Oncology Training Needs Assessment Among Health Care Professionals in Nigeria

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PURPOSE This study investigated the status of training and preparedness for oncology practice and research and degree of interprofessional collaboration among health care professionals in the six geopolitical regions of Nigeria.

METHODS A convergent parallel mixed methods design was used. Three hundred seventeen respondents completed a three-part, online questionnaire. Self-rated competencies in oncology research (26 items), oncology practice (16 items), and interprofessional collaboration (nine items) were assessed with a one- to five-point Likert scale. Six key informant and 24 in-depth interviews were conducted. Descriptive statistics, analysis of variance, and pairwise t-test were used to analyze the quantitative data, whereas thematic analysis was used for the qualitative data.

RESULTS Respondents were mostly female (65.6%) with a mean age of 40.5 ± 8.3 years. Respondents include 178 nurses (56.2%), 93 medical doctors (29.3%), and 46 pharmacists (14.5%). Self-assessed competencies in oncology practice differed significantly across the three groups of health care professionals ($F = 4.789$, $P = .009$). However, there was no significant difference across professions for competency in oncology research ($F = 1.256$, $P = .286$) and interprofessional collaboration ($F = 1.120$, $P = .327$). The majority of respondents (267, 82.4%) felt that educational opportunities in oncology-associated research in the country are inadequate and that this has implications for practice. Key training gaps reported include poor preparedness in data analysis and bioinformatics (138, 43.5%), writing clinical trials (119, 37.5%), and writing grant/research proposals (105, 33.1%). Challenges contributing to gaps in cancer research include few trained oncology specialists, low funding for research, and inadequate interprofessional collaboration.

CONCLUSION This study highlights gaps in oncology training and practice and an urgent need for interventions to enhance interprofessional training to improve quality of cancer care in Nigeria. These would accelerate progress toward strengthening the health care system and reducing global disparities in cancer outcomes.

INTRODUCTION

Cancers are leading causes of death globally with an increasing morbidity and mortality burden in sub-Saharan African countries (SSA), including Nigeria.[1] In the absence of effective responses, the burden will continue to increase because of several factors. These include an increase in the prevalence of cancer risk factors that are linked to globalization, epidemiologic transitions, aging, and exposures to environmental carcinogens.[2,3] Country-specific cancer research is crucial for the conceptualization and implementation of innovative evidence-based interventions in low- and middle-income countries (LMICs), as research findings from high-income countries may not be sufficiently robust to meet the needs of patients with cancer in their own communities.[4,5]

Studies in SSA have documented suboptimal training opportunities in cancer research,[6,7] care, and practice.[7-9] This is a persistent challenge at every level of higher education in Nigeria.[8-11] Suboptimal cancer research capacity in sub-Saharan Africa has deep roots in the long history of colonialism followed by years of political instability and disinvestments by donor countries in the robust science and technology needed to power sustainable development in SSA. The resulting dearth of human resources, the weak clinical and research competencies of oncology scientists/clinicians coupled with poor engagement in research, and the inability of countries to attract and retain very skilled and experienced cancer researchers and clinicians demand urgent attention.[6,12-15]

Of greater significance is the lack of adequate curriculum for advanced training in health professions

CONTEXT

Key Objective

Our study investigated the status of training and preparedness for oncology practice and research and degree of interprofessional collaboration among health care professionals in Nigeria.

Knowledge Generated

We identified significant training gaps in cancer care and research, which include poor preparedness in data analysis and bioinformatics, writing clinical trial protocols, and writing grant/research proposals. In addition, the educational opportunities for structured oncology sub-specialist training in the country are inadequate and this has implications for practice. Lack of interprofessional practice and research collaborations was identified as the factor contributing to the dearth of highly trained oncology clinicians and researchers in Nigeria.

Relevance

Our findings provide data to inform the adoption and development of a structured curriculum in clinical oncology, oncology nursing, and oncology pharmacy aimed at building the clinical and research capacities of oncologists in Nigeria and Africa at large. Invariably, this will contribute to an improvement in the quality of cancer care and accelerate progress toward the reduction of the global disparities in cancer outcomes.

and structured career pathways in academic medical centers to facilitate the development of independent cancer researchers.[13,14] Standard training in oncology in most developed countries consists of a graduate program or a board certification fellowship guided by a curriculum that is in line with the recommendations of the European Society for Medical Oncology and ASCO.[16,17] Without leadership and a structured curriculum, there is weak interprofessional collaboration to improve quality of cancer care in Nigeria and other LMICs. Such collaboration is essential for providing holistic care that takes into account the physical, psychological, and social needs of each patient with cancer in Nigeria.[18] Studies indicate that interprofessional collaboration in all aspects of cancer care, including administration of chemotherapy,[19] radiation therapy,[20] nursing care,[21] and cancer screening,[22] is vital for improving cancer outcomes.

These challenges are not unique to Nigeria. A recent global survey that assessed the training of oncologists revealed that most of the respondents from LMICs expressed interest in cancer research. Identified impediments to pursuing this goal included lack of mentorship and guidance in the conduct of research and lack of structured teaching in clinical settings.[14] To build on the findings from this global survey and explore the needs for training in cancer research and clinical practice in Nigeria, we developed a survey to investigate the status of training in oncology practice and research for clinicians in Nigeria.

METHODS

Study Design and Scope

The study used a convergent parallel design.[23] An online, semistructured questionnaire, key informant interviews (KIIs), and in-depth interviews (IDIs) were administered to clinicians and researchers in academic tertiary institutions,

cancer centers, oncology units, clinics, and wards where oncology services are available, in the six geopolitical zones of Nigeria.

Study Population

The quantitative component of the study involved the administration of questionnaires to pharmacists; nurses; doctors; postdoctoral fellows; early-, mid-, and late-career researchers; and practitioners involved in the prevention and treatment of cancers. Other stakeholders such as the head of departments of nursing, pharmacy, and medicine (oncology, radiation oncology, pediatric oncology, obstetrics, and gynecology); members of the Association of Nigerian Nurses and Midwives and the Pharmacists Council of Nigeria; and resident doctors participated in the qualitative interviews.

The study participants were identified primarily in two ways. First, the members of the research team appointed six coordinators to recruit mobilizers from each geopolitical zone who sent invitations to individuals from their zones. Second, trainees were identified through existing national databases of oncology researchers obtained from institutions such as the Association of Resident Doctors; Association of Oncology Pharmacists, pediatricians, gynecologists, and oncology nurses; and the Association of Nigeria Nurses and Midwives and the Pharmacists Council of Nigeria.

Sample Size Determination and Sampling Technique

The sample size was determined using the sample size calculator for proportions,[24] with the following assumptions: $\alpha = .05$, $\beta = .8$, a design effect of 1.0, 95% CI, a population size of 315,325 clinicians,[25] and a hypothesized proportion of 50%. This resulted in a minimum required sample size of 384. The total sample size was stratified by profession. The ratio was determined by the statistics documented in the Second National Strategic Health Development Plan, which

TABLE 1. Sociodemographic Characteristics of Study Respondents

Demographic Characteristic	No. (%)
Sex	
Male	109 (34.4)
Female	208 (65.6)
Age as at the last birthday, years	
20-29	21 (6.6)
30-39	145 (45.7)
40-49	98 (30.9)
50-59	48 (15.1)
60-69	5 (1.6)
Educational level	
Bachelors	178 (56.1)
Masters	34 (10.8)
Doctorate	12 (3.8)
Postdoctoral	3 (0.9)
Residency	27 (8.5)
Fellow	63 (19.9)
Profession	
Nurse	178 (56.2)
Doctor	93 (29.3)
Pharmacist	46 (14.5)
Geopolitical zones	
North-west	39 (12.3)
North-east	36 (11.4)
North-central	22 (6.9)
South-west	67 (21.1)
South-east	77 (24.3)
South-south	76 (24.0)
Employer	
Public	305 (96.2)
Private	12 (3.8)
Area of specialization	
Medical oncology	6 (1.9)
Gynecologic oncology	47 (14.8)
Surgical oncology	24 (7.6)
Radiation oncology	17 (5.4)
Pediatric oncology	22 (6.9)
Hematology-oncology	17 (5.4)
Oncology pharmacy	40 (12.6)
Oncology nursing	75 (23.7)
Others	69 (21.8)
Oncology training/practice status	
Currently undergoing training in oncology/have not commenced oncology practice/research	146 (46.1)
Currently undergoing oncology training/have commenced oncology practice/research	71 (22.4)

TABLE 1. Sociodemographic Characteristics of Study Respondents (Continued)

Demographic Characteristic	No. (%)
Completed training in oncology but have not commenced oncology practice/research	33 (10.4)
Completed training in oncology/have commenced oncology practice/research	67 (21.1)
Total No. of years in oncology practice/research	
Not applicable/not in practice yet	109 (34.4)
1-5	113 (35.6)
6-10	70 (22.1)
11-20	22 (6.9)
More than 20	3 (0.9)
Stage in career	
Early career ($<$ 5 years)	99 (31.2)
Mid-career (5-15 years)	167 (52.7)
Late career ($>$ 15 years)	51 (16.1)
Academic appointment	
Yes, in academics	87 (27.4)
No, not in academics	230 (72.6)

states that Nigeria has 21,892 pharmacists, 65,759 doctors, and 249,566 nurses and midwives.[24,25] The survey used a purposive sampling technique.

Quantitative Data Collection

Quantitative data were collected using a semistructured, online questionnaire developed through a review of the literature.[14,26,27] The instrument comprised six sections: sociodemographic characteristics of respondents, opportunities for oncology-focused training, preparedness and competency in oncology practice and research, interprofessional practice, and specific cancer-focused training needs. Competency in oncology research was assessed with 26 items in the instrument, each requiring a response on a one- to five-point self-rating scale (maximum score of 130). Competency in oncology practice was assessed with 16 items (maximum score of 80), whereas interprofessional collaboration was assessed with nine items using the same scale (maximum score of 45). The online questionnaire was distributed via Survey Monkey using purposive and snowball sampling techniques.

Qualitative Data Collection

Qualitative data collection interview guides were used to conduct six KIIs with stakeholders and leaders in nursing, pharmacy, and medicine across the six geopolitical zones of Nigeria. Twenty-four IDI were also administered with selected pharmacists, nurses, resident doctors, postdoctoral fellows, and early- or mid-career researchers involved in cancer prevention and treatment. The interview sessions were conducted by trained interviewers either by telephone or face-to-face and were audio-recorded.

TABLE 2. Opportunities for Oncology-Focused Training (N = 317)

Statements	Yes, No. (%)	No, No. (%)	Unsure, No. (%)	NA, No. (%)
Standardized set of cancer learning activities, courses, or competencies for undergraduate training	104 (32.8)	177 (55.8)	36 (11.4)	
Standardized set of cancer learning activities, courses, or competencies for postgraduate training	109 (34.4)	123 (38.8)	45 (14.2)	40 (12.6)
Standardized set of cancer learning activities, courses, or competencies for residency program	73 (23.0)	118 (37.2)	49 (15.5)	77 (24.3)
Participation in oncology clinical rotation/laboratory/public health educational experience in cancer care	199 (62.8)	75 (23.7)	43 (13.6)	
Setting in which cancer topics were taught during undergraduate/postgraduate/residency training program				
Didactic lectures	108 (34.1)	209 (65.9)		
Clinical rotations	194 (61.2)	123 (38.8)		
Small groups/case-based learnings	101 (31.9)	216 (68.1)		
Laboratory	40 (12.6)	277 (87.4)		
Online web-based teachings	58 (18.3)	259 (81.7)		
Independent learning with a list of resources and materials	120 (37.9)	197 (62.1)		
Short courses/workshops	136 (42.9)	181 (57.1)		
Others	12 (3.8)	305 (96.2)		
Type of continuing professional education opportunities they have access to[a]				
MCPDP	187 (59.0)	130 (41.0)		
CME	78 (24.6)	239 (75.4)		
Oncology conferences	93 (29.3)	224 (70.7)		
Short courses on oncology	82 (25.9)	235 (74.1)		
Clinical observership	72 (22.7)	245 (77.3)		
Others	20 (6.3)	297 (93.7)		
Extent of oncology content in the identified program				
Sparingly oncology	179 (56.5)	138 (43.5)		
Mainly oncology	100 (31.5)	217 (68.5)		
Majorly oncology	38 (12.0)	62 (88.0)		
Do you feel that the continuing education opportunities you have for current oncology care are adequate?	50 (15.8)	267 (84.2)		
Optimal way to teach oncology to professionals in your category?[a]				
Noncertificated methods				
Online forums	28 (8.8)	289 (91.2)		
Face-to-face lectures	112 (35.3)	205 (64.7)		
Blended approach	51 (16.1)	266 (83.9)		
Access to learning materials and videos	28 (8.8)	289 (91.2)		
Peer-to-peer learning	2 (0.6)	315 (99.4)		
Hands-on sessions in an advanced cancer center	94 (29.7)	223 (70.3)		
Others	2 (0.6)	315 (99.4)		
Certificated methods				
Diploma program	45 (14.2)	272 (85.8)		
Degree program	49 (15.5)	268 (84.5)		
Postgraduate diploma	49 (15.5)	268 (84.5)		
Postgraduate (M.Sc.) program	72 (22.7)	245 (77.3)		
Postgraduate fellowship in oncology	99 (31.2)	218 (68.8)		
Others	3 (0.9)	314 (99.1)		

Abbreviations: CME, Continuing Medical Education; MCPDP, Mandatory Continuing Professional Development Programs; NA, not applicable.
[a]Multiple response questions.

Data Analysis

Quantitative data. IBM SPSS statistics, version 25 was used to analyze the data. Descriptive statistics, means and standard deviations or proportions, as appropriate, were calculated. One-way analysis of variance and pairwise *t*-tests were used to assess the statistical significance of differences among group means.

Qualitative data. The audio recordings were transcribed verbatim, and the transcripts were coded using NVIVO 12.0 software. The data were analyzed using a deductive thematic analysis approach. The set of codes were predefined in relation with the research questions and reviewed by the research team. Final approved themes were used to summarize the study findings and reporting.

Ethical Considerations

The University of Ibadan/University College Hospital Ethics Review Committee reviewed and approved the protocol for the study before the commencement of data collection (UI/EC/21/0114). An electronic signature on an informed consent form was obtained from each participant after information was provided on the nature of the study.

RESULTS

Characteristics of Study Participants

Qualitative analysis. Thirty clinicians across six geopolitical zones in Nigeria participated in qualitative data collection. This comprised 24 IDIs (four in each of the six geopolitical zones, with 12 nurses, six doctors, and six pharmacists responding) and interviews of six key informants (one leader in nursing, medicine, or pharmacy in each of the six geopolitical zones). The majority (65.6%) were female, with nurses constituting 46.7% (n = 14) of the participants. Participants between age 35 and 39 years constituted 43.3% (n = 13), and 35.6% (n = 11) were within five years after highest qualification.

Quantitative analysis. The mean age of respondents was 40.5 ± 8.3 years, and 65% were female (Table 1). More than half were nurses (56.2%), and the majority (52.7%) were professionals in their mid-career practice (5-15 years). Twenty-seven percent had an academic appointment, and the south-east geopolitical zone of Nigeria accounted for the highest proportion of respondents (24.3%) as shown in Table 1.

Status and Opportunities of Oncology-Focused Training in Nigeria

With respect to their undergraduate and graduate education, 32.8% and 34.4% of respondents, respectively, stated that there was a standardized set of cancer learning activities, courses, or competencies. Only 44 (13.9%) respondents felt that the oncology education provided during their training program was adequate. Only 77 (24.3%) felt that the oncology training they had prepared them to manage patients with cancer very well, whereas 169 (53.3%) felt that their training did not prepare them for a career in cancer research. A majority (20 of 30) of interview participants also decried the state of oncology training and education as being below standard or of low standard. Very few described it as above average or good/very good. To quote one interview participant: "*It's poorer than it needs to be. I think that right now, we just have… We have a center in Abuja that is affiliated with, International Atomic Energy Agency. They are the only ones that do a certification in oncology nursing. I am aware that University College Hospital used to have a program in oncology nursing, but I don't know if that's still ongoing now. The status is rather poor. We don't have so many oncology nurses that are professionally trained. We might have a few who have worked in oncology for years but professional training is still something that is very poor in my opinion*" <KII_Male Doct_SS>.

Sixty-seven percent of the respondents reported that the oncology content in identified training programs/opportunities was sparse. The majority (267, 84.2%) reported that opportunities for continuing education in oncology care were inadequate. This statement by a respondent buttresses this claim: "*It's very poor. We don't really have a standard, a standardized training for oncology nursing practice in Nigeria. The few [trained nurses] that we have, are learning on the job*" <KII_Male Pharm_SW>.

About a third (117, 36.9%) reported that refresher trainings are not conducted in their specialty or that where they occur, the frequency is variable (1-5 times a year, with the most common (29.3%) being once a year). In the qualitative study, more than half of respondents rated the refresher training for nurses as average. Only a few rated it as good. The status of oncology training and education for pharmacists was rated as being poor across all stages of training. The majority of respondents rated the training of medical doctors to be good because of the numbers of trained, mentored, or *certified* oncology practitioners in the profession. However, the majority of practitioners in the field opined that the status is not structured; many claimed that there are no established patterns, curricula, or modes of training. This quote underscores this view: "*many are oncologist by just practice not by certification.*" … *my main concern about oncology training is that it is not structured. People are just there based on the fact that there is a team/unit called oncology unit and you are in the team. Of course you will learn some things but there is no structure…people are oncologist by just practice not by certification*" <IDI_Female Doct_NC>.

Regarding opportunities for continuing education, nurses constituting 59.0% of the respondents had access to Mandatory Continuing Professional Development Programs. Other opportunities available to the respondents included oncology conferences (29.3%), continuing medical education (24.6%), short courses on oncology (25.9%), and clinical observerships (22.7%). Similar

TABLE 3. Preparedness for Oncology Practice (N = 317)

Statement	NA, No. (%)	NW, No. (%)	SW, No. (%)	MW, No. (%)	QW, No. (%)	EW, No. (%)
Initial consultation/assessment for a patient with a new cancer diagnosis	55 (17.4)	53 (16.7)	78 (24.6)	65 (20.5)	56 (17.7)	10 (3.2)
Follow-up visit/care for a patient with an oncologic presentation	37 (11.7)	59 (18.6)	80 (25.2)	83 (26.2)	49 (15.5)	9 (2.8)
Development and implementation of management care plan for a patient with an oncologic presentation	29 (9.1)	51 (16.1)	86 (27.1)	88 (27.8)	48 (15.1)	15 (4.7)
Safe and appropriate delivery of systemic therapy	39 (12.3)	56 (17.7)	83 (26.2)	75 (23.7)	52 (16.4)	12 (3.8)
Safe and appropriate delivery of radiation therapy	121 (38.2)	90 (28.4)	42 (13.2)	37 (11.7)	23 (7.3)	4 (1.3)
Safe delivery of oncologic surgery	125 (39.4)	66 (20.8)	52 (16.4)	41 (12.9)	28 (8.8)	5 (1.6)
Safe dispensation of oncology cancer drugs	44 (13.9)	48 (15.1)	80 (25.2)	61 (19.2)	58 (18.3)	26 (8.2)
Managing symptoms and toxicities	25 (7.9)	47 (14.8)	84 (26.5)	84 (26.5)	57 (18.0)	20 (6.3)
Providing supportive/palliative care	20 (6.3)	44 (13.9)	68 (21.5)	98 (30.9)	60 (18.9)	27 (8.5)
Providing survivorship care	42 (13.2)	84 (26.5)	78 (24.6)	57 (18.0)	40 (12.6)	16 (5.0)
Collaboration with multidisciplinary and interdisciplinary health care teams to provide optimal patient care	20 (6.3)	44 (13.9)	79 (24.9)	80 (25.2)	66 (20.8)	28 (8.8)
Engagement in a complex/difficult discussion or ELSI with cancer patients/family member	40 (12.6)	80 (25.2)	83 (26.2)	67 (21.1)	37 (11.7)	10 (3.2)
Supervision and mentoring of oncology trainees	89 (28.1)	65 (20.5)	70 (22.1)	59 (18.6)	25 (7.9)	9 (2.8)
Engagement in activities that raise awareness about advancements in oncology to a wider audience	34 (10.7)	73 (23.0)	78 (24.6)	73 (23.0)	45 (14.2)	14 (4.4)
Leadership and effective management of your oncology practice/unit	40 (12.6)	58 (18.3)	74 (23.3)	87 (27.4)	45 (14.2)	13 (4.1)
Identification of gaps in the cancer delivery system and recommendation of a plan to address them	42 (13.2)	79 (24.9)	85 (26.8)	69 (21.8)	34 (10.7)	8 (2.5)

Abbreviations: ELSI, ethicolegal and social issues; EW, extremely well; MW, moderately well; NA, not applicable; NW, not well at all; QW, quite well; SW, slightly well.

findings emerged from the qualitative interviews, where more than a quarter of the 30 participants (seven participants) had no cancer-related training aside from the institutional trainings. Of these, only about one sixth (five) had cancer-related trainings through workshops, seminars, and online/virtual trainings. According to the respondents, optimal ways to teach oncology to professionals are face-to-face lectures (35.3%), hands-on sessions in an advanced cancer center (29.7%), a blended approach (16.1%), and online forums and materials (8.8%; Table 2). Our qualitative study participants were in alignment with this finding, with the majority desiring practical or clinical exposure. This was considered the best way to teach oncology practice, training, and mentoring.

Preparedness for Oncology Practice

About a quarter (24.6%) of the respondents felt that they were slightly well prepared for initial consultation/assessment of a patient with a new cancer diagnosis and (20.5%) felt that they were moderately well prepared. An assessment of all competencies in oncology practice showed that < 40% to 50% of the respondents felt moderately well/quite well prepared (Table 3).

Preparedness for Oncology Research

Regarding preparedness for oncology research, about a third (31.9%) reported being slightly well prepared to identify research topics, 27.4% to conduct systematic literature searches, and 28.1% to access publications online. Key perceived deficiencies reported were poor preparedness in big data analytics and bioinformatics (138, 43.5%), writing institutional review board protocols (119, 37.5%), writing grant or research proposals (105, 33.1%), and development of manuscripts (96, 30.3; Table 4). The majority of interview respondents stated that they would like to have structured trainings on cancer research and statistical analysis and other topics such as molecular diagnosis, patient care and wound management, hysterectomy, patient navigation, genetic counseling, and health education.

Interprofessional Collaboration Oncology Research/Practice

Almost two fifths either strongly disagreed (11.0%) or disagreed (31.5%) that clinicians (doctors, nurses, and pharmacists) always met to discuss oncology care as a group before interacting with patients with cancer. Similarly, regarding collaboration for cancer research, the majority of interview respondents lamented a lack of, or inadequate, collaboration among clinicians. According to one respondent, "*I will tell you the truth is that everybody has been in silos; meaning the doctors, the clinicians have been doing their own [things] on their own, I do not know*

TABLE 4. Preparedness for Oncology Research (N = 317)

Statement	NA, No. (%)	NW, No. (%)	SW, No. (%)	MW, No. (%)	QW, No. (%)	EW, No. (%)
Identifying research topics	39 (12.3)	51 (16.1)	101 (31.9)	76 (24.0)	36 (11.4)	14 (4.4)
Systematic search of literature	37 (11.7)	45 (14.2)	87 (27.4)	82 (25.9)	56 (17.7)	10 (3.2)
Assessing publications	32 (10.1)	50 (15.8)	89 (28.1)	85 (26.8)	51 (16.1)	10 (3.2)
Writing grant and research proposals	51 (16.1)	105 (33.1)	73 (23.0)	55 (17.4)	29 (9.1)	4 (1.3)
Writing IRB protocols	78 (24.6)	119 (37.5)	66 (20.8)	36 (11.4)	15 (4.7)	3 (0.9)
Development of manuscripts	54 (17.0)	96 (30.3)	88 (27.8)	45 (14.2)	25 (7.9)	9 (2.8)
Developing research instruments and data collection	36 (11.4)	47 (14.8)	109 (34.4)	73 (23.0)	39 (12.3)	13 (4.1)
Collection of patient data	17 (5.4)	25 (7.9)	87 (27.4)	94 (29.7)	67 (21.1)	27 (8.5)
Analysis of quantitative data	26 (8.2)	53 (16.7)	95 (30.0)	92 (29.0)	37 (11.7)	14 (4.4)
Conduct of qualitative studies	29 (9.1)	65 (20.5)	103 (3.25)	75 (23.7)	34 (10.7)	11 (3.5)
Conduct of mixed methods research studies	37 (11.7)	90 (28.4)	94 (29.7)	63 (19.9)	24 (7.6)	9 (2.8)
Computer-assisted qualitative data analysis	38 (12.0)	108 (34.1)	81 (25.6)	61 (19.2)	22 (6.9)	7 (2.2)
Ethical conduct of research	30 (9.5)	41 (12.9)	87 (27.4)	87 (27.4)	54 (17.0)	18 (5.7)
Responsible conduct of research	25 (7.9)	43 (13.6)	92 (29.0)	81 (25.6)	65 (20.5)	11 (3.5)
Development of oral and poster presentations for conferences	32 (10.1)	67 (21.1)	90 (28.4)	60 (18.9)	50 (15.8)	18 (5.7)
How to conduct plagiarism tests using software	57 (18.0)	136 (42.9)	64 (20.2)	37 (11.7)	18 (5.7)	5 (1.6)
Big data analytics and bioinformatics	62 (19.6)	138 (43.5)	68 (21.5)	40 (12.6)	7 (2.2)	2 (0.6)
Soft skills, ie, communication skills, networking, etc	35 (11.0)	53 (16.7)	101 (31.9)	71 (22.4)	43 (13.6)	14 (4.4)
Clinical research	34 (10.7)	51 (16.1)	101 (31.9)	81 (25.6)	38 (12.0)	12 (3.8)
Epidemiological studies	43 (13.6)	68 (21.5)	106 (33.4)	63 (19.9)	26 (8.2)	11 (3.5)
Statistical analysis	33 (10.4)	76 (24.0)	113 (35.6)	69 (21.8)	19 (6.0)	7 (2.2)
Basic research	29 (9.1)	40 (12.6)	103 (32.5)	84 (26.5)	44 (13.9)	17 (5.4)
Project management	39 (12.3)	77 (24.3)	103 (32.5)	63 (19.9)	29 (9.1)	6 (1.9)
Implementation science	51 (16.1)	83 (26.2)	101 (31.9)	58 (18.3)	19 (6.0)	5 (1.6)
Development of budgets and financial management	51 (16.1)	103 (32.5)	83 (26.2)	50 (15.8)	25 (7.9)	5 (1.6)
Development of Gantt charts	73 (23.0)	117 (36.9)	72 (22.7)	34 (10.7)	15 (4.7)	6 (1.9)

Abbreviations: EW, extremely well; IRB, institutional review board; MW, moderately well; NA, not applicable; NW, not well at all; QW, quite well; SW, slightly well.

what the nurses are even doing, the pharmacist are coming up, agreeing on their own …" <KII_Female Pharm_NW>.

Another respondent characterized the poor interprofessional collaboration among health care professional by saying "*there is very little collaboration between professionals in terms of cancer research. For example, doctors doing research may take the nurses under them in oncology as their data collectors and that is not appropriate as that does not qualify them to be researchers. Research should be carried out such that various experts bring their contributions from the medicine, pharmacy, nursing and psychological perspectives… this would enhance self-confidence and interpersonal relationship and reduce conflicts between experts*" <KII_Female Academic/Nurse_SE> (Table 5).

Association of Competency for Practice, Research, and Interprofessional Collaborations by Professional Group

There are statistically significant differences in the competency mean scores for oncology practice across the professional groups ($P = .009$), specifically between doctors and pharmacists ($P = .0076$) and between nurses and pharmacists ($P = .0032$). However, the difference in the mean score for competency in oncology research across the professions is not significant ($F = 1.256$, $P = .286$). Similarly, there is no statistically significant difference in the mean score for interprofessional collaboration in oncology research/practice among the professional groups (Table 6).

DISCUSSION

This was a mixed methods study designed to investigate the status of training in oncology practice and research for clinicians in Nigeria and their training needs. The use of a mixed methods approach provided a rich, valid description of the gaps in training for oncology practice and research in Nigeria. Despite the fact that Nigeria's six geopolitical regions were not equally represented in our sample, efforts exerted to include as many participants from all regions as possible ensured more informative results than that would have been

TABLE 5. Interprofessional Collaboration in Oncology Research/Practice

Statement	SD, No. %	D, No. %	N, No. %	A, No. %	SA, No. %
The physicians, nurses, and pharmacist in oncology practice in my institutions work together as a well-coordinated team	24 (7.6)	33 (10.4)	58 (18.3)	142 (44.8)	60 (18.9)
I have the support I need from other personnel to care for patients	11 (3.5)	24 (7.6)	70 (22.1)	167 (52.7)	45 (14.2)
Working in oncology research is like being part of a large family	6 (1.9)	15 (4.7)	74 (23.3)	162 (51.1)	60 (18.9)
Unit/Hospital management is doing a good job promoting interprofessional practice by doctors, nurses, and pharmacists	12 (3.8)	43 (13.6)	89 (28.1)	136 (42.9)	37 (11.7)
Unit/hospital management is doing a good job promoting interprofessional research by doctors, nurses, and pharmacists	18 (5.7)	45 (14.2)	108 (34.1)	119 (37.5)	27 (8.5)
I experience good collaboration with other clinicians (*aside my discipline*) in oncology clinical practice	5 (1.6)	24 (7.6)	77 (24.3)	170 (53.6)	41 (12.9)
I experience good collaboration with other clinicians (*aside my discipline*) in oncology research	7 (2.2)	34 (10.7)	94 (29.7)	153 (48.3)	29 (9.1)
Communication breakdowns are common between clinicians (doctors, nurses, and pharmacists), and this affects the delivery of cancer care	18 (5.7)	64 (20.2)	58 (18.3)	131 (41.3)	46 (14.5)
Interprofessional rivalry is common between clinicians (doctors, nurses, and pharmacists), and this affects involvement in cancer research	20 (6.3)	54 (17.0)	70 (22.1)	120 (37.9)	53 (16.7)

Abbreviations: A, agree; D, disagree; N, neutral; SA, strongly agree; SD, strongly disagree.

achieved if some regions were left out. The goal of this study was to provide data to inform development of a tailored capacity-building program.

The majority of participants in our study described the state of oncology training and education in Nigeria as being below the standard. Similar findings have been reported in studies in different regions of the world.[14,28-31] Findings from a study in Europe revealed that a majority of medical students rated clinical exposure to the management of patients with cancer as unsatisfactory.[28] Similarly, in Turkey, more than half of the nurses in one study did not receive any training regarding oncology palliative care. They stated that the education was not sufficient and knowledge and skills were mostly acquired during in-service education.[29] The status of oncology training and education for pharmacists in our study was rated grossly inadequate across all stages of training. This finding aligns with that of a study in Ghana, where a majority of pharmacists had never attended oncology continuing education

TABLE 6. Association Between Competency for Oncology Practice, Research, and Interprofessional Collaborations by Clinician Groups

Health Care Professional Group	No.	Mean	SD	F	P	Pairwise t Test	P
Practice competency				4.789	.009		
Nurse	178	41.33	12.67			Doctor *v* pharmacist	.0076
Doctor	93	41.09	11.89			Doctor *v* nurse	.8784
Pharmacists	46	35.15	12.12			Nurse *v* pharmacist	.0032
Total	317	40.36	12.51				
Research competency							
Nurse	178	64.88	18.93	1.256	.286	Doctor *v* pharmacist	.2186
Doctor	93	64.29	19.82			Doctor *v* nurse	.8130
Pharmacists	46	59.85	19.93			Nurse *v* pharmacist	.1276
Total	317	64.00	19.36				
Interprofessional collaboration				1.120	.327		
Nurse	178	37.03	6.93			Doctor *v* pharmacist	.3307
Doctor	93	36.69	5.59			Doctor *v* nurse	.6576
Pharmacists	46	35.35	8.40			Nurse *v* pharmacist	.2142
Total	317	36.69	6.81				

Abbreviation: SD, standard deviation.

and only a few had received university education training in oncology.[30]

The findings established that more than half of the respondents had no standard oncology training in either pre- or postprofessional training. Similarly, the majority had no further cancer-related training aside from that received during institutional trainings. Only a few had cancer-related training through workshops, seminars, and online/virtual trainings. These were mostly self-funded. This finding was supported by the study by Jalan et al on oncology training in LMICs, where the higher proportion of respondents report having to self-fund core oncology training. Ability versus inability to self-fund has implications for workforce selection and may increase disparities within and between countries, which may adversely affect the most disadvantaged populations and diminish the social accountability of training programs.[14] The majority of respondents in our study would like to have structured trainings on cancer research and statistical analysis. The demand for capacity building in cancer research that we identified aligns with findings in East Africa.[6]

The majority of respondents acknowledged their lack of capacity to conduct oncology research. A quarter advocated for strong collaboration/partnerships within and among countries, with others emphasizing the need for adequate hands-on experience in oncology research. Mentoring and training were identified as good approaches to build their capacities. This corresponded with the views of study participants in East Africa.[6] Straus et al[31] also noted that structured and longitudinal mentorship from a competent and dedicated expert is critical during the foundational educational experience. The majority of our study participants expressed a need for more practical or clinical exposure. This was considered the best way to teach oncology practice. This was consonant with findings from Calgary, Canada, where interactive methods of teaching, such as case study activities and class discussions, have been advocated for.[3,32,33] Almost all our study participants attributed inadequate research capacity and poor clinical practice to lack of funding. Other inadequacies were identified, including in leadership and governance, patients/

participants' attitudes toward research, and poor collaborations. These challenges have also been reported in other studies.[13,34-36]

In the opinion of a majority of respondents, there is optimal collaboration among clinicians in terms of clinical care. However, with regard to cancer research, the majority reported poor collaboration among clinicians. This corresponds with findings from previous studies in Nigeria, which revealed low collaboration, interprofessional practice, and teamwork among health care professionals and researchers.[12,18]

Despite the use of multiple strategies and much effort on the part of the investigators for the recruitment of the respondents, the study attained only 82% of the target accrual. Participants from the north-east and north-central geopolitical zones were fewer in number than those from other regions, because of the difficulty of reaching and engaging them. This is attributed to insurgency and unrest in those regions of Nigeria at the time of data collection.

In conclusion, this study identified significant training gaps in cancer care and research among clinicians and researchers in Nigeria. Lack of interprofessional practice and research collaborations and lack of mentorship were identified as factors responsible for the dearth of highly trained oncologists in Nigeria. Specifically, this study identified an urgent need for the development of structured curriculum in the primary disciplines of clinical oncology, oncology nursing, and oncology pharmacy that will facilitate interdisciplinary and interprofessional training in oncology clinical trials and patient-oriented translational cancer research. By building the clinical and research capacities of the next generation of highly qualified subspecialists in oncology associated research in Nigeria, the country can begin to address the growing burden of cancer and thereby improve interdisciplinary and interprofessional collaboration across the frontline health care workers. With investment in much needed training infrastructure and adoption of structured postgraduate curriculum leading to board certification, Nigeria has the potential to lead the transformation of cancer care across Sub-Saharan Africa.

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