Assessment of the Adequacy of Neurosurgery Teaching Methods among Medical Students in Enugu State, Nigeria

Abstract

Background: Various educational neurosurgery teaching methods are employed across few Nigerian universities, especially Enugu state. **Aim(s):** To determine the adequacy of current neurosurgery teaching methods, factors influencing eventual choice of neurosurgery amongst final year medical students in Enugu state, Nigeria and suggest improvement methods towards best global standards. **Materials and Methods:** This was an online cross-sectional study conducted among final year medical students currently on Neurosurgery rotation in Enugu state, Nigeria using a validated questionnaire. Data was analyzed (inferential and deferential) using SPSS; chi-squares values were calculated. Significance was set at p value <0.05 and measures were put in place to limit bias. **Results:** 106 students filled and submitted the form with a response rate of 72.60%. Most respondents revealed that their universities had mandatory neurosurgery rotations. Majority affirmed that a general poor learning environment (75%) was the major obstacle to standard teaching. About 49% had interest in specializing in surgery but only 18% have interest in neurosurgery as a future sub-specialty choice. Positively, majority (90.6%) alluded to having qualified teachers, with 43.4% of them advocating for improved training of the teachers. There was a significant correlation between choice of specialty and the students' monthly income (less than N10, 000 had a p: 0.003). Other factors that were positively correlated in eventual choice as their future desired subspecialty include poor exposure to clinical neurosurgery cases (p: 0.020) and little or no exposure of students to neurosurgery research opportunities (p: 0.024). **Conclusion/Recommendations:** The current neurosurgical teaching methods in Enugu state are not fully optimal yet. There is a need for some improvement in current learning environment and teaching methods to improve the students' understanding of neurosurgery and eventual increased interest in final choice of neurosurgery as their desired subspecialty.

Keywords: *Final-year students, neurosurgery, residency, simulation, teaching*

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Introduction

Neurosurgery is regarded as one of the most admired surgical specializations. The disease burden of neurosurgery in Nigeria is, however, high. Traumatic brain injury was the largest contributor to death overall, with a male:female ratio of 6.6:1 from a study by Aimokun *et al.*[1] Nigeria has an estimated population of at least 200 million, according to the World Bank data; this implies that one neurosurgeon will need to attend to 100,000 Nigerians, which is a far cry from the needed expected number of neurosurgeons.[2]

The current massive brain drain in Nigeria makes this even worse, and this has a resultant negative effect on Nigerian undergraduate teaching methods. In fact, no fewer than 727 medical doctors trained initially in Nigeria relocated to the United Kingdom between December 2021 and May 2022.[3] However, to support the ongoing development and viability of our profession, neurosurgery in Nigeria must continue to draw the best and the brightest individuals, especially from the newer doctors, with target aimed at final-year medical students who would eventually graduate and choose an area to specialize.[4] The future of neurosurgery practice would only be improved by strengthening the educational system and encouraging more young doctors to have interest in neurosurgery. Unlike some other specialties, there is no national specialty-specific agreed curriculum for the teaching of neurosurgical topics at medical schools in Nigeria. The Royal College of Surgeons of England in the United Kingdom published a national undergraduate surgical curriculum in 2015 incorporating four neurosurgical topics in

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Website:
www.jwacs-jcoac.com

DOI: 10.4103/jwas.jwas_303_22

Quick Response Code:

How to cite this article: Imediegwu KU, Aham KA, Ezeaku AM, Tietie EU, Onyebuchukwu CQ, Nwagwu ID, *et al.* Assessment of the adequacy of neurosurgery teaching methods among medical students in Enugu State, Nigeria. J West Afr Coll Surg 2023;13:36-42.

which undergraduate medical students are expected to be competent, namely painful/paralyzed limb, peripheral nerve palsies, back pain (including cauda equina syndrome), and increased intracranial pressure. Similarly, the American College of Surgeons and the Association for Surgical Education in the United States also developed a medical student core surgical curriculum consensus to ensure uniformity in the foundation of core surgical knowledge needed by all medical students.[5] Currently, there are two hospitals with full accreditation in neurosurgery for residents in south-south and south-eastern Nigeria, namely the University of Nigeria Teaching Hospital (UNTH) and Memfys Hospital, and both are in Enugu state, Nigeria.[6] However, to the best of our knowledge, there is currently no study in Nigeria assessing the adequacy of neurosurgery teaching in Nigeria for medical undergraduates. Hence, this study which aims to assess the perspectives of the final-year medical students on the adequacy of neurosurgery teaching methods among final-year students in Enugu state and factors that influence the choice of neurosurgery as a subspecialty, stands to make a significant contribution to fill this gap in knowledge. It will also equip stakeholders in undergraduate medical education with evidence for reliable decision-making.

Materials and Methods

This study was carried out among final-year medical students in Enugu state, Nigeria, who gave consent to participate in the study. It was a cross-sectional prospective online survey conducted over a period of 3 months.

A predesigned online-based validated questionnaire created on Google forms was developed by the principal investigator using previous related global studies and modified accordingly and distributed through online platforms by key representatives in the institutions over a 3 months period to 146 final-year medical students at the two medical schools in Enugu state namely University of Nigeria, Enugu and Enugu state University, Parklane, Enugu. In total, 106 students filled and submitted the form which gave a response rate of 72.60%. The content accuracy and internal validity of the survey items were finalized with multidisciplinary input from the study investigators. The questionnaires had two sections. Section one assessed the socio-demographic characteristics of the respondents, including age, marital status, religion, institution, degree, and monthly income. Section two assessed the different factors that could help to determine the adequacy of neurosurgery teaching methods. Fourteen areas were addressed in the questionnaire, namely the availability of mentorship programs, the use of graphical illustrations in teaching sessions, the use of virtual learning tools to supplement physical classes (applications and soft wares), directed access to journals and publications, cadaveric teachings and simulations, teaching courses

for lecturers, duration of postings, peer-to-peer teaching, theatre exposure, research teachings, quality of lecture notes, curriculum content and frequency of feedbacks. The key outcome sought was the interest of the respondents in the neurosurgery specialty.

Data were analyzed using the IBM Statistical Product and Services Solutions version 25, and results were presented in tables and figures. Descriptive and inferential analysis was done. The confidence interval was set at 95%, and the significance was set at $P < 0.05$. Participants were told the purpose of the study and who the researchers were. They were also provided with information on risks, benefits, privacy, and anonymity in the language they could understand so that they could make an informed decision as to whether or not to participate. Participants who agreed to participate were asked to sign a consent form containing the above information. The study was done entirely online and did not influence any existing patient treatment methods. Ethical approval was obtained from the ethical committee of the University of Enugu teaching hospital, UNTH, Enugu.

Results

There were a total of 106 respondents as shown in Table 1.

Sociodemographics

Interest in neurosurgery specialty and surgery

The majority of the respondents had no interest in undertaking neurosurgery specialist training ($n = 38; 62.3\%$), even though most of the respondents were interested in surgical specialties ($n = 30; 49.2\%$).

Table 1: Sociodemographic characteristics of the study participants ($n = 106$)

Variable	Frequency n (%)
Age (year)	
21–24	60 (56.6)
>24	46 (43.4)
Marital status	
Single	99 (93.4)
Married	7 (6.6)
Religion	
Christianity	106 (100.0)
University name	
ESUTH (Enugu)	35
UNTH (Enugu)	71
Degree	
1st degree	98 (92.5)
2nd degree	8 (7.5)
Monthly income	
<10,000	17 (16.0)
10,000–20,000	22 (20.8)
20,000–40,000	24 (22.6)
>40,000	43 (40.6)

Educational factors affecting interest in neurosurgery specialty

Discussion

Our study revealed that the majority of students rotate through neurosurgery, which is commendable. This differs from a study[7] by Ibrahim *et al.*, which revealed that 23% had rotated through neurosurgery, and more students (45.1%) agreed that neurosurgery rotations should be compulsory in medical school and internship. This rotational experience and clerkship opportunities would give the students an actual real-life neurosurgery experience which has been shown to improve the skill level of the students in the future and also significantly improve their chances of matching into neurosurgery programs in a study in the United States by Ekhator *et al.*[8] Our study revealed a low interest in neurosurgery amongst the students contrary to a study by Lee *et al.*,[5, 9] which showed a high interest in a neurosurgical career among surveyed medical students. The duration of postings was also optimal, with most having at least 4 weeks of rotations as shown in Table 2. Most of the students also affirmed the quality of teaching from their teachers. Worthy of note is the fact that most of the students agreed to the extra efforts of the residents in providing quality teachings and demonstrations.

A great majority alluded to a smaller number of simulations available in the neurosurgery teaching methods. Our study also revealed a poor structure toward educating students early enough on research methods. This is not optimal, as a study by Stumpo *et al.*[9,10] showed that early research involvement was considered among factors that stimulated the interest of students in choosing a neurosurgical specialty in a meta-analysis published by the world neurosurgery journal.

We also pointed out the poor level of cadaveric dissection laboratories available for neurosurgery learning.

There seems to be a poor level of relationship between students and consultants, hence the need for an existing mentorship relationship, as one-third of the participants affirmed to the low level of mentorship.

Even though almost half of the respondents agreed to choose a surgical specialty postgraduation, greater than two-thirds did not indicate interest in neurosurgery. This differs from a study[11] where most who showed interest in surgery eventually wanted neurosurgery.

As revealed in Table 3, a factor that was positively associated with a choice of specialty included a monthly income of less than N10,000 ($P = 0.003$). This is not surprising, considering that neurosurgical practice is generally perceived as a lucrative one.

Other factors that contributed significantly to the poor interest in neurosurgery were poor exposure to clinical neurosurgery cases ($P = 0.020$) and little or no exposure of students to neurosurgery research opportunities ($P = 0.024$). The rest were low access to journals and websites. There may be a need to create special neurosurgery study modules where students can select neurosurgery projects to improve interest, as revealed in a study[12] in the United Kingdom. Webinars have been shown in a study by Bongetta and Zoia[13] to be positively associated with improvements in knowledge, behavior, and skills.

As shown in Figures 1 and 2, almost half of the respondents (49%) had intentions of a surgical specialty in the future; however, only 18% of them would consider neurosurgery as a first option. It can be inferred that the choice of neurosurgery as a sub-specialty is not limited to a single factor but a mixture of several factors during the course of
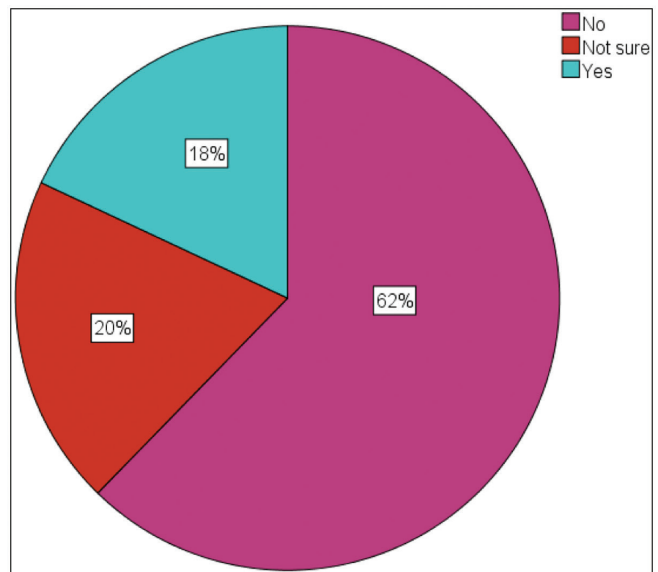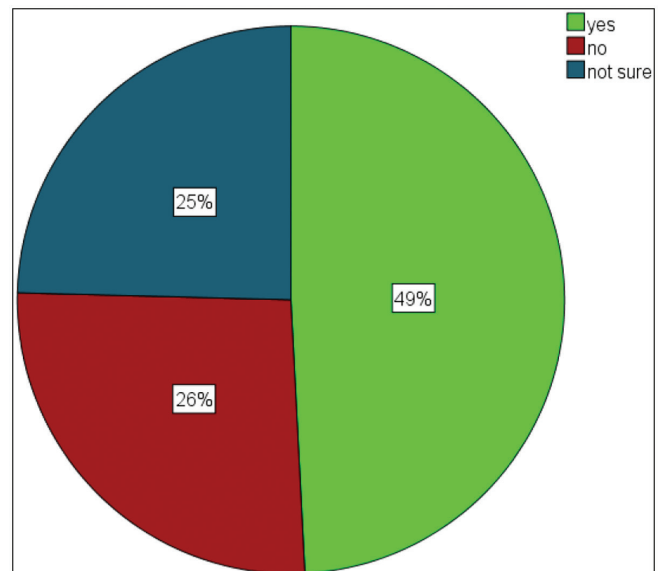

Figure 1: Interest in neurosurgery specialty

Figure 2: Interest in surgery

Table 2: Measures of the adequacy of neurosurgery training

Factor	Frequency *n* (%)
How many weeks of neurosurgery do clinical students rotate through in your school?	
<2 weeks	16 (15.1)
2–4 weeks	8 (7.5)
>4 weeks	82 (77.2)
Is neurosurgery compulsory rotation for everyone in the clinical class?	
No	21 (19.8)
Not sure	11 (10.4)
Yes	74 (69.8)
Do you have adequate simulation teaching in neurosurgery?	
No	55 (51.9)
Not sure	24 (22.6)
Yes	27 (25.5)
Do you have tutorials with resident doctors in neurosurgery?	
No	31 (29.2)
Not sure	4 (3.8)
Yes	71 (67.0)
Rate the adequacy of theatre exposure to cases in neurosurgery	
Poor	26 (24.5)
Average	63 (59.4)
Very good	17 (16)
Is there availability of cadaver and dissection labs for neurosurgery-related teachings?	
Always available	21 (19.8)
Never available	47 (44.3)
Rare	38 (35.8)
Do you have well-trained teachers?	
No	4 (3.8)
Not sure	6 (5.7)
Yes	96 (90.6)
Do you have access to website and journal link in your college/hospital?	
No	30 (28.3)
Not sure	44 (41.5)
Yes	32 (30.2)
Do you have any neurosurgery mentor in your institution?	
No	56 (52.8)
Not sure	17 (16.0)
Yes	33 (31.1)
What suggestion do you think will improve neurosurgery teaching in Nigerian universities?	
More courses for training teachers	46 (43.4)
More employment of teachers	28 (26.4)
Others	32 (30.2)
What do you dislike about neurosurgery teaching or practice in your institution?	
Dull lecturers	6 (5.7)
Heavy lecture load	34 (32.1)
Poor state of classroom	8 (7.5)
Unfriendly lecturers	10 (9.4)
Others	48 (45.3)
What is the quality of lecture notes given at your university?	
Poor	5 (4.7)
Fair	53 (50.0)
Good	48 (45.3)
Is there a structure for research teachings for medical students in your school?	
No	37 (34.9)
Not sure	41 (38.7)
Yes	28 (26.4)

Table 2: Continued

Factor	Frequency *n* (%)
What is the degree of relationship with your residents, consultants?	
Poor	81 (76.4)
Average	24 (22.6)
Very close	12 (11.3)

Table 3: Correlative analysis-Factors associated with interest in the choice of a neurosurgery specialty

Factors	No	Not sure	Yes	Chi-square	*P*-value
Age					
15–20	1	0	2	6.177	0.186
21–24	35	9	13		
25–60	30	10	6		
Marital status					
Single	61	17	21	2.060	0.357
Married	5	2	0		
Degree					
1st degree	62	17	19	0.568	0.753
2nd degree	4	2	2		
Monthly income (naira)					
<10,000	4	4	9	19.446	0.003
10,000–20,000	18	2	2		
20,000–40,000	14	6	4		
>40,000	30	7	6		
Mandatory neurosurgery rotation					
No	16	6	2	2.603	0.626
Yes	44	14	16		
Not sure	6	2	3		
Duration of neurosurgery posting					
<2 weeks	10	2	4	6.350	0.175
2–4 weeks	53	13	16		
>4 weeks	3	4	1		
Simulation of neurosurgery cases					
No	34	7	14	6.186	0.186
Yes	15	6	6		
Not sure	17	6	1		
Tutorials with neurosurgery residents					
No	19	4	8	1.711	0.789
Yes	45	14	12		
Not sure	2	1	1		
Availability of cadaver dissection laboratories					
Not available	32	7	8	1.308	0.860
Rarely used	22	8	8		
Available and accessible	12	4	5		
Availability of qualified lecturers					
No	3	1	0	6.276	0.179
Yes	60	15	21		
Not sure	3	3	0		
Presence of neurosurgery mentors					
No	38	8	10	4.334	0.363
Yes	16	9	8		
Not sure	12	2	3		
Access to neurosurgery journals in Institution					
No	23	1	6	7.889	0.096
Yes	18	6	8		
Not sure	25	12	7		

| Factors	No	Not sure	Yes	Chi-square	*P*-value
Table 3: Continued					
Quality of neurosurgery lecture notes					
Very good	7	9	15	1.509	0.825
Fairly good	8	6	14		
Poor	1	0	1		
Adequacy of exposure to clinical neurosurgery cases					
Poor	23	3	0	11.643	0.020
Average	33	13	17		
Very good	10	3	4		
Exposure and structure for research learning in neurosurgery for students					
No	27	1	9	11.221	0.024
Yes	18	5	5		
Not sure	21	13	7		
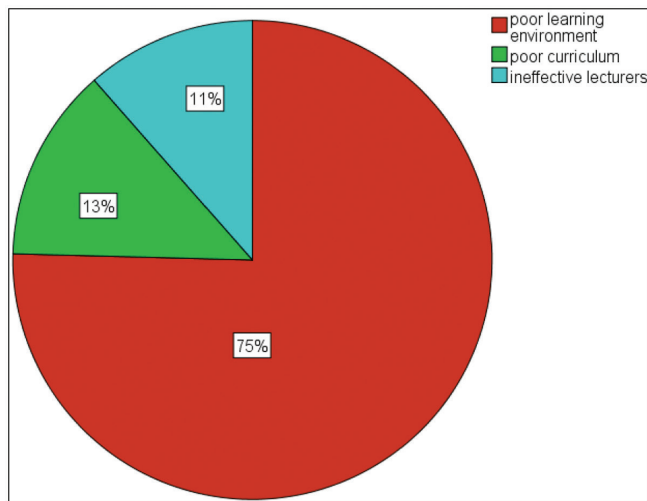
Figure 3: Challenges to standard neurosurgical education in your institution
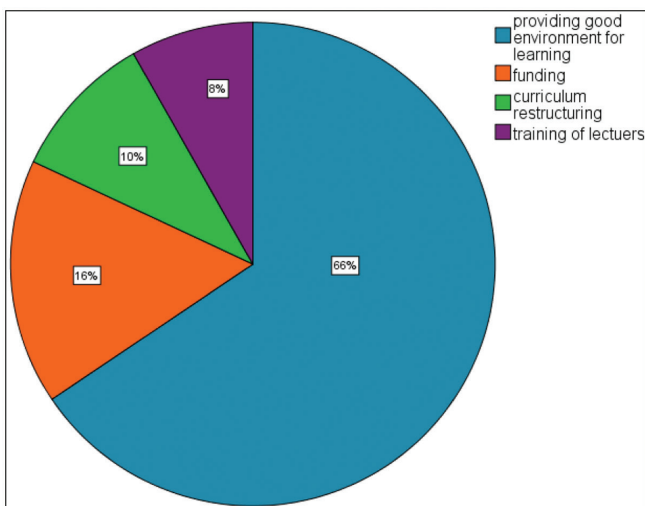

Figure 4: Recommended solutions to challenges of standard neurosurgical education

training. Poor learning environment was perceived as the major obstacle to standard neurosurgical education by the respondents as visible in Figure 3. The ideal environment for standard neurosurgical teaching would include factors such as regular neurosurgical teaching simulations, internet access, graphical illustrations, friendly tutors, exposure to theatre sessions, practical neurosurgery virtual teachings, and videos.[14] These factors were indeed identified to be lacking in our study.

As shown in Figure 4, two-thirds (66%) of the respondents agreed that a good neurosurgical working environment would ultimately solve the problem of low-standard teaching of neurosurgery, improve the performance of the students and possibly increase the number of interested students in the final choice of neurosurgery as a subspecialty.

Conclusion/Recommendations

The teaching methods in neurosurgery in Enugu state are not optimal, with more negative findings than positives from our study. We recommend the need for the creation of active mentorship groups to improve the relationship between students and the consultants who serve as their teachers. There is also the need for more graphical illustrations, virtual learning (applications and soft wares), internet availability, and journal access for the student in Nigerian universities. Cadaveric teachings and simulations should also be more frequently utilized in teaching methods across institutions, especially for uncommon neurosurgical conditions. There could also be a structure to improve the routine theatre exposure experience of the students, thereby increasing their interest to specialize in neurosurgery. Other areas to improve on include more research teachings and attachments with the urgent need for the creation of a nationally standardized curriculum for neurosurgery. Stakeholders should include neurosurgeons,

medical educators, general practitioners, and a variety of specialists that play a crucial role in the management of patients with neurosurgical conditions. We also advocate the creation of national associations to support medical students in approaching the field of neurosurgery early in their education. Also, we suggest that medical institutions implement university-based interest groups to stimulate interest. Finally, it is highly imperative for a system that allows regular feedbacks at defined intervals to develop a system for better educational delivery.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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