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Assessment of Knowledge and Attitudes of Radiographers towards Postgraduate Education in Radiotherapy in Northwest Nigeria

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Abstract

Background: Professional postgraduate diploma (PGD) programmes in radiography commenced in Nigeria almost two decades ago. However, few radiographers hold PGD qualifications in radiation therapy. This study aims to assess radiographers' knowledge of, and attitudes towards, postgraduate education in radiotherapy in Kano, Katsina, and Jigawa States of Nigeria.

Methods: We used a descriptive cross-sectional study design. A structured, validated, self-administered online questionnaire with two sections (respondents' demographic characteristics; knowledge and attitude items on radiotherapy and the RRBN PGD Radiotherapy program) was distributed to all 140 eligible diagnostic radiographers in the three states between November 2022 and February 2023 using purposive, total-enumeration sampling. A total of 108 completed questionnaires were returned (response rate: 77.1%). Data were analysed using SPSS version 20 and are presented as frequency and percentages.

Results: Most respondents (98.1%, n = 106) were aware of the RRBN PGD Radiotherapy programme, and 77.8% (n = 84) expressed willingness to enrol. Overall, 84.3% (n = 91) would enrol if the programme were held in northwestern Nigeria, whereas only 24.1% (n = 26) were willing to travel to southern Nigeria without sponsorship. Only 47.2% (n = 51) were aware of any government or institutional sponsorship for the programme.

Conclusion: Radiographers in Kano, Katsina and Jigawa States have basic knowledge of radiotherapy and a positive attitude towards postgraduate education in radiotherapy. However, distance from the programme venue and limited awareness of sponsorship appear to constrain enrolment.

Introduction

Cancer is a rapidly growing global health burden, with an estimated 19.3 million new cases and approximately 10 million cancer deaths worldwide in 2020 [1]. In Africa, the disease accounts for approximately 715,000 new cases and 542,000 deaths annually, figures projected to double within 20 years owing to population growth, ageing and an increased prevalence of risk factors [2]. In Nigeria, radiotherapy services remain severely under-resourced: as of 2010, only three operational megavoltage machines were available nationwide, far below the IAEA benchmark of one linear accelerator per 400 patients [3]. As of 2022, Nigeria

had fewer than 50 certified therapy radiographers, most of whom were concentrated in the Southwest and Southeast [4]. More radiotherapy centres are being established in Northwest Nigeria, yet these centres face a critical staff shortage [4].

Radiography is an allied health profession comprising three principal disciplines: diagnostic radiography, radiotherapy and nuclear medicine. Rapid advances in equipment, medical science and specialisation necessitate postgraduate education in radiography [5]. Radiographers require continuing professional development to maintain competence, keep pace with allied health professions and address the expanding scope of their clinical roles [5,6].

Radiotherapy is a treatment modality that uses high-energy rays or radioactive substances to damage tumour cells and halt their growth and division. Used alone or in combination with surgery or chemotherapy, radiotherapy has been an effective tool for treating cancer for more than 100 years [7]. It is estimated that approximately two-thirds of all cancer patients will receive radiotherapy at some point in their treatment [7]. Radiation may be delivered externally via an external beam or internally through brachytherapy, with the choice of modality depending on the tumour's localisation, size and type [7]. Approximately 60% of patients with solid tumours receive radiotherapy, underscoring its central importance in oncological management [8].

Postgraduate education is designed to equip graduates with in-depth theoretical and practical knowledge beyond a basic qualification. Many institutions worldwide have commenced relevant postgraduate programmes for radiographers [9]. In Nigeria, postgraduate studies in radiography began about two decades ago at the University of Nigeria, Nsukka; Nnamdi Azikiwe University, Awka; and the Institute of Radiographers, an arm of the Radiographers Registration Board of Nigeria (RRBN). Despite this, the number of radiographers with relevant post-basic qualifications, particularly in clinical settings, remains low [10].

Evidence from multiple African countries documents radiographers' positive attitudes towards postgraduate education alongside the formidable barriers they face. Eze et al. [10] found that 80% of radiographers in Edo and Lagos States, Nigeria, were willing to enrol in postgraduate programmes, while Ugwu et al. [11] identified organisational barriers, principally the limited number of universities offering radiography postgraduate programmes and stringent admission requirements, as the most significant obstacles in Southeastern Nigeria. Similarly, Mubuuke and Pope [9] demonstrated, through qualitative interviews with radiographers at Cardiff University, that both intrinsic factors (desire for professional development, new challenges and professional satisfaction) and extrinsic factors (funding availability, mandatory continuing professional development requirements and improved remuneration) simultaneously shape radiographers' decisions to pursue postgraduate education. More recently, Byenfeldt et al. [6] reported that Swedish radiographers prioritised improving examination quality and patient safety as motivators for advanced-level study. In contrast, staff shortages and lack of paid study time remained structural barriers. Yordanova [12] similarly documented that radiographers in North-Eastern Bulgaria demonstrated strong interest in expanding their professional competences, with heavy workloads and limited access to approved training programmes constituting the dominant structural obstacles to professional advancement. These international findings indicate that barriers to postgraduate education are wide-ranging and structural, and point to the need for collective responses from individual practitioners, employing organisations and academic institutions alike.

Knowledge, attitude and practice (KAP) frameworks have been used to examine healthcare workers'

engagement with radiological modalities and continuing professional education across diverse settings. Zafar et al. [13] found that although healthcare providers in Karachi, Pakistan, generally held positive attitudes towards radiological training, significant knowledge deficits regarding specific procedural and regulatory details persisted, underscoring the need for targeted professional education outreach. The current generation of radiographers must pursue postgraduate education to remain relevant in the era of evidence-based medical practice [14]. However, empirical studies and literature reviews indicate that no study has been conducted in Northern Nigeria, and more specifically in Kano, Katsina and Jigawa States, regions with newly established radiotherapy centres that face acute workforce shortages affecting radiotherapy service delivery. Understanding diagnostic radiographers' knowledge and attitudes towards radiotherapy postgraduate education in Northwest Nigeria is therefore a prerequisite for workforce development planning. This study aims to assess radiographers' knowledge and attitudes towards postgraduate education in radiotherapy in Kano, Katsina, and Jigawa States of Nigeria.

Materials and Methods

This study employed a descriptive cross-sectional design with purposive, total-enumeration (census) sampling of all eligible diagnostic radiographers in the three states. We obtained primary data through a structured, self-administered online questionnaire distributed between November 2022 and February 2023. The minimum sample size, calculated with Yamane's formula [$n = N/(1 + Ne^2)$, where $N = 140$ and $e = 0.05$], was approximately 104 respondents.

The study population comprised all registered diagnostic radiographers practising in government and private hospitals in Kano, Katsina and Jigawa States of Nigeria. These states were selected because of the recent establishment of radiotherapy centres in the region and the resulting demand for specialised therapy radiography workforce.

As the total population of eligible radiographers across the three states was small and accessible (n = 140), all were invited to participate. Of these, 108 returned completed questionnaires (response rate: 77.1%), which exceeded the calculated minimum sample size.

Inclusion and Exclusion Criteria

All diagnostic radiographers in active practice in Kano, Katsina and Jigawa States of Nigeria were eligible to participate. Therapeutic radiographers, radiographers practising outside the three study states, and personnel who declined to participate were excluded.

Data Collection Instrument

Data were collected using a structured, self-administered online questionnaire comprising two sections. Section A covered demographic characteristics (age, sex, cadre, state of work and years of working experience). Section B comprised 14 items assessing knowledge of radiotherapy and of the RRBN PGD Radiotherapy program (items Q6–Q13) and attitude towards postgraduate education in radiotherapy (items Q14–Q19). Knowledge items were multiple-choice questions with three response options each; attitude items used a binary Yes/No response format. Each questionnaire included a participant information sheet and consent form.

Questionnaire Validity and Pilot Testing

Content validity was established through consultation with seven subject-matter experts: three therapy radiographers with postgraduate qualifications, two medical physicists, and two senior academics in radiography. The experts reviewed all items for clarity, relevance, and appropriateness to the study objectives and suggested minor wording revisions, which were incorporated before finalisation. This process ensured that the questionnaire adequately captured the constructs of knowledge and attitude as defined for this study.

A pilot study was conducted with five diagnostic radiographers from Kaduna State who were not included in the main study, following the validation approach described by Johnson and Christensen [15] and applied by Ugwu et al. [11] in a comparable Nigerian radiography study. Pilot participants completed the questionnaire and commented on the clarity of the instructions, item wording, and estimated completion time. Based on pilot feedback, we reworded two items for clarity and restructured the demographic section for logical flow. The Cronbach's alpha coefficient derived from pilot responses was 0.71, indicating acceptable internal consistency for the attitudinal items. The revised questionnaire was used for the main data collection without further changes.

Data Analysis

Data were analysed using the Statistical Package for Social Sciences (SPSS version 20.0; IBM, Armonk, NY, USA). Results are presented as absolute frequencies and percentages, calculated from the valid responses to each item. Inferential statistics were not applied because the study was descriptive in design and item-level (raw) data were not available for further analysis, as the data had been extracted from a postgraduate diploma project report of the Institute of the RRBN; this is acknowledged as a limitation.

Ethical Consideration

The Research Ethics Committee of the Radiographers Registration Board of Nigeria (RRBN) granted ethical clearance. All participation was voluntary, and informed consent was obtained from every participant. Respondents were assured of the confidentiality and anonymity of their responses through an accompanying cover letter and consent form. No personal identifiers were collected.

Results

Demographic Characteristics

A total of 108 questionnaires were completed and returned (response rate: 77.1%). The respondents' demographic characteristics are presented in Table 1 and Figures 1 and 2. Most respondents were young, early-career, basic-grade radiographers working in Kano State; age data were available for 107 respondents.

Table 1: Demographic Characteristics of Respondents (n = 108)

Characteristic	frequency	%
Age Group (years)		
20–29	77	72.0
30–39	24	22.4
40–49	5	4.7
50 and above	1	0.9
Sex		
Male	70	64.8
Female	38	35.2
Cadre		
Radiographer	81	75.0
Senior Radiographer	18	16.7
Principal Radiographer	3	2.8
Prefer Not to Answer	5	4.6
Chief Radiographer	1	0.9

Note: Age data were available for 107 respondents (percentages for age are based on n = 107); percentages may not total 100 because of rounding.

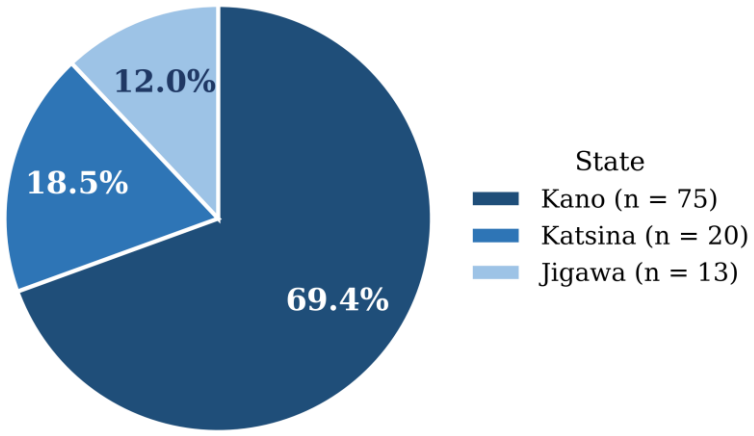


Figure 1. Distribution of respondents by state of work (n = 108)

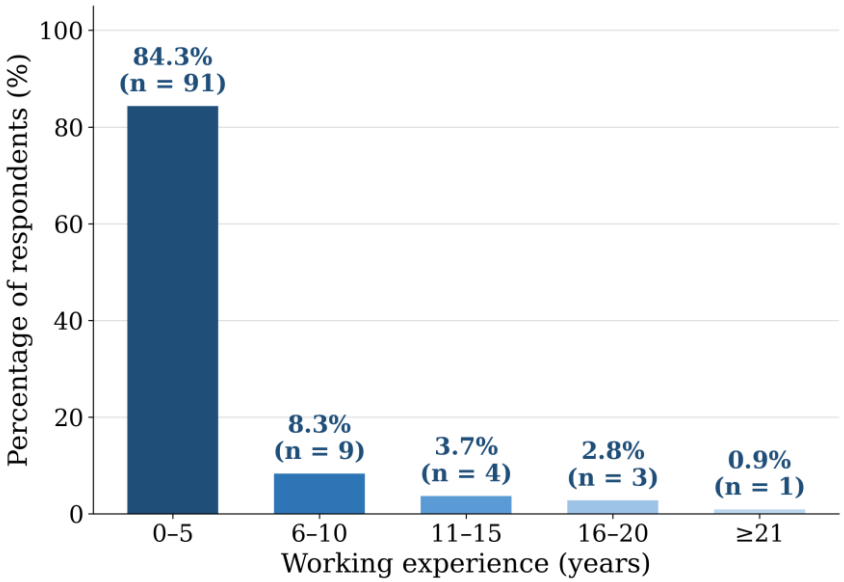


Figure 2. Distribution of respondents by work experience (n = 108).

Knowledge of Radiotherapy and PGD Radiotherapy

Table 2 summarises responses to the knowledge items (Q6–Q13). Knowledge of the purpose and modes of radiotherapy was near-universal (Q6–Q8), and almost all respondents were aware of the RRBN PGD Radiotherapy program (Q10: n = 106, 98.1%). The main knowledge gaps concerned fractionation terminology (Q9), the programme location (Q12), and the registration fee (Q13).

Table 2: Responses to Items on Knowledge of Radiotherapy and PGD Radiotherapy, n (%) (n = 108)

Item	Question	Valid n	A, n (%)	B, n (%)	C, n (%)
Q6	Radiation therapy is used to treat	108	**108 (100.0)**	0 (0.0)	0 (0.0)
Q7	Mode of delivery of radiation therapy	108	**106 (98.1)**	1 (0.9)	1 (0.9)
Q8	Internal delivery of radioactive substance is called	108	**108 (100.0)**	0 (0.0)	0 (0.0)
Q9	Process of dividing a dose into multiple fractions	105	18 (17.1)	**85 (81.0)**	2 (1.9)
Q10	RRBN offers a PGD in Radiotherapy	108	**106 (98.1)**	1 (0.9)	1 (0.9)
Q11	Duration of the PGD Radiotherapy program	103	**80 (77.7)**	22 (21.4)	1 (1.0)
Q12	Institute branch running the program	105	22 (21.0)	**78 (74.3)**	5 (4.8)
Q13	Total registration fee for the three modules	105	**49 (46.7)**	49 (46.7)	7 (6.7)

Note: A, B and C are the response options for each item; correct answers are shown in bold: Q6: A = cancer; Q7: A = externally and internally; Q8: A = brachytherapy; Q9: B = fractionation (A = fragmentation); Q10: A = yes; Q11: A = one year; Q12: B = Lagos (A = Abuja; C = Kano); Q13: A = ₦450,000 (B = ₦500,000; C = no idea). Percentages are based on the number of valid responses (Valid n) for each item.

Attitude towards PGD Radiotherapy

Table 3 summarises responses to the six attitude items (Q14–Q19). Attitudes were largely positive (Q14–Q16), with 77.8% (n = 84) interested in pursuing PGD Radiotherapy. However, fewer than half (n = 51, 47.2%) were aware of any sponsorship for the program (Q17). Willingness to enrol fell from 84.3% (n = 91) if the program were held in Northwestern Nigeria (Q18) to 24.1% (n = 26) if it required travel to Southern Nigeria without sponsorship (Q19).

Table 3: Responses to Items on Attitude towards PGD Radiotherapy, n (%) (n = 108)

Item	Question	Yes, n (%)	No, n (%)
Q14	PG education increases competency and accuracy of radiographers in the radiotherapy unit	106 (98.1)	2 (1.9)
Q15	Obtaining PG education would influence promotion at the workplace	90 (83.3)	18 (16.7)
Q16	Interest in pursuing PG education in radiotherapy	84 (77.8)	24 (22.2)
Q17	Awareness of government or institutional sponsorship for PGD Radiotherapy	51 (47.2)	57 (52.8)
Q18	Would enrol in PGD Radiotherapy if the programme were held in Northwestern Nigeria	91 (84.3)	17 (15.7)
Q19	Would travel to Southern Nigeria for PGD Radiotherapy without sponsorship	26 (24.1)	82 (75.9)

Note: PG = postgraduate; RRBN = Radiographers Registration Board of Nigeria

DISCUSSION

This study assessed knowledge of, and attitudes towards, postgraduate radiotherapy education among diagnostic radiographers in Kano, Katsina, and Jigawa States of Nigeria. In these regions, newly established radiotherapy centres face acute workforce

shortages [4]. The results showed that respondents had sound foundational knowledge of radiotherapy, with all 108 respondents (100.0%) correctly identifying its application in cancer treatment and the nature of brachytherapy. This is consistent with basic radiotherapy concepts forming part of the undergraduate radiography curriculum. The finding is consistent with Dlama et al. [16], who reported good knowledge of evidence-based practice among radiographers in North East Nigeria, suggesting that the foundational science is well embedded in training across Nigerian regions. However, the lower accuracy on Q9 (fractionation; n = 85, 81.0%) and the limited knowledge of the program fee (Q13; n = 49, 46.7%) indicate specific gaps that targeted educational outreach could address.

Awareness of the RRBN program was high (n = 106, 98.1%), exceeding the 93% reported by Eze et al. [10] for radiographers in Edo and Lagos States and the 86.4% found by Ohemeng et al. [14] in Ghana. This suggests that information about the program has reached the Northwest region through professional association activities, including RRBN national conferences, which have been identified as important channels for promoting continuing professional development (CPD) and postgraduate education awareness [11]. However, logistical details, particularly program location and cost, were less well known: only 74.3% (n = 78) correctly identified the Lagos site, and only 46.7% (n = 49) identified the correct registration fee. This gap in operational knowledge may itself constitute a barrier to enrolment.

Uncertainty about program registration fees also deserves attention. Responses to Q13 were almost evenly split between the two stated amounts (n = 49, 46.7% each), with 6.7% (n = 7) of respondents indicating no knowledge of the cost whatsoever. While fee uncertainty does not directly prevent enrolment, it points to a gap in operational knowledge that may add to hesitancy, particularly among early-career radiographers. This finding is consistent with Zafar et al. [13], who similarly documented that knowledge gaps among health care providers were most pronounced for specific procedural and regulatory details, precisely the category to which program fees and logistics belong. The RRBN and affiliated professional associations should ensure that accurate, current program fee information is disseminated through official channels, including the RRBN website, national conferences and state radiography association platforms.

Respondents' overall attitude towards postgraduate education in radiotherapy was strongly positive, with 98.1% (n = 106) recognising its role in enhancing clinical competency. This finding mirrors the very high attitude scores reported by Ugwu et al. [11] in Southeastern Nigeria and the 80% willingness to enrol found by Eze et al. [10] in Edo and Lagos States. The 77.8% (n = 84) of respondents in the present study who expressed interest in pursuing PGD Radiotherapy is also comparable to the intrinsic motivational factors described by Mubuuke and Pope [9], who found that radiographers' inner desires for professional development, new challenges and career progression were key drivers of postgraduate education decisions. The recognition by 83.3% (n = 90) of respondents that postgraduate education would influence their workplace promotion is consistent with Mubuuke and Pope's [9] observation that improved remuneration and career advancement are important extrinsic motivators, and with Byenfeldt et al.'s [6] finding that elevated professional status was rated highly (mean score 9.2 out of 10) among Swedish radiographers' reasons for seeking advanced-level knowledge. Yordanova's [12] finding that Bulgarian radiographers demonstrated similarly high intrinsic motivation for competence expansion, with structural access barriers, rather than lack of interest, being the primary deterrent to advancement, supports the pattern observed in this study.

Despite positive attitudes, distance and funding appear to be the two major barriers to enrolment, although these were inferred from the responses rather than measured directly. Only 24.1% (n = 26) of respondents were willing to travel to Southern Nigeria for the program without financial support, compared with 84.3% (n = 91) who would enrol if the program were held in Northwestern Nigeria. In addition, fewer than half of the respondents (n = 51, 47.2%) were aware of any government or institutional sponsorship for the program. This pattern is consistent with the findings of Eze et al. [10], where 91% of respondents cited university system instability and lack of government sponsorship as hindrances, and of Moonsamy [17], who identified lack of funding and non-recognition of postgraduate qualifications in human resource frameworks as primary barriers among radiographers in KwaZulu-Natal. Mubuuke and Pope [9] similarly found that all nine participants in their qualitative study reported funding as a major challenge, with several requiring bank loans and others abandoning postgraduate plans after repeated scholarship failures. Ugwu et al. [11] described organisational barriers, limited program availability, and stringent enrolment requirements as the dominant bottleneck in Nigeria. This finding aligns with the distance and access constraints identified in the present study.

At the time of the survey, the RRBN PGD Radiotherapy program was offered at a single southern institute (Lagos), which created a structural geographical barrier that disproportionately affected radiographers in the North. This is particularly consequential given that North West Nigeria currently has new radiotherapy centres in operation that urgently require qualified therapy radiographers [4]. The subsequent approval of a PGD Radiotherapy program in Northern Nigeria, combined with government sponsorship or study leave provisions, is likely to increase enrolment, as suggested by the 84.3% (n = 91) conditional willingness found in this study.

These findings have practical policy implications. The RRBN should ensure that the approved PGD Radiotherapy programme in Northern Nigeria is fully operational and widely publicised among radiographers in the Northwest to reduce distance barriers. Federal and state governments should introduce sponsorship schemes and study leave entitlements for radiographers seeking postgraduate radiotherapy qualifications, recognising this investment as a strategic component of cancer service expansion. Professional associations should use national forums to disseminate accurate information on programme costs and logistics to address the gaps in operational knowledge identified in this study. These recommendations align with the broader literature: Mubuuke and Pope [9] advocate government educational loans and the establishment of local programmes; Byenfeldt et al. [6] call for legally regulated modality-based specialisation positions that would create institutional demand for advanced-level courses; and Ugwu et al. [11] recommend increased programme capacity, additional academic faculty, and reduced programme duration and cost.

This study was limited by a relatively modest sample size (n = 108), confined to three states, which may restrict the generalizability of findings to other Northern Nigerian regions. The cross-sectional design precludes causal inference, and purposive sampling and self-reported responses may introduce selection and response bias. Barriers to enrolment were not assessed by dedicated questionnaire items and are inferred from responses to Q17–Q19. Because item-level data were not available, we could not perform inferential analyses (for example, associations between state, cadre, or experience and knowledge or attitude), and most respondents (84.3%) were early-career radiographers. Non-

response bias is possible given the 77.1% response rate, and the binary Yes/No format of attitude items, while appropriate for this exploratory level of analysis, did not capture the depth of respondents' views. Future studies should employ larger, multi-state samples and consider qualitative methods to explore the specific logistical and financial barriers in greater detail.

CONCLUSION

Radiographers in Kano, Katsina and Jigawa States of Nigeria demonstrate basic knowledge of radiotherapy and a consistently positive attitude towards postgraduate education in radiotherapy. The main deterrents to enrolment appear to be not a lack of knowledge or motivation, but structural barriers such as geographical distance and limited funding or awareness of sponsorship. It is recommended that the RRBN ensure the approved PGD Radiotherapy program in Northern Nigeria is fully operational and widely publicised, and that relevant government agencies and hospital administrations provide sponsorship and study leave to enable qualified radiographers in the study area to obtain this specialisation. Addressing these barriers is urgent given the expanding radiotherapy infrastructure in North West Nigeria and the critical shortage of qualified therapy radiographers.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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