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Critical Assessment of Various Neurosurgery Training Programs of Pakistan

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ABSTRACT

AIM: To assess the real challenges faced by neurosurgery residents in developing countries with limited resources and massive workload.

MATERIAL and METHODS: This is a cross-sectional study based on the questionnaire filled by the neurosurgery trainees in Pakistan directed at their training, stress factors, surgical competency, research interest, job satisfaction, and future endeavors.

RESULTS: A total of 75 neurosurgery residents participated in study; 73.3% were male. About 61.3% were working for more than 72 h per week. Average sleeping hours per day were less than 7 h for 92% of trainees. Only 78.6% were able to receive teaching sessions for at least once a week or more. Practical handling of neurosurgical gadgets like microscope and endoscope was never experienced by 26.7% and 18.7%, respectively. Even the senior most residents were able to perform only 41.08% of their surgeries independently. Financial support was only acceptable to 21.3%, and 60.9% want to leave the country upon training completion.

CONCLUSION: The training programs in the developing countries need critical changes to provide favorable learning conditions with availability of appropriate surgical tools, structural changes of training programs, development of research interest, and improvement on the socioeconomic needs of the trainee.

KEYWORDS: Neurosurgery training, Developing country, Residency program

INTRODUCTION

In recent years, neurosurgery has become one huge specialty with many subspecialties grouped under it, including neurotrauma, neuro-oncology, vascular neurosurgery, functional neurosurgery, skull base neurosurgery, spine surgery, and pediatric neurosurgery. With diverse subspecialties and new advancements, the training in the field of neurosurgery has become a bigger challenge to meet the educational demands, surgical competency, communications skills, and patient's expectation of the desired outcome. The changes in the neurosurgery for the more improved training methods according to the modern technologies have been so evident in recent years, which has strong impact on the working environment and socioeconomic challenges (13).

The modern-day neurosurgery training, like any other surgical specialty, is based on the training of the resident in a particular center where the clinical and surgical skills are improved gradually over the years. A resident is exposed to the focused clinical practice, new advanced technologies, and their handling, the decision-making, learning the traditional and modern surgical techniques, and managing the complications. Training varies from center to center and country to country, and the reason is not only the technical advances available to few but also depends on the resident's learning abilities, working hours, and mentorship.

Recognition of neurosurgery as a separate specialty started in the early twentieth century (9). Training programs in Asia started in the 1950s. Pakistan is a developing country and has

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limited resources for health. The same is observed when we look into the advancement and growth of neurosurgery in the country with the population of 220 million and only around 450 neurosurgeons. The history of neurosurgery in Pakistan goes back to the early 1950s when the first neurosurgery unit was established at Jinnah Postgraduate Medical Centre Karachi (12). Despite this fact, Pakistan was the third country in Asia to start a formal neurosurgery training program in 1962. Since then, neurosurgery has come a long way with so many new added training centers across the country and more improved training structure.

The objective of our study is to look into the neurosurgery training programs of the country for the competency level of the resident neurosurgeons in terms of the clinical skills, exposure to the recent advances, development of their surgical experience, and readiness for future challenges as independent neurosurgeons.

METHODOLOGY

This cross-sectional study was conducted from July 2019 to January 2020 to assess neurosurgery training experience in Pakistan. The survey was designed to get the personal information of a neurosurgery trainee, institutional affiliation, training details, learning experience and skills development for the recent advancements, working hours, social and financial aspects, and future choices. Via e-mail, the online survey was sent to 87 residents working in 16 different accredited neurosurgery institutes of the country affiliated with the national neurosurgery training programs. A total of 75 residents responded and filled out the survey voluntarily (response rate 86.2%).

RESULTS

Demographic details and institute selection: This study included 73.3% (55) male and 26.7% (20) female neurosurgery trainees (Table I). Out of the total 75 respondents, 17.3% were in their final residency year (RY-5), while 30.7% had already completed their training and were waiting for their exit exams (RY-6). Fourth year trainees (RY-4) were 24%, and RY-3 were 28.0%. RY-1 and RY-2 trainees were working in the general surgery at the time of study, so they were not included. Most of the trainees (46.7%) stated that the institution they are working in was the first choice at the time of induction, 40% selected their institute because of the supervisor they wanted to work with, and 13.3% chose their institute as the last option.

Teaching sessions and educational meetings: Daily teaching sessions were being conducted in 49.3% of institutes, two to three sessions per week in 18.7%, once per week in 10.7%, two to three per month in 10.7%, and rarely in 8%. Journal club was part of the weekly educational program in 4% of institutes, two to three per month in 8%, once per month in 26.7%, rarely in 34.7%, and never in 26.7%. The most frequently (86.7%) consulted textbook by residents for learning was the *Handbook of Neurosurgery* (Mark S. Greenberg, 2020), whereas 64% used *Principles of Neurological Surgery* (Richard G. Ellenbogen, 2018) as a reference book during their training. Other common texts include *Ramamurthi and Tandon's Textbook of Neurosurgery* (ed. 2012) and *Youmans and Winn Neurological Surgery* (ed. 2016). Internet and PowerPoint presentations were also the main source of education according to 46.6% of residents.

Surgical experience, surgical meetups, and research interest: Performing the surgeries in operation theaters is one of the most important aspects of surgical training. Table II compares the emergency and elective surgeries performed by the residents at different levels of their training. Intraoperative handling of some important neurosurgical tools in the department was regular use of magnification loupes (14.7%), microscope (21.3%), endoscope (33.3%), intraoperative monitoring (18.6%), neuronavigation (20%), stereotaxy (6.7%), and CUSA (22.7%), but lack of hands-on training to these equipment was common (Figure 1). When asked regarding their surgical skills, only 42.7% believed to have good or excellent surgical skills.

When asked about research and conferences, 49.3% of residents were found to have no publication to their name, and 66.7% had never attended an international neurosurgery conference (Figure 2).

Stress factors, satisfaction, and future plans: Weekly working hours of more than 72 h were observed by 61.3% residents, 48–72 h by 37.3%, and less than 48 h by 1.3% (Figure 3). Sleep time of 6–7 h per day was provided to 53.3%, 3–5 h to 38.7%, and 8–9 h to 8% (Figure 4). No participation in regular extracurricular activities was observed in 33.3% residents. Any departmental or institutional level academic evaluation was stated by only 22.7% of residents. Most of the residents were satisfied with their overall training (56%),

Table I: Demographic Data of Trainees

Level of Training	No of trainees (%)	Males (%)	Female (%)
RY3	21 (28.0%)	14 (66.7%)	7 (33.3%)
RY4	18 (24.0%)	13 (72.2%)	5 (27.8%)
RY5	13 (17.3%)	9 (69.2%)	4 (30.8%)
RY6	23 (30.7%)	19 (82.6%)	4 (17.4%)
Total	75 (100.0%)	55 (73.3%)	20 (26.7%)

Table II: Comparison of Elective and Emergency Surgeries Among Trainees

	Emergency		Elective	
	Performed	Assisted	Performed	Assisted
RY-3	5.2%	94.7%	0	100%
RY-4	28.05%	71.8%	11.8%	88.1%
RY-5	69.2%	30.7%	23.2%	76.7%
RY-6	91.08%	8.9%	41.08%	58.9%

while other factors like supervisor, administration of the training institute, and financial status were also noted (Figure 5). After completion of the degree program, 60.9% wanted to go abroad for a job or any fellowship, while 39.1% wanted to start their career in Pakistan as consultant neurosurgeon. As for future plans, 29.3% wanted to pursue spine surgery, while 21.3% wanted to pursue general neurosurgery (Figure 6).

DISCUSSION

Specialized training particularly in the field of surgery requires proficiency not only in the basic knowledge and clinical evaluation but also in many other disciplines like surgical skills, collaboration and communication, leadership qualities, decision-making, and update on research and recent

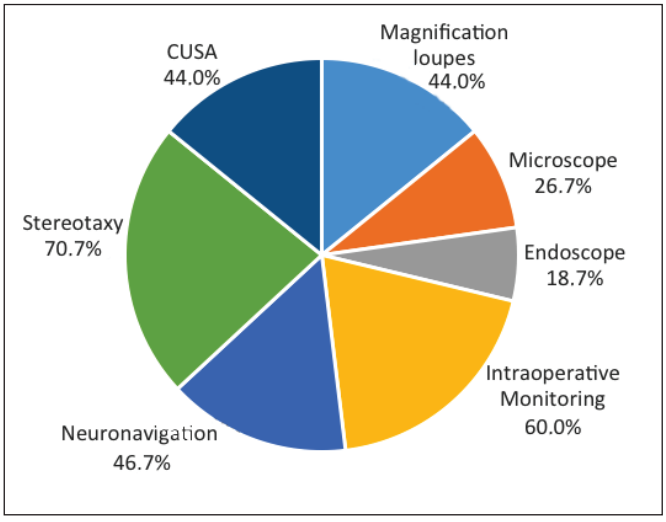

Figure 1: No hands-on experience.

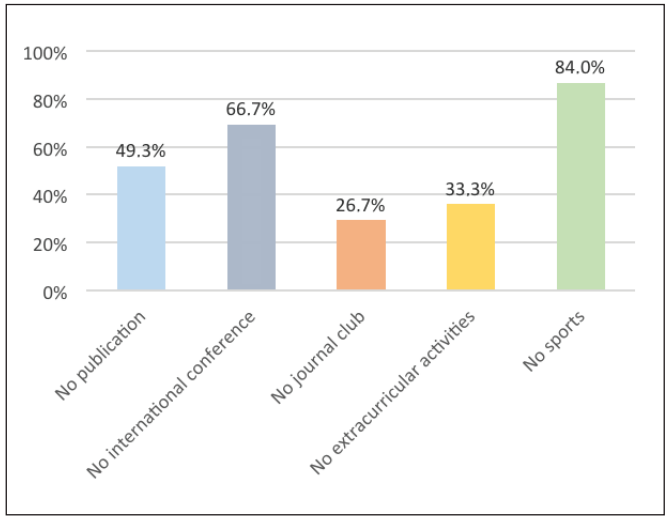

Figure 2: Publication and Extracurricular activities.

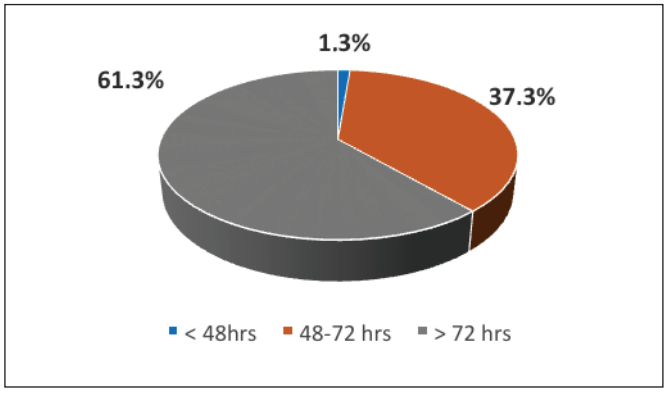

Figure 3: Average working hours per week.

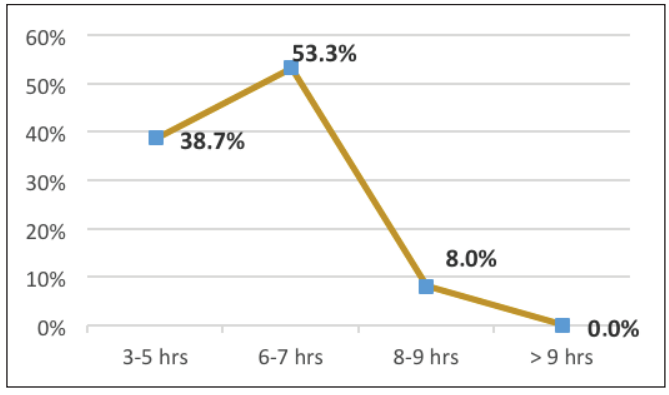

Figure 4: Average sleeping hours per day.

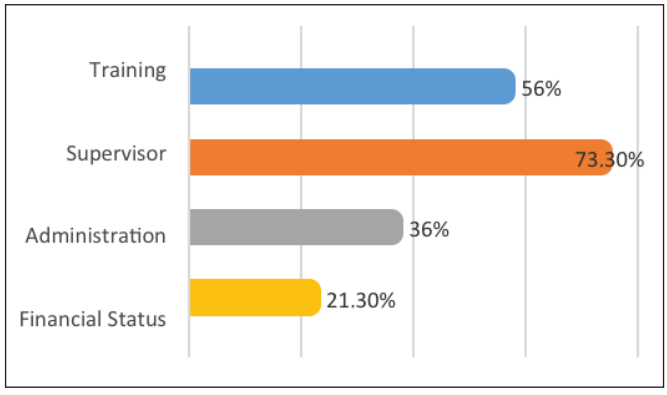

Figure 5: Satisfaction factor in training institutes.

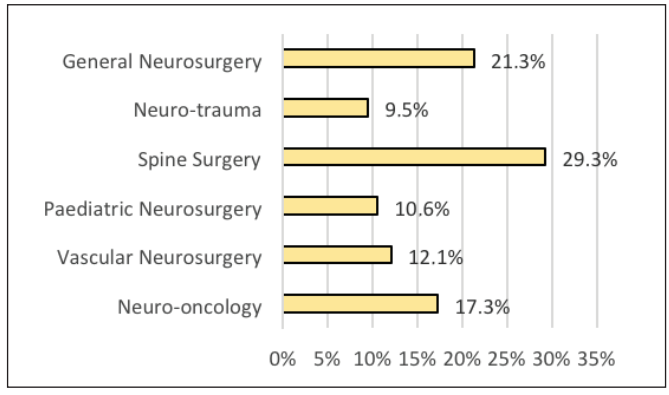

Figure 6: Future interests in neurosurgery.

advances (6). All these qualities and skills are strongly related to the quality of resident training, but the assessment can be a difficult task in real. Neurosurgery is particularly different from other medical fields in a way that the struggle to improve the outcome continues in an environment where there is always a constant risk to a patient's life or quality of life with each decision. Miller constructed a system to evaluate the clinical expertise based on four qualities, namely, knowledge, performance, competence, and action (7). Assessment of the first three in a resident can determine the professional competency at the time of action in future (8). So, any attempt made to enhance the level of neurosurgery training will only be justifiable if it is favorable to patients (10).

There are two types of national residency programs approved for neurosurgery training in Pakistan, one is a fellowship program under College of Physicians and Surgeons Pakistan (FCPS), and another is Master in Surgery (MS) under accredited universities. At the time of survey, a total of 193 residents (FCPS, 166; MS, 27) were enrolled for training under these two programs at 28 neurosurgery training institutes in the country where only less than one-fifth training centers were under the private sector. Out of 75 respondents, 92% were enrolled for Fellowship of College of Physicians and Surgeons (FCPS) and 8% for MS program. Both these degree programs have a total of 5 years training, which includes 3 years neurosurgery training and initial 2 years of general surgery and allied. For MS, residents are inducted directly in the neurosurgery. For FCPS, they are inducted in general surgery initially and then join the neurosurgery. Both degree programs are run by the same supervisors and centers throughout the country, and there is no significant difference in training. Training is available in tertiary care centers of all major cities of the country where a dedicated neurosurgery unit is available. Most of these training units are larger units with more than 50 beds for in-patients, and 76% of these units have 7 or more neurosurgery trainees working at 1 time. Junior residents (RY-3 and RY-4) were 52%, while senior residents (RY-5 and RY-6) were 48%.

Teaching sessions and clinical grand rounds are one of the important components of educational training in any field. We inquired about the teaching sessions and ward rounds from neurosurgery trainees. Only half of the training institutes included in our study were conducting daily teaching sessions for their trainees, while one-third neurosurgery trainees were being trained with once per week or less frequent teaching sessions. Journal clubs were an even less common part of neurosurgery trainee programs in the country, where almost two-thirds had never or rarely participated in any journal club. Most of the institutes did not have an open access for international neurosurgery journals for the trainees.

The quality of a neurosurgery training unit can be assessed by the availability of the learning resources, teaching courses, required specialized instruments and medical equipment, easy accessibility to residents, and real-time handling during the surgical procedures. We assessed the emergency and elective procedures performed by the residents during their neurosurgery training years. It was observed that junior residents were performing most of the surgeries as assistant (RY-3 94.7% emergency and 100% elective, while RY-4 71.8% emergency and 88.1% elective) and were able to perform very limited surgeries independently. Even the independently performed surgeries were mostly the emergency cases. The senior residents were performing most of their emergency surgeries independently (RY-5 69.2% and RY-6 91.08%), while they were assisting most of their cases (RY-5 76.7% and RY-6 58.9%) in elective surgeries. The most common elective procedures performed by the residents as assistant were brain tumors, spine tumors, cranial trauma, spine trauma, degenerative spine diseases, congenital spine diseases, and hydrocephalus. Common independent procedures performed by residents were head trauma followed by congenital spine diseases, hydrocephalus, spine trauma, and spine tumors.

Among the common intraoperative neurosurgical tools, the microscope and endoscope are the most frequent instruments used by neurosurgery residents from Pakistan, but still about one-fourth of the trainees had never used a microscope, and one-fifth had never used an endoscope. Moreover, only about a quarter of trainees had used stereotaxy or intraoperative monitoring. These figures reflect the lack of modern neurosurgical arsenal training.

Educational meetups, workshops, seminars, and conferences have been the recent trend for learning about the modern advances, sharing of clinical/surgical experience, and opportunity to showcase the new research in the field. Only one-third had ever attended an international neurosurgery conference during their training, whereas less than two-thirds of trainees have been regular at national neurosurgery conferences.

Publication is a huge sum of new ideas, acquiring the new knowledge on the said subject, collection and processing of data, analytical process, and establishment of notable results. Interest of a resident in research and publication can represent a spectrum of qualities that can give him/her the distinction over others (5). Pakistan's history of publication in neurosurgery goes back to 1979, when I.H. Bhatti was the first neurosurgeon to report a research article (4). In our study, about half of the trainees have a publication every year.

Continuous advancement in neurosurgery around the world or at least in the region requires a constant evolving process to meet the required knowledge, technical skills, and expertise. Maintaining such a competency level that too against the odds of a busy working routine is itself a challenging task for the residents. Stress factors, such as working hours, sleep, financial support, and time for extracurricular activities, play an important role on the learning of training residents. Most of the residents (61.3%) were found working more than 72 h per week, whereas none of them work for less than 48 h per week. Sleep time was also observed to be short and irregular for most of the residents with no regular day off. Only half of the residents were having adequate sleep of at least 6 h a day. There has been a debate on the human errors caused by fatigue and lack of experience; however, literature suggests that lack of experience is still a more common cause for such errors than fatigue (3).

Neurosurgery is one of the few medical fields where traditional gender polarity exists despite the large number of eligible female candidates passing out of medical school (11). The historical perception, long working hours, and high patient expectations are the major factors for this unlikeness of female residents toward this field. This gender disparity has started to show a declining trend recently. In addition, in our study, 26.7% of the residents were female, which is better than the 9.3% reported back in a 2016 survey (2). Limited opportunities in other surgical specialties due to saturation and exemplary presence of some successful female neurosurgeons on the neurosurgery platforms are the key factors in this shift.

Despite the difficult working conditions, long working hours, and lesser learning opportunities, most of the neurosurgery trainees were satisfied with their ongoing experience. Only 16% residents showed dissatisfaction regarding their overall training. Supervisors or mentors are the important factor in augmentation of the resident's clinical knowledge, improving surgical competency, encouragement for research and publication, and future career guidance, but the key is a mutual respect and association (1). In our study, we noted that the mentor or supervisor was a major factor for a resident's interest toward the field and institute selection. A supervisor was considered the reason for institute selection according to about half of residents, and most were satisfied with their supervisors. Experience with the institutional administration and financial support provided to them during training were less satisfactory.

Although learning is a never-ending procedure, the core neurosurgery training in Pakistan is limited to 3 years, and then the trainees are assessed for their knowledge, clinical and surgical skills, and safe practice. After clearing the exit exam, they can choose to pursue their career as independent neurosurgeon or work under experienced neurosurgeons for further skills development or opt for a post-fellow program in any super-subspecialty of neurosurgery. When asked about their future plans after becoming a certified neurosurgeon, most of the residents were intending to go abroad for either their fellowship or job, whereas 39.1% plan to start their career as independent neurosurgeons in the home country.

Neurosurgery training in itself is a challenge with added disadvantages in a developing country with limited opportunities, long tiring work hours, inaccessibility to learning tools, scarcity of financial support for research, and significant variation between training centers. With increasing interest in neurosurgery training, more organized effort must be made on account of the licensing bodies and government to redesign the training program, neutralize the institutional differences, and provide financial support for the new research.

CONCLUSION

Our study highlighted that training programs in Pakistan are far from satisfactory. We suggest that appropriate action be taken to standardize the training programs that focus on attaining technical knowledge, achieving surgical skills, developing research interest, and acquiring leadership qualities with an acceptable breathing space for personal development and socialization. As a developing country, we need to prioritize the structural and technical changes in the training programs to meet the competence level of residents in the rest of the world.

REFERENCES

1. Azam M, Anwar S, Shamim MS, Waqas M: Mentoring ethics in postgraduate surgical training: A developing country perspective from Pakistan. Surg Neurol Int 4:156, 2013
2. Bakhshi SK, Waqas M, Alam MM, Shamim MS, Qadeer M: Neurosurgery training in Pakistan: Follow-up survey and critical analysis of National Training Programs. J Pak Med Assoc 66(Suppl 3)(10):S75-S77, 2016
3. Bina RW, Lemole GM Jr, Dumont TM: On resident duty hour restrictions and neurosurgical training: Review of the literature. J Neurosurg 124(3):842-848, 2016
4. Bhatti IH, Patel YM: Platelet adhesiveness in spontaneous subarachnoid haemorrhage: A preliminary study. J Pak Med Assoc 29:2-5, 1979
5. Madhugiri VS: Publication performance and research output of Neurology and Neurosurgery training institutes in India: A 5-year analysis. Neurol India 63:338-346, 2015
6. Malik MU, Diaz Voss Varela DA, Stewart CM, Laeeq K, Yenokyan G, Francis HW, Bhatti NI: Barriers to implementing the ACGME outcome project: A systematic review of program director surveys. J Grad Med Educ 4:425-433, 2012
7. Miller GE: The assessment of clinical skills/competence/performance. Acad Med 65:S637, 1990
8. Mirza S, Athreya S: Review of simulation training in interventional radiology. Acad Radiol 25:529-539, 2018
9. Muzumdar D: Neurosurgery in the past and future. An appraisal. Ann Med Surg (Lond) 1:13-15, 2012
10. Oliveira LM, Figueiredo EG: Simulation training methods in neurological surgery. Asian J Neurosurg 14:364-370, 2019
11. Renfrow JJ, Rodriguez A, Liu A, Pilitsis JG, Samadani U, Ganju A, Germano IM, Benzil DL, Wolfe SQ: Positive trends in neurosurgery enrollment and attrition: Analysis of the 2000-2009 female neurosurgery resident cohort. J Neurosurg 124(3):834-839, 2016
12. Shamim MS, Tahir MZ, Godil SS, Kumar R, Siddiqui AA: A critical analysis of the current state of neurosurgery training in Pakistan. Surg Neurol Int 2:183, 2011
13. Tarnaris A, Arvin B, Ashkan K: Evolution in practice: How has British neurosurgery changed in the last 10 years? Ann R Coll Surg Engl 90(6):508-512, 2008