Perception of Medical Students towards Studying Neurosurgery in Kenya: A Mixed Methods Study

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Abstract

Objective Neurosurgery, a highly demanding and vital medical specialty, faces significant challenges in sub-Saharan Africa, where a shortage of trained neurosurgeons persists. This study aimed to explore the perceptions of medical students in Kenya regarding neurosurgery as a career choice.

Methods This is a cross-sectional study. A questionnaire was administered to collect both quantitative and qualitative data. It was pretested for clarity and validity, and included questions on demographics, interest in neurosurgery, confidence, exposure to neurosurgery during medical education, and faculty support experience. Quantitative data were analyzed using the chi-square tests, Kruskal–Wallis tests, and ordinal regression. Qualitative responses consisted of open-ended questions and were assessed using thematic analysis.

Results The survey was distributed to 324 students, and 225 responses (69.4%) were received. Among respondents, 54.2% expressed interest in neurosurgery. Confidence in pursuing neurosurgery was found to be a strong predictor of interest. Key challenges reported were a lack of mentorship (60.9%), insufficient clinical exposure (39.1%), and limited faculty support (60.9%). Thematic analysis of qualitative responses highlighted the need for enhanced mentorship programs, increased clinical exposure, structured educational resources, and better work–life balance support.

Conclusion The findings, while limited, begin to underscore the importance of improving mentorship, clinical exposure, and structural support for medical students in sub-Saharan Africa. Addressing the deficit of the available neurosurgical workforce in Kenya begins with addressing the deficit in student development. This study offers

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insights from current medical students in Kenya on the barriers preventing their pursuit of neurosurgical training. These findings may also be relevant to other Low-and Middle-Income Countries (LMICs) with similar challenges.

Introduction

Neurosurgery is a highly challenging and fulfilling medical specialty, demanding a distinct blend of intellectual sharpness, technical skill, and emotional strength.[1] It is a medical specialty focused on treating intricate neurological conditions, frequently requiring life-saving surgeries for patients with disorders of the brain, spinal cord, and peripheral nervous system.[2] Although neurosurgery is a crucial field, it encounters major challenges, particularly in resource-limited areas, where there is a lack of trained specialists, insufficient infrastructure, and limited educational resources for medical students interested in the field.[3,4]

In Kenya, as well as in many other sub-Saharan African countries, there is an increasing awareness of the need to strengthen the health care system, especially in the field of neurosurgery. The African continent faces a critical shortage of neurosurgeons, accounting for less than 1% of the global neurosurgical workforce.[5] While there have been efforts to address this gap, including international collaborations and increasing training programs,[6] the number of medical students choosing neurosurgery as a career remains disproportionately low. This brings up a crucial question: Why do so few medical students choose neurosurgery, despite the growing need for skilled neurosurgeons in Africa?

The decision to pursue neurosurgery is influenced by various factors, including exposure to the field during clinical rotations, mentorship opportunities, personal interests, and concerns about the demands of the specialty, such as long working hours and work–life balance.[7] Sociocultural factors, such as gender stereotypes, family expectations, and societal opinions on the prestige and practicality of pursuing a highly specialized career, also influence students' perceptions of the field.[3,8]

Although Kenya has a well-established tradition of neurosurgery, challenges persist in attracting medical students to the field. The history of neurosurgical practice in Kenya dates back to the 1940s, with Dr. Renato Ruberti being the first trained specialist to arrive in the country.[9] His efforts, alongside those of Dr. Mahmood Qureshi and Dr. David Oluoch-Olunya, laid the foundation for the development of neurosurgery training in Kenya.[10] Currently, training is available through institutions such as Kenyatta National Hospital, Aga Khan University Hospital, Coast General Hospital, Tenwek Mission Hospital, and the University of Nairobi.[10] However, despite this long history, the specialty continues to face barriers, including the long duration of training and limited residency positions.[3,11]

While studies in other African countries, such as Zambia and Egypt, have highlighted the demanding nature of neurosurgery and its associated barriers,[11,12] there has been limited research surrounding medical students' perceptions toward the specialty in sub-Saharan Africa. This study seeks to address this gap by exploring regional perceptions of medical students regarding neurosurgery, specifically in Kenya.

Methods

A cross-sectional survey of Kenyan medical students was conducted. Inclusion criteria were all medical students who were enrolled in medical programs at universities in Kenya during the 2023 to 2024 academic year. Exclusions were students who had not participated in any clinical rotations. Cochran's sample size formula was used to determine the number of required participants.

Data were collected using a self-administered questionnaire, which combined both closed-ended and open-ended questions. The questionnaire was pretested for clarity and validation, and adjustments were made before full deployment. It was designed to assess various aspects of students' perceptions of neurosurgery and was divided into sections that addressed demographics, interest in neurosurgery, confidence in pursuing neurosurgery, perceived challenges, and recommendations for improving support for students interested in the field. The survey was administered online through Google Forms to ensure ease of access for students from different institutions across the country. To ensure no duplicate responses were submitted, each participant was required to use a unique email address to access the survey, and their submission was linked to their internet protocol (IP) address to flag any potential duplicates. Data collection took place over a 6-week period, spanning from October to November 2024.

Quantitative data were analyzed using descriptive statistics to summarize demographic characteristics, levels of interest, confidence in neurosurgery, and exposure to the field. Inferential statistical tests were used to examine relationships between variables. Specifically, a chi-square test assessed the relationship between categorical variables, the Kruskal–Wallis test was used to compare the mean ranks of age when first considering neurosurgery across different groups, while Mann–Whitney U tests determined differences in interest based on clinical exposure duration and faculty support. Ordinal regression was used to evaluate the relationship between confidence in pursuing neurosurgery, interest in the field, and various demographic and exposure factors. Open-ended responses were analyzed using

Table 1 Perceptions of final-year medical students toward neurosurgery: Demographic and career-related characteristics

	N	Percentage	Mean	SD	Test value	Mean ranks	*p*-Value
Age	225		23.69	2.864			0.003[b]
Sex					3.402	–	0.493[a]
Male	117	52.0	–				
Female	108	48.0					
Final year					7,601.000	–	0.005[c]
Yes	122	54.2	–				
No	103	45.8					
Citizenship							
Kenyan	224	99.6	–				
Kenyan/Mexican	1	0.4					
Completed clinical rotation					7,543.000	–	0.010[c]
Yes	115	51.1	–				
No	110	48.9					
First considered neurosurgery career					34.139	–	<0.001[b]
In primary school	66	29.3	–			93.64	–
In secondary school	47	20.9	–			97.64	–
In medical school	54	24.0	–			105.82	–
Never[d]	58	25.8	–			154.61	–
Duration of exposure to neurosurgery in medical school					14.701	–	0.258[a]
Less than 2 weeks	88	39.1	–				
2 to 4 weeks	51	22.7					
4 to 8 weeks	51	22.7					
More than 8 weeks	35	15.6					
How confident do you feel pursuing a career in neurosurgery?					86.900	–	0.000[b]
Not confident	34	15.1	–			59.04	–
Slightly confident	37	16.4	–			85.05	–
Neutral	67	29.8	–			97.33	–
Moderately confident	50	22.2	–			142.75	–
Very confident[d]	37	16.4	–			178.70	–
Faculty support					4.288	–	0.368[a]
Yes	88	39.1	–				
No	137	60.9					

[a]Chi-square test.
[b]Kruskas–Wallis test.
[c]Mann–Whitney U test with [d]Dunn's post hoc.

thematic analysis, which involved transcribing responses, coding them into categories based on recurring themes, and organizing these codes into broader themes. Microsoft Excel, SPSS version 27, and NVIVO were used for statistical testing and thematic analysis, respectively.

Ethical approval was obtained from Moi University's Institutional Research and Ethics Committee (IREC) and the National Commission for Science, Technology, and Innovation (NACOSTI). Informed consent was obtained from all participants prior to their involvement in the study, ensuring their anonymity and confidentiality. Participants were informed of their right to withdraw from the study at any point without consequence. All collected data were securely stored and accessible only to the research team.

Results

Demographic Characteristics

Among the 324 invited participants, determined by the Cochran's sample size formula, 225 (69.4%) completed the

Table 2 Chi-square test results for associations between demographic and career-related factors and interest in neurosurgery

Factor	Chi-square statistic (χ^2)	Degree of freedom (df)	*p*-Value
Gender versus interest	3.402	4	0.493
Final-year status versus interest	10.963	4	0.027
Clinical rotation versus interest	6.434	1	0.011
Faculty support versus interest	4.288	4	0.368
Exposure duration versus interest	14.701	12	0.258
First considered neurosurgery versus interest	41.751	12	<0.001
How confident are you in pursuing a neurosurgery career?	168.041	16	<0.001

Table 3 Logistic regression parameter estimates for factors influencing interest in neurosurgery

Parameter estimates								
		Estimate	Std. error	Wald	df	Sig.	95% Confidence interval	
							Lower bound	Upper bound
Threshold	Interested in neurosurgery							
	Not interested	−4.814	1.688	8.132	1	0.004	−8.123	−1.505
	Slightly interested	−3.836	1.683	5.198	1	0.023	−7.134	−0.538
Location	Age (years)	0.083	0.060	1.890	1	0.169	−0.035	0.201
	How confident are you about pursuing neurosurgery?							
	Not confident	−5.571	0.615	82.030	1	0.000	−6.776	−4.365
	Slightly confident	−4.175	0.565	54.654	1	0.000	−5.282	−3.068
	Neutral	−3.830	0.507	57.027	1	0.000	−4.824	−2.836
	Moderately confident	−2.048	0.479	18.273	1	0.000	−2.988	−1.109
	Considering a career in neurosurgery = No	−1.014	0.384	6.985	1	0.008	−1.766	−0.262
	Adequate support from faculty = No	−0.561	0.273	4.223	1	0.040	−1.097	−0.026

Table 4 Additional resources and support desired by medical students for informed decision-making on pursuing neurosurgery

Category	Subcategory/Open codes	Sample quotes
Mentorship	Guidance from experts and role models	Good mentorship from the seniors; mentorship programs from neurosurgeons and neurologists
Clinical exposure	Practical learning opportunities in neurosurgery	More clinical exposure; work placements in neurosurgery wards
Work–life balance	Balancing professional and personal responsibilities	Work–life balance is the main support that would encourage me
Career prospects	Information on neurosurgery career opportunities	Job market; insights into the neurosurgery profession
Structured programs	Workshops, seminars, and educational resources	Career guidance session; neurosurgery support groups; guidance programs

survey. This included both final-year students ($n = 122$, 54.2%) and non-final-year students ($n = 103$, 45.8%). The mean age of participants was 23.7 years (SD = 2.86). The age distribution ranged from 21 to 30 years, with the majority of students falling within the 22 to 24 age range. A total of 117 (52.0%) male and 108 (48.0%) female students participated in the study, indicating a nearly equal distribution of genders. A majority of the respondents (224, 99.6%) were Kenyan citizens, with 1 (0.4%) participant identifying as Kenyan/Mexican. A total of 115 participants (51.1%)

Table 5 Suggested mechanisms to improve the delivery of neurologic care in Kenya: Perspectives from medical students

Category	Subcategory/Open codes	Sample quotes
Mentorship	Guidance from experts and role models	Equipment and skilled human resource; expand residency training positions; government to channel more resources to the field
Structured programs	Workshops, seminars, and educational resources	Public–private partnership; workshops and training; tutorials in neurosurgery; more research on techniques used, advancement in robotics and tech in health care systems
Technology	Innovation and advanced equipment	Improve technology; prompt trauma care with point-of-care imaging; better equipment and training facilities
Financial support	Scholarships and reduced costs	Scholarships; subsidized training; better insurance
Policy improvement	Better health care policies	Addressing socioeconomic barriers; better government policies that favor the medical system; investment in infrastructure and operating theaters

Table 6 Additional feedback on neurosurgery as a career choice: Insights from medical students

Category	Subcategory/Open codes	Sample quotes
Mentorship	Guidance from experts and role models	More mentorship is needed to help students and doctors decide on neurosurgery; consistent mentorship programs to help students from their first days in medical school
Structured programs	Workshops, seminars, and educational resources	Anatomy and physiology grasped well, coupled with scholarship programs, would make neurosurgery a better career path
Work–life balance	Balancing professional and personal responsibilities	More young people would choose neurosurgery if institutions ensured work–life balance and wellbeing for both patients and providers
Perceptions	Destigmatization and encouragement for neurosurgery	Residency should accommodate family needs; eradicate beliefs that men are better neurosurgeons than women; highlight the beauty of neurosurgery as a career

completed a clinical rotation in neurosurgery, while 110 participants (48.9%) had not (►**Table 1**).

Interest in Neurosurgery

Out of the total participants, 112 students (54.2%) expressed interest in pursuing neurosurgery as a career. However, 58 students (25.8%) reported having no interest in the field, while the remaining 55 participants (24.0%) were slightly interested.

Neurosurgery was first considered during primary school for 66 students (29.3%), 47 students (20.9%) during secondary school, and 54 students (24.0%) during medical school. There were 58 students (25.8%) who indicated that they never considered neurosurgery as a career.

Perceived Challenges to Studying Neurosurgery

Not receiving adequate support from faculty was reported by 137 (60.9%) respondents while 88 students (39.1%) felt that faculty support was sufficient.

Less than 2 weeks of clinical exposure to neurosurgery was reported by 88 (39.1%) students. About 51 students (22.7%) reported 2 to 4 weeks of exposure, another 51 (22.7%) students 4 to 8 weeks, and 35 students (15.6%) reported more than 8 weeks of exposure.

The primary concerns about a career in neurosurgery that were expressed included work–life balance, demanding nature of neurosurgical practice, long working hours, and high stress levels. Respondents' suggestions for improvement included better institutional support for work–life balance.

Confidence in Pursuing Neurosurgery

The majority of participants reported varying levels of confidence in pursuing neurosurgery as a career. Specifically, 34 students (15.1%) reported being "not confident," 37 students (16.4%) were "slightly confident," 67 students (29.8%) were "neutral," 50 students (22.2%) were "moderately confident," and 37 students (16.4%) were "very confident" in their ability to pursue neurosurgery.

A Kruskal–Wallis test revealed a significant difference in confidence levels across the various categories ($p < 0.001$), with those who had more exposure to neurosurgery and a stronger interest in the specialty reporting higher levels of confidence.

Statistical Analysis of Factors Influencing Interest in Neurosurgery

A chi-square test showed no significant association between gender and interest in neurosurgery ($\chi^2 = 3.402$, $p = 0.493$) (►**Table 2**).

A significant relationship was found between final-year status and interest in neurosurgery ($\chi^2 = 10.963$, $p = 0.027$) with final-year students reporting an overall higher interest in neurosurgery.

Furthermore, a significant association was found between having completed a clinical rotation in neurosurgery and the level of interest in pursuing the field ($\chi^2 = 6.434$, $p = 0.011$), with students rotating on neurosurgery services more likely to express interest in the specialty.

No significant relationship was found between the duration of exposure to neurosurgery and interest in pursuing it ($\chi^2 = 14.701$, $p = 0.258$) or faculty support and interest in neurosurgery ($\chi^2 = 4.288$, $p = 0.368$), despite respondents citing the lack of adequate mentorship as a challenge.

A significant association was found between when students first considered neurosurgery as a career and their current interest in the field ($\chi^2 = 41.751$, $p < 0.001$). Those who had considered neurosurgery earlier in their educational journey (especially during primary and secondary school) were significantly more likely to be interested in pursuing it.

Lastly, a strong correlation was observed between students' confidence in pursuing neurosurgery and their interest in the field ($\chi^2 = 168.041$, $p < 0.001$).

Ordinal Regression Analysis

Ordinal regression analysis showed that higher confidence levels were strongly associated with a great interest in neurosurgery (►**Table 3**). Specifically, students who were moderately or very confident were significantly more likely to express an interest in the specialty ($p < 0.001$). Students who had considered neurosurgery early in their academic journey, that is, during primary or secondary school, were also more likely to express interest in the field ($p < 0.001$).

Additionally, respondents who rotated in neurosurgery were more likely to express interest in pursuing such a career ($p = 0.008$). Conversely, a lack of faculty support demonstrated a negative correlation with neurosurgical interest ($p = 0.040$).

Suggestions by Medical Students

Thematic analysis of open-ended student responses emphasized a need for mentorship programs, with support and career insights from experts in the field needed to stimulate interest in neurosurgery. Clinical exposure was also identified, with students highlighting the importance of hands-on opportunities in neurosurgery. Suggestions included placement in clinical wards and neurosurgical operating theaters to allow for firsthand learning experiences (►**Table 4**).

Additionally, work–life balance emerged as a critical concern, with students reporting a greater inclination to pursue neurosurgery if institutional support was available for balancing professional and personal lives.

Furthermore, respondents indicated the need for information surrounding job market trends, career paths, and additional financial logistics (►**Table 5**).

As a final recommendation, students suggested the introduction of structured learning and support programs, such as workshops, seminars, and career counseling sessions, with the aim of enhancing student understanding and literacy in neurosurgery (►**Table 6**).

Discussion

The pursuit of neurological surgery as a career specialty is one that requires the foresight of medical students early on in their medical education. Commitment to this challenging yet rewarding specialty is undermined by barriers presented to students studying in sub-Saharan African countries. Our study elucidates the various factors influencing medical students' interest in the specialty, expanding upon previous studies conducted in Zambia, Egypt, and other African nations to highlight medical students' concerns and mitigate barriers to aspiring neurosurgeons.[1,7,8,11,12]

The findings of this study indicate that over half (54.2%) of the medical students expressed interest in pursuing neurosurgery as a career, which is relatively high given the demanding nature of the specialty. This finding is consistent with studies showing that factors such as intellectual challenge, prestige, and the opportunity to make a significant impact on patients' lives often drive students in neurosurgery.[1,8] In comparison, a similar study conducted in Zambia reported a higher percentage (81%) of students expressing interest in the field,[12] possibly due to differences in exposure and the health care context. The presence of students with no interest (25.8%) or slight interest (24.0%) in neurosurgery, however, highlights a divide in perceptions about the specialty. Previous studies have suggested that such attitudes are influenced by factors like exposure to neurosurgery, mentorship, and clinical experiences,[13,14] reinforcing the idea that early and ongoing engagement with the specialty is key in shaping students' career decisions.

Several challenges were identified as barriers to pursuing neurosurgery, with inadequate faculty support, limited clinical exposure, and concerns about work–life balance being most prominent. Over 60% of students reported insufficient faculty support, a finding that aligns with previous research indicating that mentorship and guidance play a crucial role in fostering students' interest in surgical fields.[13,15,16] Faculty members are instrumental in shaping students' perceptions and career trajectories, particularly in countries where neurosurgery is less established as a specialty. The lack of exposure to neurosurgery was another significant challenge, with 39.1% of students reporting less than 2 weeks of clinical exposure. This is consistent with findings from other studies, which suggest that prolonged clinical exposure and hands-on experience are essential in promoting interest in neurosurgery.[17] Medical schools should consider extending rotation periods and offering more opportunities for students to observe or participate in neurosurgical procedures to increase their familiarity with the field and build confidence.

Concerns about work–life balance were also frequently raised, particularly the long working hours and high stress associated with neurosurgery. Similar concerns have been reported in other countries,[7,8,18] with many students reconsidering surgical careers due to the perceived negative impact on personal life. Addressing work–life balance within neurosurgery should therefore be a priority, with potential solutions

including flexible scheduling, mental health resources, and structured residency programs that allow for a healthier balance between professional and personal responsibilities.

Confidence in pursuing neurosurgery was strongly linked to both prior exposure and initial interest in the field. Students who had early exposure to neurosurgery, either through clinical rotations or during their earlier education, reported higher confidence levels. Students who felt more confident in their ability to succeed in neurosurgery were much more likely to express an interest in the specialty. These findings are consistent with literature that emphasizes the importance of early career exposure in fostering long-term interest in surgical specialties.[1] To support this, programs that provide early exposure to neurosurgery, such as outreach initiatives in high schools and undergraduate programs, could be effective in creating a pipeline of students interested in the specialty and better prepared for the demands of neurosurgery.

To enhance support for aspiring neurosurgeons, several recommendations were made by students. First, the establishment of mentorship programs is crucial. These programs would connect students with experienced neurosurgeons, offering career advice, guidance, and support throughout their education. Thus, opportunities for strong mentorship and guidance could foster student engagement and interest in neurological surgery. Previous studies have demonstrated that mentorship plays a significant role in increasing retention and interest in surgical specialties.[19,20] Second, increasing clinical exposure through extended rotations and opportunities to shadow neurosurgeons would help build technical skills and familiarity with the field. Additionally, structured educational programs, including seminars, workshops, and career fairs, could provide students with more opportunities to learn about neurosurgery outside the clinical environment. Lastly, improving work–life balance within neurosurgery through flexible residency schedules and mental health resources is essential to ensure that students feel confident in pursuing the specialty long-term.

In terms of policy and practice, several key implications emerged. There is a need for increased funding for neurosurgery programs to support mentorship opportunities and expand training resources. Medical schools should also invest in faculty development to ensure that neurosurgeons are actively involved in teaching and mentoring students interested in the specialty. Additionally, integrating neurosurgery more thoroughly into the undergraduate curriculum would ensure that all students have balanced exposure to the field, regardless of their eventual specialty choice.

Future research could focus on longitudinal studies to track medical students' perceptions and career decisions over time. This would help to further understand the factors influencing students' interest in neurosurgery and provide insights into how these perceptions evolve throughout medical education.

Limitations

This study offers valuable insights, but there are several limitations that should be acknowledged. The reliance on self-reported data introduces the possibility of response bias, as students may provide answers they believe are more socially desirable. Additionally, the accuracy of self-reported data regarding clinical exposure to neurosurgery may vary among participants, which could affect the study's conclusions about exposure levels.

Conclusion

This study highlights the perceptions of medical students toward neurosurgery in Kenya, offering critical insights into factors that influence their interest in pursuing the specialty. Whereas over half of the respondents expressed interest in the specialty, their desire was closely tied to early exposure, clinical experiences, and personal confidence. However, systematic barriers—including limited mentorship, inadequate faculty support, and minimal hands-on opportunities—continue to hinder student engagement with the specialty.

Addressing these gaps is essential to cultivating the next generation of neurosurgeons in the country. Efforts to strengthen mentorship, expand clinical exposure and promote work–life balance could significantly impact student interest and retention in the field. Importantly, this study shows that the solution to Kenya's neurosurgical workforce deficit begins in the undergraduate pipeline.

Ultimately, the challenges identified are not unique to Kenya. They mirror broader issues faced by medical students across many low- and middle-income countries. As such, findings from this study can offer valuable insights that may inform broader educational and policy reforms aimed at building a more robust, well-supported, and locally trained neurosurgical workforce.

Conflict of Interest
None declared.

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