



Original Article



Perspective of Women in Neurosurgery: Quantitative Study Interpreting Journey of Professional Identity Formation in Female Doctors of Low Middle Income Country

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ABSTRACT

Globally, there is a shift towards choosing medical and allied specialities over neurosurgery. In Pakistan, where female medical students now outnumber males, this trend has led to a significant gap in the availability of qualified neurosurgeons. **Objectives:** To assess how the perception of neurosurgery evolves from final year medical school to house job among female doctors focusing on educational adequacy, socioeconomic factors and challenging career choices. **Methods:** This cross-sectional descriptive study was conducted through a validated questionnaire. This questionnaire encompassed demographic information, and a series of items designed to evaluate students' educational perceptions regarding neurosurgery, their socioeconomic viewpoints on neurosurgery, and their perspectives on neurosurgery training within Pakistan. **Results:** We received 216 responses from participants, with 115 (53.2%) being final-year students and 101 (46.8%) serving as house officers. 57.9% of participants disagreed to consider neurosurgery as a career option whereas 97.7% considered neurosurgical illnesses challenging and interesting. Neurosurgery involving long operating hours was the strongly agreed question among participants (97.2%). Final-year students were significantly more likely to perceive their neurosurgery education as inadequate (61.7%). Likewise, they reported greater concerns about limited job opportunities compared to house officers (20% vs 7.9%, $p=0.012$). **Conclusions:** It was concluded that although there is considerable interest in neurosurgery, enrollment among females remains low due to educational gaps, socioeconomic barriers and gender challenges. Limited teaching resources, the demanding nature of the field, and perceived negative impacts on personal life among female doctors contribute to this trend.

INTRODUCTION

The brain is one of the most fascinating organs of the body, making its study both intriguing and challenging for medical students. However, mastering the basic anatomy and clinical understanding of neurosurgery can be daunting in the early years of training. The critical question remains: Does this fascination translate into a willingness to pursue neurosurgery as a career, particularly among female medical students who often face additional family

and socioeconomic challenges in developing countries like Pakistan? [1]. Globally, there is a paradigm shift in speciality preferences with a growing inclination towards internal medicine and allied fields due to various factors [2]. In Pakistan, only one-third of medical students show interest in surgery-related fields as a career, which is concerning given the country's large and growing population that requires a balanced distribution of specialists [3].



Additionally, the proportion of female medical students has been gradually increasing, reversing the historical gender ratio from 30% to 70% female dominance. If this trend continues, Pakistan's healthcare system will require more female specialists in surgery, including neurosurgery to meet the needs of its 235.8 million people [4]. Neurosurgery is considered one of the most demanding surgical specialties requiring dedication, technical proficiency and long-term commitment. However, the interest in pursuing neurosurgery remains alarmingly low despite the rising global burden of neurosurgical diseases [5]. In Pakistan, neurosurgical diseases are currently catered by approximately 400 neurosurgeons and 700 postgraduate residents. While it has been estimated that around 22 million patients require neurosurgical interventions with a significant (5 million) proportion from third-world countries [6]. Given the current statistics and this stark gap between demand and availability of qualified neurosurgeons, there is an urgent need to address the factors influencing career choices in the speciality of neurosurgery [7]. Previous studies have explored medical students' hesitancy towards surgery. Existing research has identified several factors such as long training duration, the requirement of competence, and the impact on family life [8]. Along with these social factors, several other factors are related purely to the teaching deficiencies present in our education system. Taking female doctors, especially under consideration, the field as being male dominant as well as societal norms including gender roles can further halt women being entering the clinical field, not alone neurosurgery [9]. Moreover, policies like the Central Induction Policy (CIP) may play a pivotal role in career choices, as female doctors as role as they choose specialties based on social circumstances rather than professional aspirations [10, 11]. Instead of broadly examining neurosurgery as a career choice, our study is structured into three key domains to give a more comprehensive perspective: 1) Educational Adequacy in Neurosurgery – Assessing whether medical training sufficiently prepares students for neurosurgery, 2) Socioeconomic Aspects of Neurosurgery – Exploring financial stability, work-life balance and long term career outlook in demanding speciality and 3) Challenges and Barriers in Neurosurgery – Identifying gender-specific obstacles from pursuing neurosurgery.

Neurosurgery remains a highly demanding specialty with persistently low female enrollment, particularly in low- and middle-income countries like Pakistan, despite increasing numbers of female medical graduates. Existing literature highlights educational deficiencies, socioeconomic barriers, and gender-related challenges; however, limited evidence exists on how perceptions evolve from final-year medical students to house officers. This transition period

is crucial in shaping career identity but remains underexplored in neurosurgical career choice research. This study aims to analyze the perception of neurosurgery as a career choice among final-year female medical students and female house officers in Pakistan. By examining their perspectives at two critical transition points, the last year of medical school to the first year of practical life, we seek to identify the factors influencing their interest, concern and decision-making regarding neurosurgery.

METHODS

This cross-sectional descriptive study was conducted at Allama Iqbal Medical College Jinnah Hospital Lahore from May 2024 to July 2024 following ethical approval from the Institutional Review Board (ERB164/8/16-05-2024/SI ERB). A pre-validated questionnaire, previously utilized in an international study was adapted for this research and transformed into Google Form [12]. The questionnaire comprised multiple sections to gather demographic data and assess participants' perceptions of neurosurgery. The questions from the questionnaire were grouped into three key domains: Educational Adequacy in Neurosurgery (Questions 1, 3 and 4), Socioeconomic Aspects of Neurosurgery (Questions 2, 11-15) and Challenges and Barriers in Neurosurgery (Questions 5-10). The study targets female final-year MBBS students and female house officers to examine their views on neurosurgery as a career choice. The sample size was calculated as 186 using a 95% confidence interval and 5% margin of error with 14 % of participants considering neurosurgery as an option for future careers [13]. However, due to logistical feasibility and accessibility to the target population, and to enhance study validity, 216 participants were employed through convenience sampling to recruit participants. An informed consent was taken from each participant. Data collection was conducted via online forms, ensuring informed consent. All data were anonymized before analysis. The anonymized data were stored securely with restricted access and only aggregated results were reported to maintain privacy. Responses were analyzed using SPSS version 21. Descriptive statistics, including frequencies and percentages were used for categorical variables and the chi-square test was applied to study correlations. Likert scale responses (ranging from 1=disagree; 2=agree; 3=moderately agree; 4=strongly agree) were analyzed to assess trends in participants' perceptions regarding neurosurgery.

RESULTS

A total of 216 participants were included in the study, comprising final year study, comprising final-year students (n=115, 53.2%) and house officers (n=101, 46.8%). The majority of participants were single (n=185, 85.6%) (Table 1).

Table 1: Demographic Characteristics of Participants

Variables	n (%)
Single	185 (85.6%)
Engaged/ Married	31(14.4%)
Final Year	115 (53.2%)
House Officer	101(46.8%)

Results represent participants' responses to various questions regarding their perceptions of neurosurgery. Notably more than half of the participants (n=115, 53.2%) felt that their neurosurgery education was inadequate. Additionally, 57.9% (n=125) of the respondents did not consider neurosurgery as a career option. Conversely, a significant majority of respondents found neurological illnesses challenging and interesting (97.7%) and agreed that neurological illnesses are complicated (94.9%). Furthermore, 93.5% of respondents believed that neurosurgery could impede family life and 96.8% agreed that neurosurgery requires a long training period (Table 2).

Table 2: Participants' Perception of Neurosurgery

Sr. No.	Questions	Disagree n (%)	Agree (Likert 2-4) n (%)
1	My neurosurgery teaching is adequate	115 (53.2%)	101(46.8%)
2	I consider neurosurgery as a career option	125 (57.9%)	91(42.1%)
3	Neurosurgical history is difficult to obtain	27(12.5%)	189(87.5%)

4	Neurosurgical signs are difficult to elicit	54 (25.0%)	162 (75.0%)
5	Limited interventions are available in neurosurgery	39 (18.1%)	177 (81.9%)
6	Neurosurgical illnesses are complicated	11 (5.1%)	205 (94.9%)
7	Neurosurgical illnesses are challenging and interesting	5 (2.3%)	211 (97.7%)
8	Most Neurosurgical illnesses have poor outcomes	18 (8.3%)	198 (91.7%)
9	Neurosurgery requires a long training period	7 (3.2%)	209 (96.8%)
10	Neurosurgery involves long operating hours	6 (2.8%)	210 (97.2%)
11	Huge prestige and income are attached to neurosurgery	12 (5.6%)	204 (94.4%)
12	Neurosurgery can impede family life	14 (6.5%)	202 (93.5%)
13	Neurosurgery training in Pakistan is too prolonged	15 (6.9%)	201 (93.1%)
14	Neurosurgery training centers in Pakistan are few	10 (4.6%)	206 (95.4%)
15	Future job opportunities will be limited	31 (14.4%)	185 (85.6%)

Participants' overall satisfaction with neurological education was low with only 68.9% of final year students and 70.63% of house officers agreeing. Socioeconomic stability associated with neurosurgery was perceived positively by 83.63% of final year students and 84.49% of house officers. However, concerns regarding hurdles in the field were prevalent with 91.01% of final-year students and 96.04% of house officers agreeing that significant challenges exist (Table 3).

Table 3: Overall Perception of Neurosurgery among Final Year and House Job Participants

Domains	Disagree n (%) Total Questions		Agree n (%) Total Questions	
	Final Year	House Officers	Final Year	House Officers
Overall Satisfaction with the level of education in neurosurgery	107 (31.10%)	89 (29.37%)	238 (68.90%)	214 (70.63%)
Overall Socioeconomic stability associated with neurosurgery	113 (16.37%)	94 (15.51%)	577 (83.63%)	512 (84.49%)
Overall perception of hurdles associated with the neurosurgery field	62 (8.99%)	24 (3.96%)	628 (91.01%)	582 (96.04%)

A comparison between final year students and house officers showed significant differences in their perceptions. Final-year students were significantly more likely to disagree that their neurosurgery education was adequate (61.7% vs 23.6%, p=0.008). Similarly, final year students perceived more limitations in future job opportunities compared to house officers (20% vs 7.9%, p=0.012). However, house officers were more likely to find neurological illnesses complicated (98% vs 92.2%, p=0.051) though this difference was not statistically significant (Table 4).

Table 4: Comparison of Final Year and House Officers

Questions	Category	Disagree n (%)	Agree (Likert 2-4) n (%)	p-value
My neurosurgery teaching is adequate	Final Year	71 (61.7%)	44 (38.3%)	0.008*
	House Officer	44 (43.6%)	57 (56.4%)	
I consider neurosurgery as a career option	Final Year	60 (52.2%)	55 (47.8%)	0.070*
	House Officer	65 (64.4%)	36 (35.6%)	
Neurosurgical history is difficult to obtain	Final Year	13 (11.3%)	102 (88.7%)	0.571
	House Officer	14 (13.9%)	87 (86.1%)	
Neurosurgical signs are difficult to elicit	Final Year	23 (20.0%)	92 (80.0%)	0.070*
	House Officer	31 (30.7%)	70 (69.3%)	
Limited interventions are available in neurosurgery	Final Year	24 (20.9%)	91 (79.1%)	0.251
	House Officer	15 (14.9%)	86 (85.1%)	
Neurosurgical illnesses are complicated and difficult	Final Year	9 (7.8%)	106 (92.2%)	0.051*
	House Officer	2 (2.0%)	99 (98.0%)	

Neurosurgical illnesses are challenging and interesting	Final Year	4 (3.5%)	111 (96.5%)	0.225
	House Officer	1 (1.0%)	100 (99.0%)	
Most Neurosurgical illnesses have poor outcomes	Final Year	15 (13.0%)	100 (87.0%)	0.008*
	House Officer	3 (3.0%)	98 (97.0%)	
Neurosurgery requires a long training period	Final Year	5 (4.3%)	110 (95.7%)	0.327
	House Officer	2 (2.0%)	99 (98.0%)	
Neurosurgery involves long operating hours	Final Year	5 (4.3%)	110 (95.7%)	0.134
	House Officer	1 (1.0%)	100 (99.0%)	
Huge prestige and income are attached to neurosurgery	Final Year	5 (4.3%)	110 (95.7%)	0.408
	House Officer	7 (6.9%)	94 (93.1%)	
Neurosurgery can impede family life	Final Year	9 (7.8%)	106 (92.2%)	0.392
	House Officer	5 (5.0%)	96 (95.0%)	
Neurosurgery training in Pakistan is too prolonged	Final Year	10 (8.7%)	105 (91.3%)	0.280
	House Officer	5 (5.0%)	96 (95.0%)	
Neurosurgery training centers in Pakistan are few	Final Year	6 (5.2%)	109 (94.8%)	0.661
	House Officer	4 (4.0%)	97 (96.0%)	
Future job opportunities will be limited	Final Year	23 (20.0%)	92 (80.0%)	0.012*
	House Officer	8 (7.9%)	93 (92.1%)	

DISCUSSION

During the last few years, there has been a paradigm shift in choosing the surgical and allied speciality as a future career which can be due to the high technical demands of surgical field along with long duty hours, but it can also be related to increasing the entry of women in the medical field and inclusion of information technology in medical horizon [14, 15]. Although a study conducted on medical students of Oman showed a negative perception of choosing neurosurgery almost 42.1% in our study viewed it as a career option, which is lower than a study conducted in Karachi, Pakistan, which reported 56.2% of participants' interest in neurosurgery [11, 16]. However, this percentage remains significantly lower than in a study in Saudi Arabia, where 86% of participants showed enthusiasm for neurosurgery as a career option [13]. According to our study, 46.8% of participants considered neurosurgery teaching to be adequate, which is lower than the Saudian study [13]. Despite this, many participants found neurosurgery teaching, history-taking, and examination techniques challenging. A significant proportion (94.9%) agreed that neurological illnesses are complicated and 97.7% found them challenging and interesting. In our study, 93.5% believed neurosurgery could impede family life. Various studies have highlighted neurosurgery as a demanding and strenuous field due to poor patient outcomes, lengthy training periods, and extensive operating hours [7, 9]. While there is a desire to pursue neurosurgery, concerns about its impact on social and family life persist due to limited training centers in Pakistan (95.4%) and constrained future job prospects (85.6%). The study conducted in Saudi Arabia reported that 81.7% of participants perceive an adequate number of training centers in their country, possibly contributing to higher interest levels in neurosurgery surprisingly 93.9% of our participants perceive that training centers in Pakistan are

few which may be one of the leading cause of lack of interest [13]. Economic survival has become a global issue which impacts the choice of future professional field same is the case with doctors, the concept of eternal service and humanitarian welfare is gradually being overshadowed by high-salary speciality choices [17]. Nowadays bread and butter earning is influencing young lads of the medical profession to think again before choosing their future speciality, Akhigbe and Sattar, registered in their study that most medical lads considered neurosurgery a high take-home pay field with a well-sophisticated reputation among the medical fraternity, and similar perception was observed in our study [12]. Around 30% of study participants in both groups were dissatisfied with neurosurgery education, indicating the need for curriculum improvement, the recently introduced integrated curriculum might enhance satisfaction and encourage female doctors to pursue neurosurgery/ Similar results were reported by Balasubramanian et al., who suggested that apart from curriculum, mentorship opportunities play a crucial role [18]. Despite high salaries, work-life balance remains a major barrier for female doctors, especially in low-middle-income countries where family responsibilities impact career choice. The central induction policy has further influenced specialty selection with location often prioritized over passion. Interest in neurosurgery declined from 42.5% among final-year students to 39.6% among house officers warranting further exploration. In a study on Saudi female doctors, 50.3% reported that family responsibilities affected their career choices [19]. The inherent challenges of neurosurgery, largely due to the complexity of neurosurgery largely due to the complexity of brain structures. Managing neurosurgical conditions demands precision and a steep learning curve with only 6.78%

disagreeing with this challenge reinforcing the intense nature of the field. Ahmed *et al* found that 48.6% acknowledged the complexity of neurological diseases which discouraged them from entering the field [20]. The findings align with Krumboltz's Social Learning Theory, which suggests that career choices are influenced by prior experiences and external conditions. Participating in this study demonstrated a decision-making process shaped by exposure to clinical settings and, mentorship, reinforcing the impact of learning experiences on career pathway [21]. Improving socioeconomic support and teaching facilities can make neurosurgery more attractive to medical graduates. Introducing comprehensive teaching methods at the medical student level can build confidence in theoretical knowledge, increasing interest in the field as students enter professional life. While creating new training centers in less populated areas may be difficult, enhancing support and resources for residents in existing centers can make the speciality more appealing and less socially challenging.

This study is limited by its cross-sectional design, reliance on self-reported data, and convenience sampling, which may introduce selection and response bias and limit generalizability. Being conducted in a single institution further restricts the applicability of findings to broader populations. Additionally, longitudinal changes in perception could not be assessed. Future studies should employ multi-center, longitudinal designs with mixed-method approaches to better explore evolving career perceptions and should implement mentorship-based and curriculum-driven interventions to improve female participation in neurosurgery.

CONCLUSIONS

It was concluded that deficiencies in neurological education, socioeconomic concerns and gender-based challenges were observed in career choices. While most of the participants found neurological illness stimulating, significant dissatisfaction exists regarding career prospects, training duration and work-life balance. House officers perceived greater challenges associated with neurosurgery compared to final year students, potentially reflecting an increased exposure to clinical exposure.

Authors' Contribution

Conceptualization: UAK, AS

Methodology: UAK, AS, HK, MM

Formal analysis: MM, MAA

Writing and Drafting: GA, AN, MAA

Review and Editing: GA, AN, MAA

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflicts of Interest

All the authors declare no conflict of interest.

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