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A national cross-sectional study on research opportunities and barriers among medical students in Nigeria, with recommendations

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Abstract

Background Clinical and health systems research are essential for advancing global healthcare. Engaging and training medical students in research will foster lifelong evidence-based practice, particularly for the emerging healthcare workforce. This study investigates the involvement of Nigerian medical students in research, identifying key opportunities and barriers to enhance their engagement.

Methods This cross-sectional, descriptive study used an online survey targeting recent graduates from 42 accredited Nigerian medical schools. A purposive sampling approach selected one federal, state, and private institution from each of Nigeria's six geopolitical zones. Data were collected between February and June 2024 using a face-validated online questionnaire, which gathered quantitative data and free-text recommendations. The survey was distributed through WhatsApp groups. Descriptive statistics and thematic analysis were employed to explore trends in the data. Ethical approval was obtained from the Jos University Teaching Hospital ethics review board (JUTH/DCS/IREC/127/XXXI/871). Informed consent was secured from each participant prior to participation.

Results Of the 429 respondents (270 men, 159 women) from 15 universities across all six zones, 92% participated in research during medical school. Men engaged in more research projects than women ($p=0.03$). Most respondents participated in two projects, usually group-based, with limited individual projects. Few had presented (20%) or published (17%) their research. Proficiency was highest in developing appropriate research methodologies (54%), while data analysis was the most challenging aspect of research (42%). Participation in research was supported by adequate mentorship for most participants (64%), whereas time constraints(74%), lack of research funding (55%), and inadequate research training (31%) were the main barriers to involvement. Regional differences were noted, with the highest participation by students in the South-South geo-political zone (98%) and the lowest in the South-West (85%). Learners from the South-West had more opportunities to present research at conferences, while those from the South-East had the fewest. Participants advocated for integrating more research opportunities into the medical

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curriculum, emphasising early skill development, expanding mentorship and networking opportunities, and offering grants to support students in conducting innovative research.

Conclusion There is a pressing need to enhance structured research opportunities in Nigerian medical education, especially for female medical students. This includes expanding access to training in data analysis, increasing publication and presentation opportunities, and integrating research skills early in the curriculum while addressing barriers like time constraints.

Clinical trial number Not applicable.

Keywords Medical education, Research participation, Nigeria, Medical students, Gender disparities

Introduction

Research is a cornerstone of medical education and practice, fostering critical thinking, innovation, and evidence-based healthcare. Early involvement in research provides medical students with essential skills, including data interpretation, academic writing, and a deeper understanding of clinical decision-making processes [1, 2]. Studies from High-Income Countries (HICs) have demonstrated that with appropriate support, student research initiatives can be both feasible and beneficial [3, 4]. However, in many Low- and Middle-Income Countries (LMICs), research opportunities for medical students remain limited [5]. Nigeria, with one of the largest medical student populations in Africa, offers a unique context for understanding the challenges and opportunities related to research engagement in this context [6].

Nigerian medical schools vary widely in terms of geographic location, ownership (public versus private), and resource allocation, which might likely influence access to opportunities [7]. Despite these variations, available data on how medical students across the country perceive and engage with research are either focal or not comprehensive. This is of great concern, as limited exposure to research during medical school can negatively impact the production of future clinician-scientists, a critical cadre for advancing global health priorities [8]. Furthermore, while research initiatives have significantly improved health services and outcomes in the Global North, Sub-Saharan Africa lags behind in conducting research that directly addresses its unique challenges [9]. Barriers to research participation in LMICs are multifactorial [5]. These barriers might be further complicated by challenges specific to Nigeria, such as regional disparities in educational resources and gendered differences, which remain poorly understood [10, 11].

Developing a research-driven educational model in medical schools is essential to strengthening the region's healthcare system [12]. To achieve sustainable improvements, Africa must cultivate innovative, context-specific solutions by understanding its distinct challenges, shaped by factors such as culture, lifestyle, and climate. Therefore, understanding the research opportunities and barriers experienced by medical students in Nigeria is critical for shaping policies and interventions that enhance research engagement. A national cross-sectional study is justified as it allows for the comprehensive exploration of these factors across diverse regions, gender groups, and school types, providing insights that are both broad and contextually relevant.

This study aims to examine the level of research engagement among Nigerian medical students, identify the available opportunities, explore the barriers that hinder participation, and gather recommendations from recent graduates on ways to enhance research involvement among medical students. The findings will provide actionable evidence to inform curriculum development, capacity-building initiatives, and policy reforms aimed at fostering a research-oriented culture among future healthcare professionals in Nigeria.

Methods

Study design

This study was a cross-sectional study, involving an online survey of recently graduated medical doctors from accredited medical schools across the six geopolitical zones of Nigeria.

Study population

The study targeted the most recent graduating sets from Nigeria's 42 accredited medical schools, representing a total of 3,355 graduates as per the Medical and Dental Council of Nigeria (MDCN) institutional graduation quota [13]. A purposive sampling approach was used, selecting one federal government-owned, one state government-owned, and one private-owned institution from each of Nigeria's six geopolitical zones to ensure diverse representation.

National accreditation was defined by inclusion on the MDCN accreditation list at the time of study, while recent graduates referred to the last graduated set of medical students from the medical schools (as of January 2021). We defined 'recent medical graduates' as the latest academic set of students who had graduated as medical doctors from Nigerian medical schools. Schools with last graduated sets longer than 2021 were excluded to mitigate recall bias. Incorporating medical doctors with

a limit of 2021 into this definition was necessary because some medical schools did not graduate any medical doctors in recent years due to university staff and health workers' industrial strike actions.

Sample size and sampling technique

The sample size was calculated using a formula for sample size determination for proportions with a margin of error of 5% and a confidence level of 95%, resulting in a minimum required sample size of 345 participants [14]. This approach aimed to enhance the robustness and representativeness of the findings. Purposive sampling was employed to select the participating institutions based on geographical distribution and institutional type (federal, state, private) within the country.

Data collection

Data was collected from February to July 2024. A face-validated, semi-structured, four-section, 35-multiple choice Likert scale and open-ended online e-survey questionnaire (Appendix 1) based on the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) was developed and utilised for this study [15]. The survey was developed by a panel comprising experienced Nigerian and international medical educators and recent medical graduates in an iterative process based on peer-reviewed literature and six focus group discussions with graduates. Additionally, pretesting was conducted with a cohort of recent graduates from an institution that was not included in the sampled institutions. The pretesting results contributed to the refinement of the survey.

The survey was distributed through secured class WhatsApp groups (WhatsApp, USA 2024), which are commonly used as communication channels in Nigerian medical schools. The survey included quantitative sections to capture information on research opportunities, barriers, and the extent of involvement in research activities among respondents, as well as a free-text section to capture recommendations for improving research participation among undergraduate medical students in Nigeria. Consent was obtained as respondents were introduced to the investigators and the purpose of the survey. They were informed of the expected duration to fill out the survey and how the data would be stored and utilised. No personal information was collected or stored, and access to data was limited to trained investigators; as such, they were assured of the privacy of their responses. Data was stored on an encrypted platform (Google Drive), and analysed on password-protected, encrypted systems to protect from unauthorised access.

During the period of data collection, the survey distribution team met weekly to evaluate responses and to strategise for more effective dissemination. Log file analysis was used to screen for duplicate entries and atypical time stamps. Only completed surveys were analysed.

Data analysis

Descriptive statistics, including frequencies, percentages, and measures of central tendency (mean, median), were used to summarise the quantitative data. Thematic analysis was employed to examine the free-text recommendations, aiming to identify areas for improving medical education in Nigeria. Statistical analysis was performed using R version 4.1.1. For continuous variables, a Kruskal-Wallis test was used, for categorical variables with cell counts greater or equal to five, a Chi-Squared test was used, and for categorical variables with cell counts less than five, the Fisher's Exact test was used to evaluate differences in characteristics between categories of respondents. Correlations were assessed between demographic variables (such as gender and institution type) and the extent of research involvement.

Qualitative analysis of free-text recommendations to improve research participation in Nigerian medical schools by recent medical graduates was done using thematic analysis. A series of online consensus meetings of 16 recent medical graduates from 15 Nigerian medical schools were held in which the results were discussed, and the free responses were reviewed, to optimise data analysis.

Ethical considerations

Ethical approval for the study was obtained from the Jos University Teaching Hospital Ethical Committee (JUTH/DCS/IREC/127/XXXI/871). Informed consent was obtained from all participants, and measures were implemented to ensure the confidentiality and anonymity of responses. Participation was voluntary, and no personal identifying information was collected. No funding was received for the survey.

Results

We obtained 429 responses from 15 Universities across the six geo-political zones in Nigeria (Fig. 1).

Sociodemographic information

Most responses were from medical students in the North-Central region ($n = 118$, 28%). Students from the University of Maiduguri provided the highest number of responses ($n = 62$, 14%). In addition, 2023 was the most common graduation year ($n = 341$, 79%). The ratio between male to female respondents was 1.7:1. Furthermore, 51% of participants attended federal government-owned schools (Table 1). A total of 92% of respondents ($n = 394$) reported active participation in research activities during their medical school education.

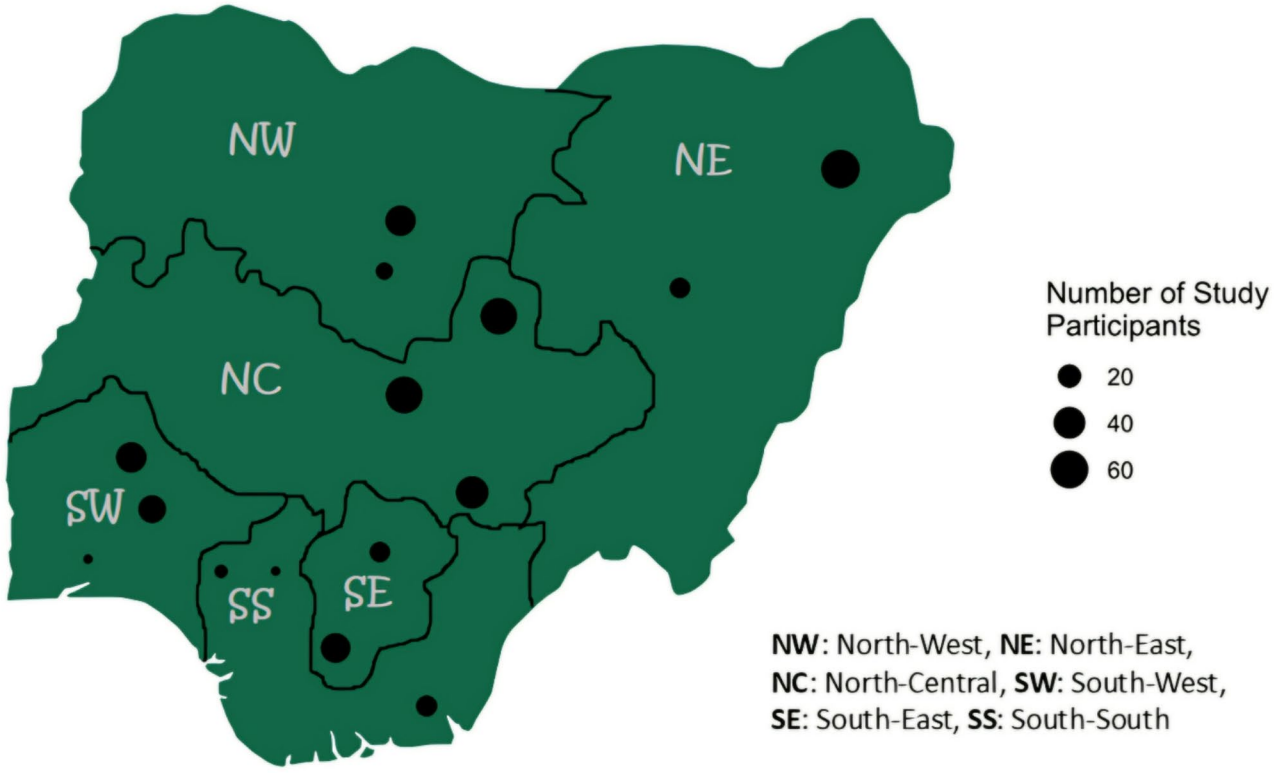

Fig. 1 Distribution of responses across Nigeria's six geopolitical zones

Research exposure

The median number of research projects contributed to was two (interquartile range (IQR): 1–2), most of which were group projects. Men had a higher median number of research projects they contributed to, compared to women (p-value = 0.03). Students from state schools had participated in a higher number of group research projects, while students from private schools had participated in a higher number of individual research projects (p-value < 0.001). Federal and private school students tended to have a high number of total research projects contributed to, compared to those from state-owned schools. The North-Central region had the highest number of contributions to group research projects, while students from the North-West and South-South regions contributed to the highest number of individual research projects. Furthermore, students from the North-Central and North-West regions contributed to the most research projects overall. The proportion of students actively participating in research projects varied from 85% (South-West region) to 98% (South-South region) (Table 2). Only 191 (44.5%) of the students had led an individual study.

Dissatisfaction with research opportunities during medical education was common, with 46% of female and 43% of male graduates expressing concerns. Students from state-owned medical schools reported the highest dissatisfaction at 48% (Table 3).

Opportunities for publication and conference attendance

Most respondents never had the opportunity for conference presentations ($n = 342$, 80%) or to publish ($n = 355$, 83%) their research work. The percentage of students who had published in an international, peer-reviewed journal ranged from 3.9% in the North-East to 28% in the South-South. Of those who had published in a local journal, the proportion by geopolitical zone ranged from 1.7% (North-Central) to 6.7% (South-East). No students from the North-East, North-West, or South-West had published in a local journal. Of those who had presented at a local conference, the proportion ranged from 8.2% (South-West) to 29% (South-South), and very few students overall had the opportunity to present at an international conference ($n = 7$; 1.63%) (Table 4).

Barriers and enablers of research participation

The top 3 barriers that prevented participants from engaging in research were a lack of time to commit to research ($n = 317$, 74%), access to funding ($n = 238$, 55%), and access to research skills ($n = 135$, 31%), whereas the top 3 enablers of research activities were presence of supervision and mentorship ($n = 274$, 64%), time availability ($n = 121$, 28%) and access to research skills ($n = 100$, 23%). Students from the South-West region were most likely to report lack of supervision, mentorship, and

Table 1 Sociodemographic and distribution of responses

Characteristics	Number of Respondents (*n* = 429)	Percentage (%)
Sex		
Male	270	62.9
Female	159	37.1
Year of Graduation		
2021	4	0.9
2022	48	11.2
2023	341	79.5
2024	36	8.4
School Ownership Type		
Federal (F)	219	51.0
State (S)	139	32.4
Private (P)	71	16.6
Region/School		
North-Central	**118**	**27.5**
University of Jos (F)	55	12.8
Bingham University (P)	56	13.1
Benue State University (S)	7	1.6
North-East	**77**	**17.9**
University of Maiduguri (F)	62	14.4
Gombe State University (S)	15	3.5
North-West	**53**	**12.4**
Ahmadu Bello University (F)	42	9.8
Kaduna State University (S)	11	2.6
South-West	**72**	**16.8**
Obafemi Awolowo University (F)	29	6.8
Ladoke Akintola University of Technology (S)	36	8.4
Babcock University (P)	7	1.6
South-East	**49**	**11.4**
University of Nigeria, Nsukka (F)	15	3.5
Chukwuemeka Odumegwu Ojukwu University (S)	34	7.9
South-South	**60**	**14**
University of Uyo (F)	16	3.7
Ambrose Alli University (S)	36	8.4
Igbinedion University (P)	8	1.9

School ownership type: F = Federal, S = State and P = Private

supportive faculty were a barrier to engagement in research, compared to students from other regions (Appendix 2).

Areas of research proficiency and difficulty in medical education

The area of research where most proficiency was gained through medical school education was methodology ($n = 233$, 54%), whereas the area of research that respondents found most difficult was formal data analysis ($n = 182$, 42%). Men were more likely than women to have gained proficiency in software skills (p-value < 0.01) and formal data analysis skills (p-value < 0.01), whereas women were more likely than men to have gained proficiency in administration skills (p-value < 0.01) (Figs. 2 and 3).

Recommendations from recent graduates

A total of 406 (95%) of participants provided free-text recommendations suggesting ways to enhance research participation among medical students. Seven themes identified in the recommendations include expanded integration of research into the medical school curriculum (29.8%), increasing mentorship and networking opportunities (24.7%), providing grants for students to conduct innovative research (22.6%), offering access to skills training such as data analysis (12.8%), and creating opportunities for conference presentations and publications (12.6%) (Table 5).

Discussion

This study revealed that although nearly all medical students in Nigeria (92%) reported some form of research engagement, this involvement was largely limited to a single group research project. Fewer than half (44.5%) had the opportunity to lead an individual research project during their six-year medical training (Table 2). This limited research participation indicates that Nigerian medical students often lack the necessary skills to independently conceptualise studies, analyse data, or take on leadership roles in research. In contrast, while research participation among medical students in HICs varies based on institutional requirements and individual interests, they typically undertake multiple research projects before graduation, facilitated by opportunities such as summer research fellowships, intercalated degrees, and dual-degree programmes [16–18]. Although studies from individual institutions in Nigeria such as Babcock University, the University of Benin and the University of Lagos have corroborated our findings by highlighting limited research exposure among medical students, this study confirms the grossly inadequate exposure of Nigerian medical students to research on a national scale [19, 20]. The impact of low research exposure may be far-reaching on the health system in Nigeria. While academic clinicians, who conduct the majority of medical research, are often driven by career advancement, clinicians in health services (not in academic positions) remain largely unmotivated to engage in research. This low participation may stem from limited exposure to quality research training and involvement during their undergraduate education, restricting their capacity and inclination to integrate research into their professional practice Consequently, this restricts the generation and application of pragmatic evidence essential for improving patient care [7].

Inadequate time dedicated to research within the Nigerian medical school curriculum, lack of access to funding

Table 2 Median number of research projects contributed to and active participation rates

	Median (IQR) number of group research projects contributed to	Median (IQR) number of individual research projects contributed to	Median (IQR) number of total research projects contributed to	Number (percentage) that actively participated in research projects
Sex				
Female	1 (1, 2)	0.4 (0, 1)	1 (1, 2)	146 (91.8%)
Male	1 (1, 2)	0.8 (0, 1)	2 (1, 2)	248 (91.9%)
p-values*	**0.6**	**0.002**	**0.029**	**0.6**
Institution Type				
Federal	0 (0, 1)	1 (1, 2)	2 (1, 3)	202 (92%)
Private	0 (0, 0)	2 (1, 2)	2 (1, 2)	64 (90%)
State	1 (0, 1)	1 (1, 2)	1 (1, 2)	128 (92%)
p-values*	**< 0.001**	**0.001**	**0.094**	**0.8**
Region				
North-Central	2 (1, 2)	0 (0, 1)	2 (1, 3)	110 (93%)
North-East	1 (1, 2)	0 (0, 1)	1 (1, 2)	73 (95%)
North-West	1 (1, 1)	1 (1, 1)	2 (1, 2)	49 (92%)
South-East	1 (1, 2)	0 (0, 1)	1 (1, 2)	42 (86%)
South-South	1 (1, 2)	1 (0, 1)	1 (1, 2)	59 (98%)
South-West	1 (1, 2)	0 (0, 1)	1 (1, 2)	61 (85%)
p-values*	**< 0.001**	**< 0.001**	**< 0.001**	**0.036**
Institution				
Ambrose Alli University	1 (1, 2)	1 (1, 1)	1 (1, 2)	36 (100%)
Benue State University	1 (1, 2)	1 (1, 1)	2 (2, 2)	7 (100%)
Babcock University	2 (2, 2)	0 (0, 1)	2 (2, 3)	7 (100%)
Bingham University	2 (1, 2)	0 (0, 0)	2 (1, 2)	50 (89%)
Chukwuemeka Odumegwu Ojukwu University	1 (1, 1)	0 (0, 1)	1 (1, 1)	30 (88%)
Gombe State University	1 (0, 2)	1 (1, 1)	2 (1, 2)	14 (93%)
Igbinedion University Okada	2 (1, 2)	0 (0, 0)	2 (1, 2)	7 (88%)
Kaduna State University	1 (1, 2)	1 (1, 1)	2 (2, 3)	11 (100%)
Ladoke Akintola University of Technology	1 (1, 3)	0 (0, 1)	1 (1, 3)	30 (83%)
Obafemi Awolowo University	1 (1, 2)	0 (0, 1)	1 (1, 2)	24 (83%)
University of Jos	2 (1, 3)	0 (0, 1)	2 (2, 4)	53 (96%)
University of Maiduguri	1 (1, 2)	0 (0, 1)	1 (1, 2)	59 (95%)
University of Nigeria Nsukka	1 (1, 2)	0 (0, 1)	2 (1, 3)	12 (80%)
University of Uyo	1 (1, 2)	0 (0, 0)	2 (1, 2)	16 (100%)
p-values*	**< 0.001**	**< 0.001**	**< 0.001**	--

*For continuous variables, a Kruskal-Wallis test was used, for categorical variables with cell counts greater or equal to five, a Chi Squared test was used, and for categorical variables with cell counts less than five, the Fisher's Exact test was used to evaluate differences in characteristics between categories of respondents. Of note, p-values are not displayed where they could not be determined

or grants, and insufficient requisite skills or training are major barriers that prevented them from research participation (Appendix 2). Medical students in Nigeria face a demanding academic schedule comprising extensive coursework, clinical rotations, and practical assessments, often running concurrently in most institutions [21]. This barrier of lack of dedicated time has been highlighted in other studies [19, 22], and specifically discourages engagement in longitudinal or complex studies. In contrast, medical students in certain HICs have dedicated years for research and can often take elective time off to focus on acquiring and utilizing research skills [16, 23, 24]. Balancing these responsibilities leaves little time for extracurricular research.

Another significant barrier is the lack of access to grants and funding. Financial constraints hinder access to essential research tools, such as statistical software, equipment, consumables, and skilled support staff. Students often cannot afford licensing for paid data analysis tools, resulting in minimal practical experience with data analysis. Additionally, many face difficulties accessing updated research articles, journals, and publishing platforms due to the high cost of journal subscriptions and the lack of institutional access in most Nigerian universities. This financial barrier is especially pronounced among students from government-owned federal and state universities, where the majority of Nigerian medical students study. Furthermore, as Nigeria is classified

Table 3 Graduates' perceptions of research opportunities in medical education

Were you provided with enough research opportunities during your medical education?						
	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**	**p-value***
Sex						
Female	24 (15%)	49 (31%)	46 (29%)	35 (22%)	5 (3%)	**0.661**
Male	33 (12%)	83 (31%)	74 (27%)	64 (24%)	16 (6%)	
Institution Type						
Federal	33 (15%)	63 (29%)	64 (29%)	48 (22%)	11 (5%)	**0.367**
Private	7 (10%)	19 (27%)	19 (27%)	24 (34%)	2 (3%)	
State	17 (12%)	50 (36%)	37 (27%)	27 (19%)	8 (6%)	
Region						
North-Central	17 (14%)	33 (28%)	32 (27%)	32 (27%)	4 (3%)	**0.164**
North-East	10 (13%)	22 (29%)	22 (29%)	21 (27%)	2 (2%)	
North-West	11 (21%)	10 (19%)	15 (28%)	10 (19%)	7 (13%)	
South-West	8 (11%)	25 (35%)	19 (26%)	19 (26%)	1 (1.4%)	
South-East	4 (8%)	21 (43%)	13 (27%)	8 (16%)	3 (6%)	
South-South	7 (12%)	21 (35%)	19 (32%)	9 (15%)	4 (7%)	

as a middle-income nation, it often does not qualify for full article processing charge (APC) waivers provided by many journals. Consequently, the inability to afford APCs required to publish in reputable journals serves as an additional deterrent for students aspiring to share their research findings [25]. This lack of funding could explain the nationwide limited opportunities to publish research findings observed among students in Nigeria (Table 4). Similar to the findings of this study, a low publication rate (6.9%) was reported among medical students at the University of Lagos [19]. Furthermore, even among Nigerian medical students who successfully published, first authorship was rare, indicating a significant gap in exposure to research leadership [11]. Meanwhile, although publication rates vary among medical students in some HICs, studies have shown that over 30% of students in these countries publish [8, 26, 27].

A lack of research skills and insufficient supervision significantly hinder participation in research. Although most participants reported proficiency in research methodology from their medical school curriculum, they faced challenges with data-related skills (Figs. 2 and 3). The limited emphasis on data training is closely linked to resource constraints and a shortage of faculty expertise [28]. This issue is further exacerbated by inadequate mentorship. More than half of the respondents indicated that mentorship played a crucial role in motivating their involvement in research. However, the instability of academic calendars in many government-owned institutions reduces the time available for mentorship and limits the feasibility of structured, hands-on research programmes. While compulsory research internships could enhance students' practical experience in data handling and increase their familiarity with research tools, such initiatives remain uncommon in Nigerian medical schools [29].

Another key concern regarding research opportunities for medical students in Nigeria is the limited access to conference presentations (Table 4). While inequitable access to conferences is a common challenge across LMICs, it may be particularly pronounced for Nigerian medical students due to barriers such as limited access to information, restricted networking opportunities, inadequate funding, and the constraints of a demanding curriculum [30].

In contrast, medical students in HICs such as the United Kingdom, the United States, and Canada often benefit from institutional policies that actively promote research exposure [31–33]. Although barriers such as time constraints and demanding curricula exist in HICs, many institutions integrate research into the curriculum through electives, summer programmes, and protected time for research activities. Students from these settings also benefit from research grants and opportunities for research assistantships which enable them to be more participatory in research processes [16, 23, 24]. Such practices highlight the importance of institutional support in fostering research involvement.

Given the contextual challenges and limited opportunities for medical students in Nigeria, it is imperative to expand the curricular elements of research for medical students in Nigeria. In addition, creating elective tracks for medical student research fellowships as is the practice in the US might also prove beneficial. While this might extend the graduation time, it will produce doctors who are keen and skilled in measuring results in their practice, applying quality improvement, and generating practice evidence that results in higher quality, more equitable medical care.

Leveraging digital technology and fostering global collaborations will be crucial to supporting research development. Mobile applications and e-learning resources

Table 4 Opportunities for publication and conference attendance

	Number with no publications (Percentage of total)	Number (percent) who published in a local journal	Number (percent) who published in an international journal (peer-reviewed)	Number (percent) with no conference presentation experience	Number (percent) who presented at a local conference	Number (percent) who presented at an international conference
Sex						
Female	137 (86%)	3 (1.9%)	19 (12%)	133 (84%)	26 (16%)	0 (0%)
Male	218 (81%)	7 (2.6%)	45 (17%)	209 (77%)	53 (20%)	7 (2.6%)
p-values*	**0.4**	**0.4**	**0.4**	**0.09**	**0.09**	**0.09**
Institution Type						
Federal	186 (85%)	4 (1.8%)	29 (13%)	173 (79%)	40 (18%)	5 (2.3%)
Private	64 (90%)	1 (1.4%)	6 (8.5%)	59 (83%)	12 (17%)	0 (0%)
State	105 (76%)	5 (3.6%)	29 (21%)	110 (79%)	27 (19%)	2 (1.4%)
p-values*	**0.071**	**0.071**	**0.071**	**> 0.9**	**> 0.9**	**> 0.9**
Region						
North-Central	104 (88%)	2 (1.7%)	12 (10%)	99 (84%)	17 (14%)	2 (1.7%)
North-East	74 (96%)	0 (0%)	3 (3.9%)	57 (74%)	19 (25%)	0 (0%)
North-West	48 (91%)	0 (0%)	5 (9.4%)	44 (83%)	9 (17%)	0 (0%)
South-West	38 (78%)	0 (0%)	11 (22%)	44 (90%)	4 (8.2%)	1 (2.0%)
South-East	43 (72%)	4 (6.7%)	13 (22%)	50 (83%)	9 (15%)	1 (1.7%)
South-South	48 (67%)	4 (5.6%)	20 (28%)	48 (67%)	21 (29%)	3 (4.2%)
p-values*	--	--	--	--	--	--
Institution						
Ahmadu Bello University	37 (88%)	0 (0%)	5 (12%)	36 (86%)	6 (14%)	0 (0%)
Ambrose Alli University	25 (69%)	3 (8.3%)	8 (22%)	29 (81%)	7 (19%)	0 (0%)
Benue State University	7 (100%)	0 (0%)	0 (0%)	6 (86%)	1 (14%)	0 (0%)
Babcock University	7 (100%)	0 (0%)	0 (0%)	6 (86%)	1 (14%)	0 (0%)
Bingham University	50 (89%)	0 (0%)	6 (11%)	45 (80%)	11 (20%)	0 (0%)
Chukwuemeka Odumegwu Ojukwu University	26 (76%)	0 (0%)	8 (24%)	31 (91%)	3 (8.8%)	0 (0%)
Gombe State University	14 (93%)	0 (0%)	1 (6.7%)	11 (73%)	4 (27%)	0 (0%)
Igbinedion University Okada	7 (88%)	1 (13%)	0 (0%)	8 (100%)	0 (0%)	0 (0%)
Kaduna State University	11 (100%)	0 (0%)	0 (0%)	8 (73%)	3 (27%)	0 (0%)
Ladoke Akintola University of Technology	22 (61%)	2 (5.6%)	12 (33%)	25 (69%)	9 (25%)	2 (5.6%)
Obafemi Awolowo University	19 (66%)	2 (6.9%)	8 (28%)	17 (59%)	11 (38%)	1 (3.4%)
University of Jos	47 (85%)	2 (3.6%)	6 (11%)	48 (87%)	5 (9.1%)	2 (3.6%)
University of Maiduguri	60 (97%)	0 (0%)	2 (3.2%)	46 (74%)	15 (24%)	0 (0%)
University of Nigeria Nsukka	12 (80%)	0 (0%)	3 (20%)	13 (87%)	1 (6.7%)	1 (6.7%)
University of Uyo	11 (69%)	0 (0%)	5 (31%)	13 (81%)	2 (13%)	1 (6.3%)
Total	**355 (83%)**	**10 (2%)**	**64 (15%)**	**342 (80%)**	**79 (32%)**	**7 (1.6%)**
p-values*	--	--	--	--	--	--
Institution Type						
Federal	186 (85%)	4 (1.8%)	29 (13%)	173 (79%)	40 (18%)	5 (2.3%)
Private	64 (90%)	1 (1.4%)	6 (8.5%)	59 (83%)	12 (17%)	0 (0%)
State	105 (76%)	5 (3.6%)	29 (21%)	110 (79%)	27 (19%)	2 (1.4%)

Table 4 (continued)

	Number with no publications (Percentage of total)	Number (percent) who published in a local journal	Number (percent) who published in an international journal (peer-reviewed)	Number (percent) with no conference presentation experience	Number (percent) who presented at a local conference	Number (percent) who presented at an international conference
p-values*	**0.071**	**0.071**	**0.071**	**> 0.9**	**> 0.9**	**> 0.9**
Region						
North-Central	104 (88%)	2 (1.7%)	12 (10%)	99 (84%)	17 (14%)	2 (1.7%)
North-East	74 (96%)	0 (0%)	3 (3.9%)	57 (74%)	19 (25%)	0 (0%)
North-West	48 (91%)	0 (0%)	5 (9.4%)	44 (83%)	9 (17%)	0 (0%)
South-West	38 (78%)	0 (0%)	11 (22%)	44 (90%)	4 (8.2%)	1 (2.0%)
South-East	43 (72%)	4 (6.7%)	13 (22%)	50 (83%)	9 (15%)	1 (1.7%)
South-South	48 (67%)	4 (5.6%)	20 (28%)	48 (67%)	21 (29%)	3 (4.2%)
p-values*	--	--	--	--	--	--

*For continuous variables, a Kruskal-Wallis test was used, for categorical variables with cell counts greater or equal to five, a Chi-Squared test was used, and for categorical variables with cell counts less than five, the Fisher's Exact test was used to evaluate differences in characteristics between categories of respondents. Of note, p-values are not displayed where they could not be determined

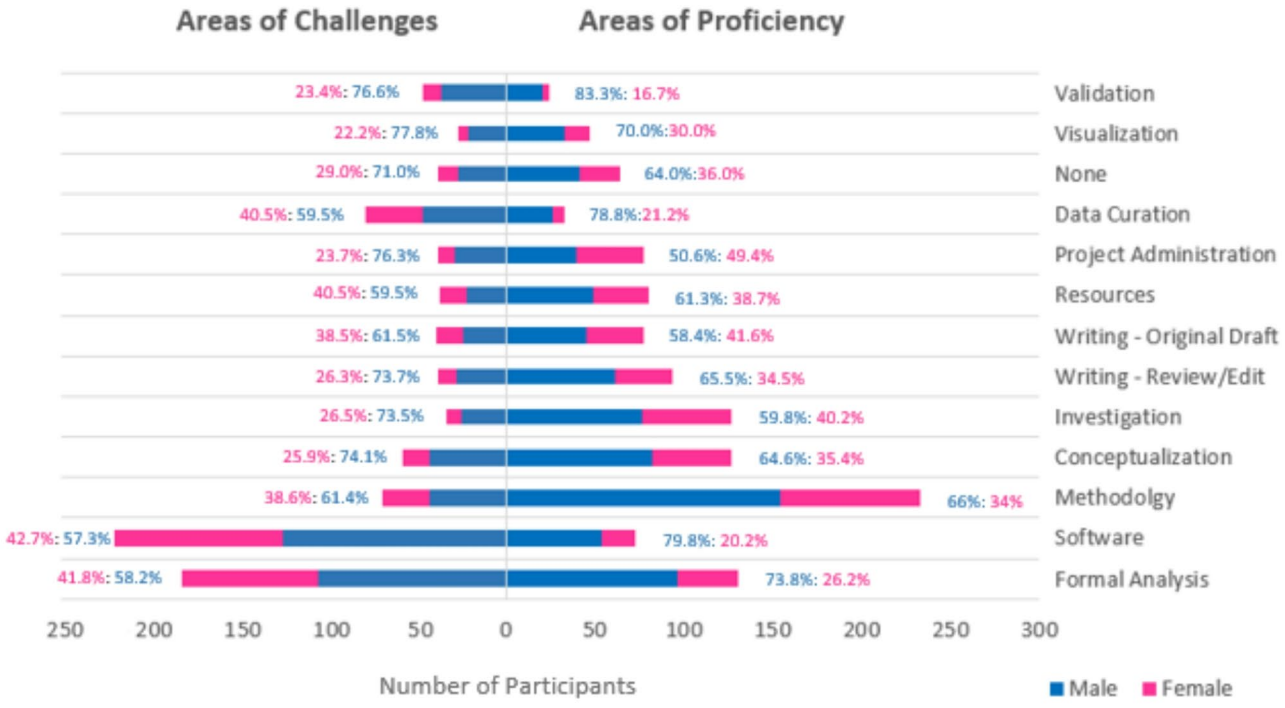

Fig. 2 Comparison of research proficiency and challenges in medical education by sex

that enable self-paced learning could address gaps in data analysis and technical training. Universities could also adopt open-source software such as R or Python, which are widely used in data science and available at no cost. Training students in these tools would ensure equitable access to data analysis skills without imposing significant financial burdens. Furthermore, global peer mentorship programmes and collaborations with HICs could further enhance research capacity among Nigerian medical students [34]. Initiatives like Research4Life connect students with mentors from HICs, guiding research design, data analysis, and scientific publishing. Regular feedback sessions, virtual interactions, and co-supervision opportunities could help students build confidence in writing and publishing, addressing critical skill gaps. Similarly, institutional partnerships, such as those established under the African Forum for Research and Education in Health (AFREhealth), could offer Nigerian students access to funded research projects, international laboratory facilities, and workshops led by experienced HIC faculty [35]. Specialty interest groups, such as Surgical Interest Group Africa and InciSioN, also play an important role by connecting students with international mentors and providing resources on research methodologies, ethics, and scientific writing. These organisations offer webinars, workshops, and free access to tailored research

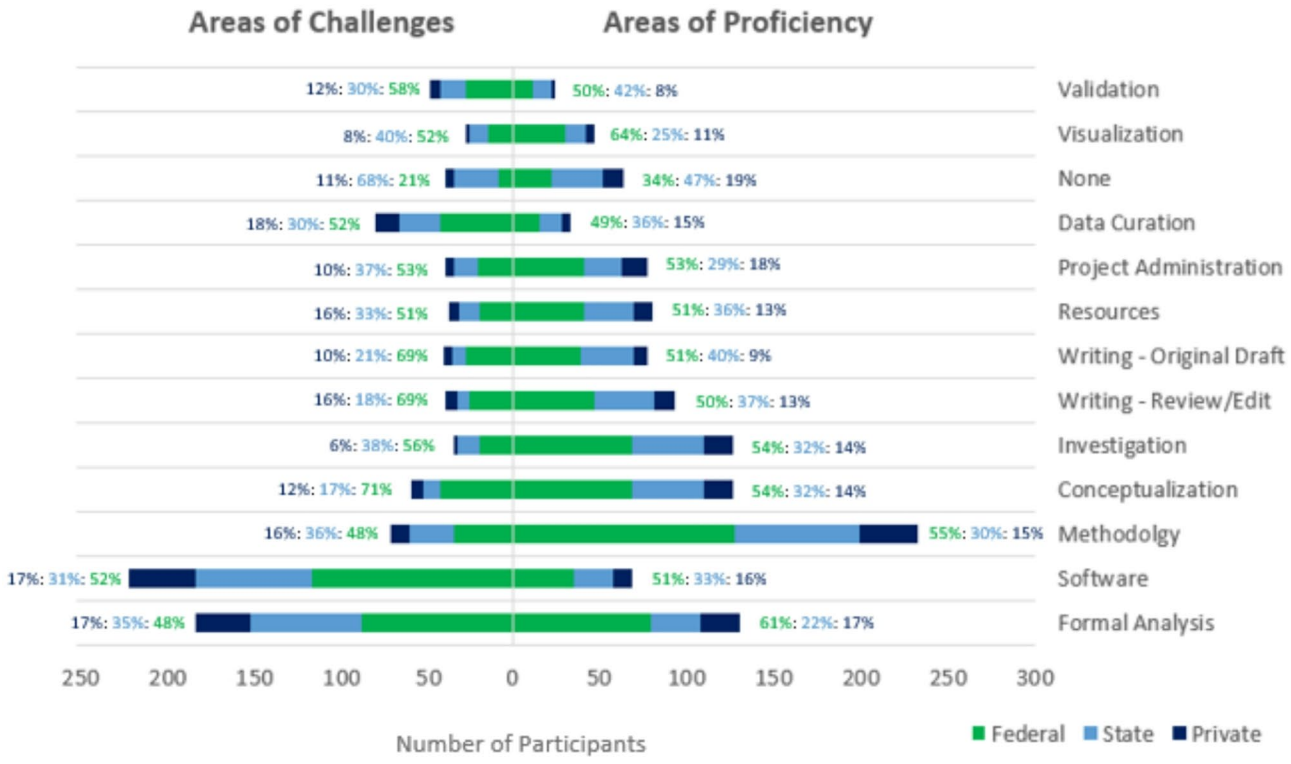

Fig. 3 Comparison of research proficiency and challenges in medical education by school ownership

tools for specific fields. These collaborations would not only expose students to advanced research methodologies but also strengthen local research infrastructure and promote long-term academic engagement [36, 37]. By leveraging digital tools and targeted networks, students can gain practical skills, broaden their professional networks, and enhance their capacity to conduct high-quality research in their areas of interest. These efforts could significantly bridge the gap in research opportunities, empowering Nigerian medical students to contribute meaningfully to global scientific discourse.

The survey revealed gender and regional disparities in research involvement. Male students reported more research projects, higher publication and conference presentation rates, and greater technical proficiency in data analysis and software use. These differences could be attributed to societal expectations, gender stereotypes, mentorship inequalities, and institutional biases. Men are more likely to have mentors with technical expertise, while women are often directed towards administrative roles due to limited female representation in research-intensive faculty positions [38]. Addressing these disparities requires collaborative learning environments where students rotate roles within mixed-gender teams to develop balanced skill sets. Additionally, equal access to technical training, such as mandatory data analysis workshops and programmes can help bridge the gap. Regarding regional differences, students from the South-South region have the highest research participation, while the South-West has the lowest. These differences are influenced by factors such as institutional resources, mentorship, regional funding, and infrastructure.

Recent graduates recommended early exposure to research, structured courses, and more dedicated time for research projects across specialities beyond Public Health, reinforcing the need for curriculum reform. They emphasised mentorship, advocating for more faculty-led guidance and research assistantship opportunities, which could provide students with practical skills while supporting faculty research. Additionally, funding is a major barrier to leading innovative studies and they recommend providing students with grants to catalyse a change. Limited access to literature and datasets hampers literature reviews and secondary studies (Table 5).

Limitations

Several limitations have been noted in this study. The use of purposive sampling to ensure diverse representation across Nigeria's geopolitical zones and institutional types may not fully reflect the experiences of all Nigerian medical graduates based on the size and diversity of the nation, limiting generalisability. However, our selection of a spread of institutions from each geopolitical zone is an attempt at addressing the extensive institutional diversity of Nigerian medical schools. We also acknowledge the possibility of recall bias from relying

Table 5 Recommendations by recent medical school graduates

Theme	*N*	%	Examples Quotes
Integrate research into the medical curriculum: Early introduction and allocation of more dedicated time for structured research courses and projects into the medical training to ensure students are consistently exposed to research throughout their education.	128	29.8	*"The syllabus should be reshaped to give more influence for research" - SW063* *"Add (research) projects to more courses in Medical School, not just Community Medicine." - SE039* *"Research should begin earlier on in medical school as opposed to only doing research in final year, and it should be made compulsory as part of the curriculum so students can actively participate." - NE068* *"A given period of time in training should be solely located for research without interference from other departments of academic activities, as this will fuel focus and increase proficiency." - NC083*
Mentorship & Networking: Strong mentorship including engaging students as research faculties research assistantship; Networking opportunities with other students nationally and globally.	108	24.7	*"Medical schools should create more mentor-mentee relationships on thesis writing" - NW026* *"Students should be encouraged to play the roles of research assistants to consultants and other staff in academia so as to imbibe the research culture early on." - SS026* *"Creating a research club or society that's open to all medical students and with provision of mentorship from faculty members" - NW048* *"Potential mentors and supervisors should stop exploiting young undergraduates for data collection and research without given them full acknowledgement and authorship status. If no reward is perceived for doing research, there is no motivation to do research."MS01*
Funding: Create opportunities for student grants, scholarships and institutional support to reduce barriers to conducting research including a dedicated national medical student grant to motivate impactful research.	97	22.6	*"The government should work with educational agencies to refine our medical curriculum to meet global standards to accommodate more research. This will also mean funding should be earmarked for undergraduate research." - SS002* *"Funding, funding, funding. Enough of the (KNOWLEDGE, ATTITUDE AND PRACTICE) type research by students, which to be honest, only adds to the already pile load of researches done by students with little to no impact." - NW048*
Research training and skills development: Provide comprehensive training to develop students' research skills in data analysis, and software use.	55	12.8	*"Teaching Data analysis in medical school to cut the cost of students going to search for analysts that will help them" - SE031* *"Adequate training on statistical software early on in medical school." - NC002* *"I believe in introducing research into medicine but also in encouraging members of faculties to develop their research lab and recruit medical students." - SW070*
Opportunities for Conferences and Publications: Expand opportunities for students to attend and present at conferences, and support them in publishing their research findings.	54	12.6	*"Room for presenting their research works. When you research and dump your work, it doesn't give you any motivation to do more." - NE012* *"Journal clubs that are accessible to all, also, university waiver of Article processing fee and Nigeria leaving Group B in research for life category" - SW039* *"All universities should have a school journal where students can access it for publishing their work." - NE007* *"Students should be made to assist lecturers on at least one research and should be trained on how to publish their works" - NC051*
Enhance availability of research resources and tools: improve access to necessary tools and resources such as existing datasets and literature needed for conducting and publishing research.	43	10.0	*"Provision of tools and resources" - SS019* *"Some universities don't have university emails for students making it difficult for students to explore research opportunities." - SS002*
Research Awareness: Educate students on the significance of research and its impact on their medical careers.	24	5.6	*"Enlightenment of the medical students about the opportunity" - NC062* *"Orientation of medical students into the importance of research work" - SW011*

on retrospective recollections and the constrained depth of qualitative responses due to the survey format as additional limitations. Richer insights could have been gained through focus group discussions or individual in-depth interviews. Retrospective review of official medical school records or even longitudinal studies following the involvement of medical students in research through school would perhaps be more accurate. However, with low involvement in research, recall bias is likely to be less in this study, compared to where respondents were trying to recall numbers for high volume involvement. Despite these challenges, the study provides a foundation for understanding research engagement among Nigerian medical students. Future studies with broader sampling and mixed-methods approaches are recommended to expand on these findings and explore the appetite for curriculum reform among medical faculty members.

Conclusion

In conclusion, while Nigerian medical students face significant challenges in research participation, structural changes such as curriculum integration and improved mentorship can foster a more supportive environment for research engagement. In Addition, national policies addressing regional and gender disparities and leveraging digital resources and international collaborations can help bridge these gaps, facilitating greater research involvement among medical students in Nigeria. This will lead to the emergence of a new breed of research-driven physicians who can contribute meaningfully to science and address numerous health challenges through unique evidence-based approaches.

Abbreviations

APC	Article Processing Charge
CHERRIES	Checklist for Reporting Results of Internet E-Surveys
HICs	High-Income Countries
LMICs	Low- and Middle-Income Countries
MDCN	Medical and Dental Council of Nigeria

Supplementary Information

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Supplementary Material 1

Supplementary Material 2

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Author contributions

P.T.K. and B.T.A. conceptualised the study and contributed to methodology, resources, writing (original draft and review/editing), visualisation, and supervision.P.T.K. and J.A.O. contributed to validation, formal analysis, investigation, data curation, and project administration, while J.A.O. additionally contributed to methodology and resources.S.A.A. contributed to the investigation, data curation, and writing (original draft and review/editing).M.M.A., O.I.M., G.E.A., M.T.M., B.M., K.M.M., J.Z., F.A., and S.D. contributed to methodology, investigation, and writing (review/editing).N.P.S. and V.S. supported validation, formal analysis, investigation, data curation, writing (review/editing), and visualisation.A.U. was responsible for validation, formal analysis, investigation, data curation, writing (original draft and review/editing), and visualisation.N.Z.G and O.A.S. contributed to the writing (original draft and review/editing), with O.A.S. also providing supervision.

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Data availability

The datasets generated and/or analysed during the current study are available in the GitHub repository, https://github.com/aashna-uppal/research_barriers_nigeria/.

Declarations

Ethics approval and consent to participate

The research was performed in accordance with the Declaration of Helsinki and was approved by the Jos University Teaching Hospital ethics review committee with reference number (JUTH/DCS/IREC/127/XXXI/871). All participants provided written informed consent and all the methods were carried out following relevant guidelines and regulations. No vulnerable groups were involved in this study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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References

1. Hasan MJ, Islam S, Sujon H, Chowdhury FI, Islam M, Ahmed M, et al. Research involvement among undergraduate medical students in Bangladesh: a multicenter cross-sectional study. BMC Med Educ. 2025;25(1):126.
2. Murdoch-Eaton D, Drewery S, Elton S, Emmerson C, Marshall M, Smith JA, et al. What do medical students understand by research and research skills?? Identifying research opportunities within undergraduate projects. Med Teach. 2010;32(3):e152–60.
3. Freitas F, Leedham-Green KE, Smith SF, Costa MJ. Partners in academic endeavour: characterising student engagement across internationally excellent medical schools. Med Teach. 2023;45(8):830–7.
4. De Jong G, Meijer E, Schout G, Abma T. Involving undergraduate nursing students in participatory health research: implications from the Netherlands. J Prof Nurs. 2018;34(6):507–13.

5. Dakhil ZA, Cader FA, Banerjee A. Challenges in clinical research in low and middle income countries: early career cardiologists' perspective. Glob Heart. 2024;19(1):13.
6. Rosenberg J, Juvonen M, Ng MZ, Arinzeh N, Adanu TSA, Ninsiima H, et al. Medical schools in Africa: seeing momentum. BMJ Glob Health. 2024;9(2):e014468.
7. Mahmoud AO, Ayanniyi AA, Lawal A, Omolase CO, Ologunsua Y, Samaila E. Perceptions of Nigerian medical specialists on research. J Public Health Afr. 2011;2(1):e1.
8. Den Bakker CR, Ommering BW, Van Leeuwen TN, Dekker FW, De Beaufort AJ. Assessing publication rates from medical students' mandatory research projects in the Netherlands: a follow-up study of 10 cohorts of medical students. BMJ Open. 2022;12(4):e056053.
9. Uthman OA, Wiysonge CS, Ota MO, Nicol M, Hussey GD, Ndumbe PM, et al. Increasing the value of health research in the WHO African region beyond 2015—reflecting on the past, celebrating the present and Building the future: a bibliometric analysis. BMJ Open. 2015;5(3):e006340.
10. Wang Y, Li J, Ou-Yang X, Wan M, Wang Y, Zhang G et al. Bridging the Gap: advancing gender equality in medical research. Postgrad Med J. 2024;qgae161.
11. Iwuagwu A, Uzochukwu B. Research productivity and associated challenges among postgraduate Doctors at the university of Nigeria teaching hospital, Enugu. West Afr J Med. 2024;41(11 Suppl 1):S10.
12. Olajide T, Arokoyo K, Adesola A, Okeke S, Abdullateef R, Anele F, et al. Building a research culture among Nigerian medical students: the modus operandi of the college research and innovation hub. BMC Med Educ. 2024;24(1):1465.
13. Medical and Dental Council of Nigeria. Medical and Dental Council of Nigeria. Status of accredited medical and dental schools in Nigeria as at October 2021. 2021. [Internet]. mdcnigeria; 2021 [cited 2025 Jan 27]. Available from: https://www.mdcn.gov.ng/public/storage/documents/document_404106511.pdf
14. KingPriest PT, Alayande BT, Clement EW, Muhammed M, Egbiri JO, Shanabo M, et al. A National perspective on exposure to essential surgical procedures among medical trainees in Nigeria: a cross-sectional survey and recommendations. BMC Med Educ. 2023;23(1):913.
15. Eysenbach G. Improving the quality of web surveys: the checklist for reporting results of internet E-Surveys (CHERRIES). J Med Internet Res. 2004;6(3):e34.
16. Radovich L, Termuhlen P, McCarty C. Evaluation of a Summer Research Program for Medical Students on a Regional Medical Campus. J Reg Med Campuses [Internet]. 2023 Mar 21 [cited 2024 Dec 20];6(2). Available from: https://pubs.lib.umn.edu/index.php/jrmc/article/view/4970
17. Tumin D, Long-Mills E, Becton M, Brewer KL, Cunningham K, Eldridge DL. Publication of medical student summer research: A Multi-institutional analysis. Med Sci Educ. 2024;34(6):1505–11.
18. Zier K, Friedman E, Smith L. Supportive programs increase medical students' research interest and productivity. J Investig Med. 2006;54(4):201–7.
19. Awofeso O, Roberts A, Okonkwor C, Nwachukwu C, Onyeodi I, Lawal IM, et al. Factors affecting undergraduates' participation in medical research in Lagos. Niger Med J. 2020;61(3):156.
20. Ani CK, Bassey AS, Osaghae OJ, Eroh MU. Medical research engagement among resident Doctors in Nigeria: assessing knowledge, attitudes, and barriers in a public and private tertiary hospital in Nigeria. BMC Med Educ. 2024;24(1):1521.
21. Ayinde OO, Akinnuoye ER, Molodynski A, Battrick O, Gureje O. A descriptive study of mental health and burnout among Nigerian medical students. Int J Soc Psychiatry. 2022;68(6):1223–31.
22. Ndudi O, Amaechi N, Ezinne BI, Chinonso O, Perpetua N. Perception of research and predictors of research career: A study among clinical medical students of Ebonyi state university Abakaliki, Southeast Nigeria. Niger J Med. 2017;26(3):200.
23. Cain L, Kramer G, Ferguson M. The medical student summer research program at the university of Texas medical branch at Galveston: Building research foundations. Med Educ Online. 2019;24(1):1581523.
24. Ho T, Agarwal A, Khambhati J, Sarfaty S, Hirsch AE. Faculty and student evaluations of a medical student summer research program: a 15 year analysis. Med Sci Educ. 2017;27(1):75–82.
25. Lawson S. Fee waivers for open access journals. Publications. 2015;3(3):155–67.
26. Wells CI, Wallace HB, McLaughlin SJP, Alexander HC, Shelling AN. Rate and predictors of publication by medical and health science summer research students: a 14-year analysis from Auckland. New Z MedEdPublish. 2016;5:129.
27. Dufour J, Gregorcyk E, Berk S, Medical student research at Texas Tech University Health Sciences Center.: increasing research participation with a summer research program. Southwest Respir Crit Care Chron [Internet]. 2017 Apr 21 [cited 2025 Mar 11];5(18). Available from: http://www.pulmonarychronicles.com/index.php/pulmonarychronicles/article/view/382
28. Ughasoro M, Musa A, Yakubu A, Adefuye B, Folahanmi A, Isah A, et al. Barriers and solutions to effective mentorship in health research and training institutions in Nigeria: mentors, mentees, and organizational perspectives. Niger J Clin Pract. 2022;25(3):215–25.
29. Long T. Why undertake a clinical academic internship? A novice researcher's reflection. Nurse Res. 2019;27(4):36–41.
30. Velin L, Lartigue JW, Johnson SA, Zorigtbaatar A, Kanmounye US, Truche P, et al. Conference equity in global health: a systematic review of factors impacting LMIC representation at global health conferences. BMJ Glob Health. 2021;6(1):e003455.
31. Yang L, Chang I, Ritz S, Grierson L. Research experiences for Canadian aspiring physicians: a descriptive analysis of medical school admission policies concerning research involvement in Canada. BMC Med Educ. 2022;22(1):151.
32. Carberry C, McCombe G, Tobin H, Stokes D, Last J, Bury G, et al. Curriculum initiatives to enhance research skills acquisition by medical students: a scoping review. BMC Med Educ. 2021;21(1):312.
33. Bard JT, Yeluru H, Karpov MV, Mu D. Evaluating the Impact of a Medical School Student-Run Research Organization on Scholarly Activity. Cureus [Internet]. 2023 Aug 7 [cited 2024 Dec 20]; Available from: https://www.cureus.com/articles/168673-evaluating-the-impact-of-a-medical-school-student-run-research-organization-on-scholarly-activity
34. Toyin-Thomas P, Wariri O, Ikhurionan P. Harnessing peer mentorship as a tool to turn human resource for health brain drain into brain gain: a case study of a Nigerian peer-mentored research group. Hum Resour Health. 2024;22(1):46.
35. Olaleye DO, Odaibo GN, Carney P, Agbaji O, Sagay AS, Muktar H, et al. Enhancement of health research capacity in Nigeria through North–South and In-Country partnerships. Acad Med. 2014;89(Supplement):S93–7.
36. Kanmounye US, Bandyopadhyay S, Munoz-Valencia A, Khalil H, Sana H, Badwi N, et al. Peer mentorship to build research capacity among members of the international student surgical network (InciSioN): a proof of concept study. BMC Med Educ. 2022;22(1):868.
37. Murphy VL, Chao P, Koea J, Srinivasa S. Systematic review of the efficacy and purpose of student surgical interest groups. ANZ J Surg. 2023;93(11):2580–8.
38. King JT, Angoff NR, Forrest JN, Justice AC. Gender disparities in medical student research awards: A 13-Year study from the Yale school of medicine. Acad Med. 2018;93(6):911–9.

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