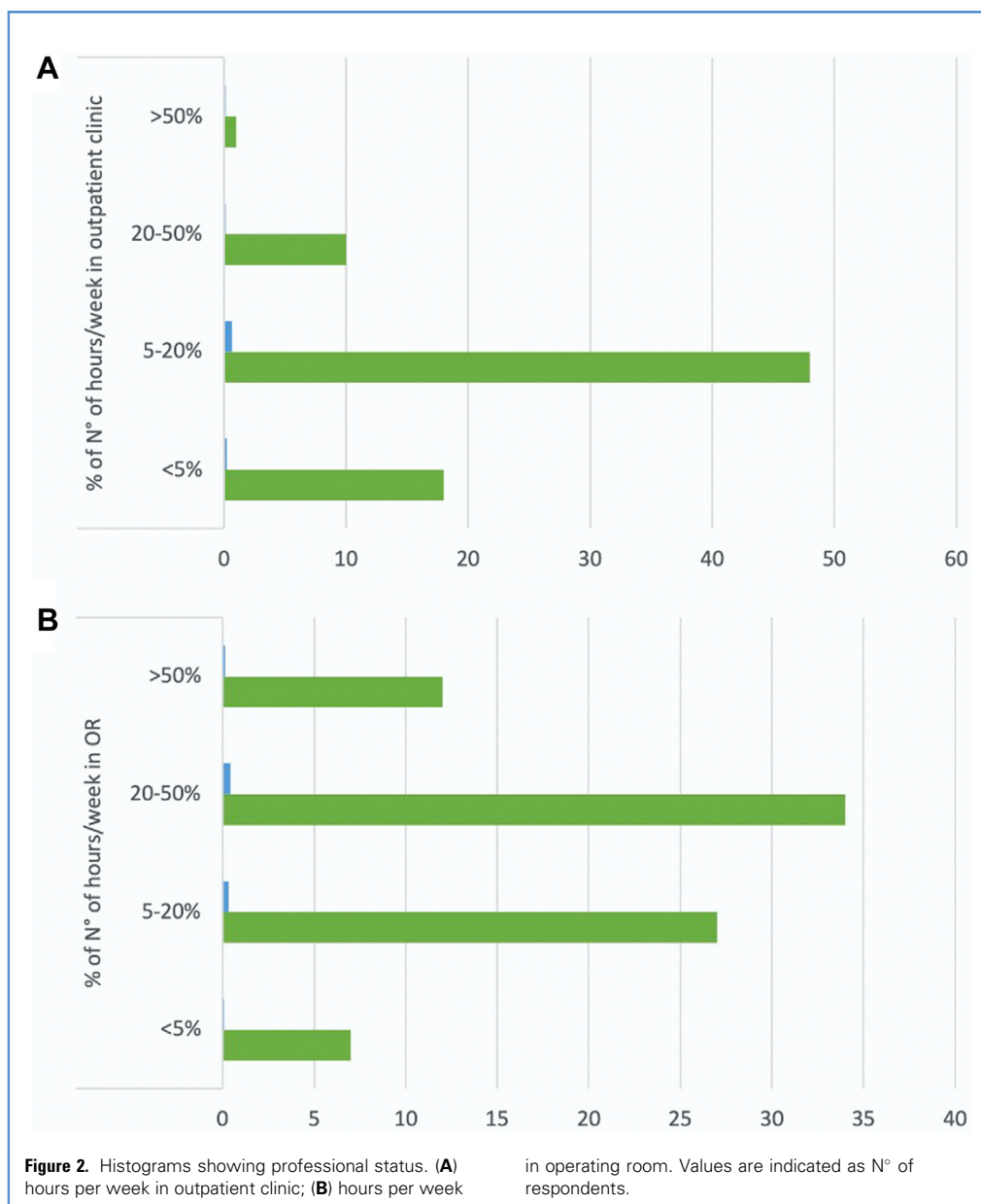
Results from our survey also showed that 45% of participants were rarely victims of harassment, but in 4% of participants, this happened frequently. As mentioned previously, it is worrisome that almost 1 woman out of 2 has been a victim of harassment. This finding is in line with previous reports. In particular, Amarouche et al.¹¹ showed that 56% of women (33% of 291 respondents) reported that they were frequently victims of harassment. Similarly, Thum et al.¹² women (80%) experience microaggressions in the workplace, a finding that is significantly more than for men (36%; $P < 0.001$). Ninety-five percent of macro/microaggressions toward female neurosurgeons were about their gender, compared to 9% of those toward men ($P < 0.001$).

The annual income of female specialist surgeons of all fields corresponds to the annual income of female neurosurgeons (average earnings 45,000–60,000 euros/year versus average earnings 45,000–80,000 euros/year, respectively) in Italy. Despite several gender inequities that still pervade women's careers in surgery, signs of changes are fortunately coming. In 2008, the American Association of Neurological Surgeon



commissioned a white paper (“call to action”) from the Women in Neurosurgery Committee of the American Association of Neurological Surgeons¹³ with the aim of highlighting the

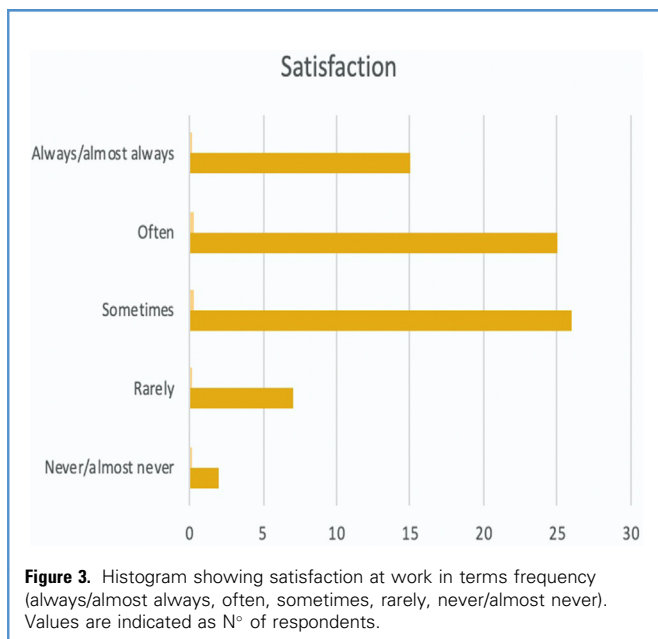
problems of women in neurosurgery and reducing the gender inequality. Acai et al.² suggested a solution to gender inequity in surgery could be better caregiving policies. However, we



should also consider that the issue of gender inequity in surgery is multifactorial, and Tannenbaum et al.² argued that the design of caregiving policies is a symptom of gender inequity, rather than a cause. We can change many things that could probably help, but would likely be insufficient, unless the underlying cause of gender bias and inequity is addressed. Possible solutions that could be embraced and encouraged are job sharing paradigms, consistent and meaningful options for parental leave, mentorship programs, equal and fair remuneration for equal work, systematic tracking of statistics on gender in neurosurgery, and the elimination of harassment in the workplace with zero tolerance policies.¹⁴

Gender bias is often related to traditional sex-role stereotypes that persist in society and can influence the perception and expectations of men and women in the workplace.

A consideration about the fact that half of respondents have no kids due to work constraints, and half do house-care work in addition to work duties could reflect a gender bias. However, this could be better explained as a social/cultural/historical norm in terms of who does the housework. Indeed, the burden of domestic duties depends on the life-partner relationship, not on a bias in the workplace. This cultural historical bias has shifted substantially and rapidly in the past several decades, with roles reversed for many couples, but this could be a social phenomenon, not a



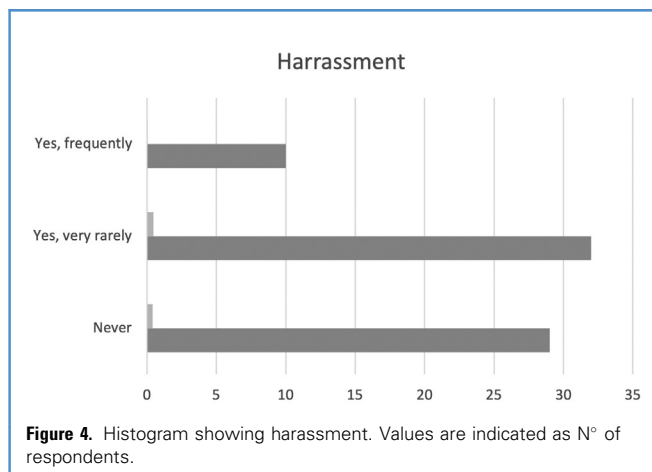
workplace policy issue. Unless the surgical culture does not shift away from the sex-role stereotypes, things will probably never change. In order to do this, constructive and public conversations about the structure of our institutions are needed.

A particularly worrisome finding was that only 1 woman held an academic role. Indeed, over a total of 84 structured academic Italian staff (28 full and 39 associate professors, 17 researchers), only 4 women are present (1 full professor and 3 researchers).¹⁵ An adequate policy of recruitment from the Italian University aimed at filling this void should be undertaken, in order to guarantee woman-to-woman mentorship in Neurosurgery in the academic field.

Despite this survey highlighted different issues for women's career in neurosurgery, several national action items are being carried on. Indeed, discussion groups about women neurosurgeons are frequently organized at the annual meeting of the Italian Neurosurgical Society (Società Italiana di Neurochirurgia, SINCh); in 2015 and 2017, specific meetings about the situation of women neurosurgeons have been organized in Rome and Terni. Still, practical actions to recruit or retain more female trainees are lacking, but we hope these will be the next steps for the future.

Several limits should be considered when interpreting the results, first the small sample size and the paucity of data prohibiting a comprehensive comparison with all Italian female neurosurgeons. A further limitation resides in the exclusion of male surgeons, which impedes a comparison between genders. Unfortunately, similar data on male neurosurgeons in Italy are not available. For this reason, we cannot really make a comparison between the 2 groups.

Finally, always in the health sector, but perhaps even more so in the surgical field, the relationship with the patient should be investigated. In Italy, in fact, the patient hardly trusts or relies on a woman surgeon. In the daily profession, this is often mortifying, further strengthening the difference between men and women



surgeons. While the latter condition requires a so-called “social” time for it to change, the former remains one of the major ways of ghettoizing the female neurosurgeon and should perhaps be investigated even more than the academic role.

CONCLUSIONS

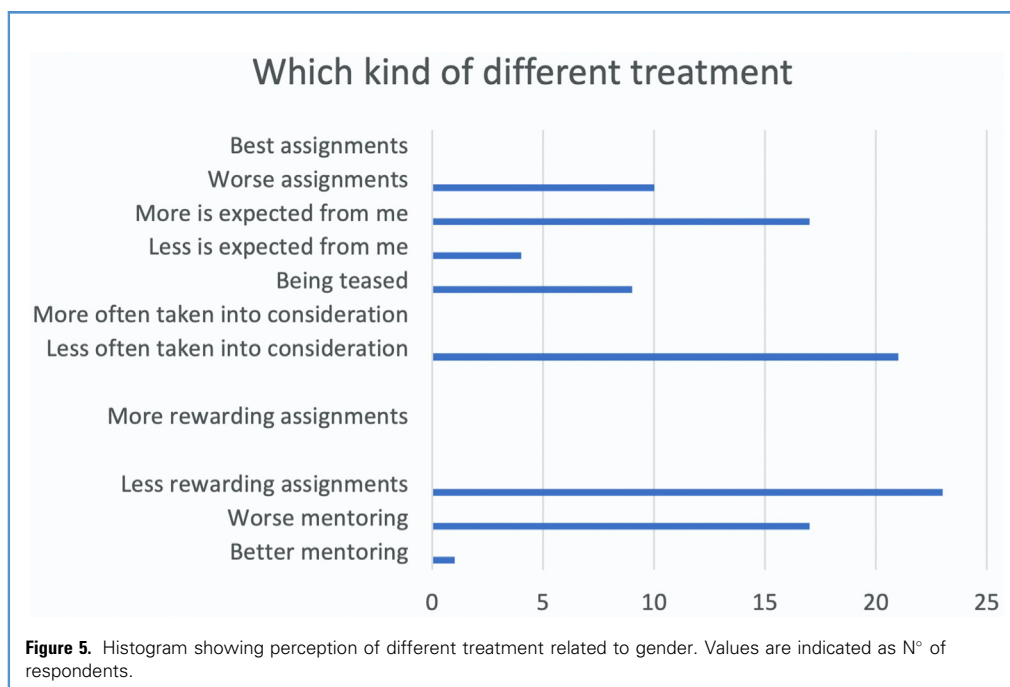
This study showed that despite the fact that the rate of satisfaction among female neurosurgeons in Italy is high, many of them experienced gender discrimination, including incidents of sexual harassment and microaggressions. Nearly half of women who wish to have children, currently do not have them for professional reasons. Policies including job sharing paradigms, consistent and meaningful options for parental leave, mentorship programs, equal and fair remuneration for equal work, and zero tolerance for harassment should be encouraged. The absence of women in academic positions should be underlined and should serve as a significant opportunity for improvement to attract young trainees, increase female representation within academic neurosurgery, and achieve equitable leadership positions.¹⁶

CRedit AUTHORSHIP CONTRIBUTION STATEMENT

Alba Scerrati: Conceptualization, Data curation, Writing – original draft. **Chiara Angelini:** Conceptualization, Data curation, Methodology. **Alba Madoglio:** Conceptualization, Data curation, Methodology. **Daniela Lucidi:** Conceptualization, Data curation, Methodology. **Sara Parini:** Software, Validation. **Daunia Verdi:** Writing – review & editing. **Andrew A. Gumbs:** Supervision, Writing – original draft. **Gaya Spolverato:** Supervision, Writing – original draft, All authors read and approved the final manuscript.

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SUPPLEMENTARY MATERIAL

How old are you?
How long have you started your surgical career (including resident's career)?
Surgical field
- General surgery
- Cardiac surgery
- Thoracic surgery
- Vascular surgery
- Pediatric surgery
- Plastic surgery
- Gynecology and obstetrics
- Orthopedics and traumatology
- Urology
- Maxillofacial surgery
- Neurosurgery
- Ophthalmology
- ENT
- Breast Unit
Working Area of your country
- Northern
- Centre
- Southern
Where do you work most of the time (>80%)?
- Public hospital
- Public university hospital
- Affiliated private structure
- Non-affiliated private structure
- Other
Do you work in a university department?
- Yes
- No
If you are in a university department, what is your role?
- Academic (residents included)
- Hospital doctor
Which type of academic role?
- Resident
- PhD
- Research fellow
Continues

Continued
- Associate professor
- Full professor
Did you spend any training or working period abroad (almost 3 months)?
- Yes
- No
Have you got any additional title, apart from specialization's degree?
- No
- II level master
- PhD
- Master class
What's your family situation?
- Single/non-cohabitant partner
- Cohabitant partner/married
- Divorced/separated/widowed
Have you got any children or would you like any?
- I haven't got, I wouldn't in the future
- I haven't got, I would like to
- I haven't got, I am not sure about to want children in the future
- I have got a child
- I have got more than a child
How many surgeons are there in your department (residents and chief excluded)?
How many women are there among these surgeons?
In your department, are there any women who are not regularly assigned to the operating theatre?
- No
- Yes, it's a "forced" choice
- Yes, it's a "personal" choice
- Yes, but the percentage is the same of the men (for example those female surgeons who go to operating theatre only in case of emergency surgery, but not for elective surgery)
Being a woman led you to give up dedicating yourself to surgical activities to dedicate yourself to outpatient activities?
- No, I decide to give up with surgery
- A little bit
- Enough
- A lot
- I do not care of operating theatre
How many hours do you work per week, on average?
How many hours (%) of your work do you spend in non-surgical activities (outpatient clinic, examinations, follow-up, ward)?
- Less than 20%
- Between 20% and 50%
Continues

Continued
- More than 50%
How many hours (%) of your work would you like to spend in non-surgical activities (outpatients, examinations, follow-up, ward)?
- Less than 20%
- Between 20% and 50%
- More than 50%
How many hours (%) of your work do you spend in surgical activities?
- Less than 5%
- Between 5% and 20%
- Between 20% and 50%
- More than 50%
How many hours (%) of your work would you like to spend in surgical activities?
- Less than 5%
- Between 5% and 20%
- Between 20% and 50%
- More than 50%
How many hours (%) of your work do you spend in research activities?
- I do not practice research activities
- Less than 5%
- Between 5% and 20%
- Between 20% and 50%
- More than 50%
How many hours (%) of your work would you like to spend in research activities?
- Less than 5%
- Between 5% and 20%
- Between 20% and 50%
- More than 50%
How many hours (%) of your work do you spend in administrative activities?
- Less than 5%
- Between 5% and 20%
- Between 20% and 50%
- More than 50%
How many hours (%) of your work would you like to spend in administrative activities?
- Less than 5%
- Between 5% and 20%
- Between 20% and 50%
- More than 50%
How many surgical procedures take place per month in your unit on average?
How many surgical procedures are assigned to you per month on average?
Continues

Continued
How many surgical procedures, are assigned to a surgeon per month on average?
How many high complexity surgical procedures take place per month in your unit on average?
How many high complexity surgical procedures do you perform as first surgeon per month?
How many high complexity surgical procedures do you perform as assistant surgeon per month?
How many medium complexity surgical procedures take place per month in your unit?
How many medium complexity surgical procedures do you perform as first surgeon per month?
How many medium complexity surgical procedures do you perform as assistant surgeon per month?
How many low complexity surgical procedures take place per month in your unit?
How many low complexity surgical procedures do you perform as first surgeon per month?
Among these problems, which do you think is the most responsible for your difficulties in the operating theatre?
- I do not find any difficulties in the operating theatre
- The staff doesn't often consider me
- More expert surgeons do not teach me enough
- The physical difference between me and other team members at the operating table
- The dimensions/proportions of surgical instruments
- The poor physical strength
- Other
- I prefer not to answer
Did you meet any role models during your training/career?
- Yes
- No
If so, men or women?
- Men
- Women
Do you know any professionally satisfied female surgeons?
- No
- Yes
Do you think you are treated differently from your colleagues/superiors for being a woman?
- No
- Yes
- I don't know
Continues

Continued

If so, in what ways do you think you are treated differently from your male colleagues?

- I received more training/suggestions/support
- I received less training/suggestions/support
- I received more unrewarding tasks
- I received fewer unrewarding tasks
- I am more often considered
- I am less often considered
- I get teased or harassed about being a woman
- More is expected of me than of a man
- Less is expected of me than of a man
- I tend to get better assignments
- I tend to get worse assignments
- I tend to get overly positive reviews on my work
- I tend to get overly negative reviews on my work
- I have better chance of being selected for a promotion
- I have worse chance of being selected for a promotion
- Other