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OPERATIONAL AND FINANCIAL CHALLENGES IN PRIVATE DIAGNOSTIC IMAGING CENTERS: A QUALITATIVE STUDY IN ENUGU STATE, NIGERIA

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ABSTRACT

Introduction: Private diagnostic imaging centers contributes significantly to strengthening healthcare delivery, though its establishment and management in low-resource settings are with significant financial and operational constraints. However, there is limited empirical evidence documenting these challenges from the perspective of radiographer-entrepreneurs in Nigeria.
Objective: To explore the operational and financial challenges involved in establishing and managing private diagnostic imaging centers in Enugu State, Nigeria.
Materials and Methods: This study employed a qualitative design using semi-structured interviews with ten owners of private diagnostic imaging centers in Enugu State, selected through purposive sampling. Data were collected through face-to-face interviews, with detailed field notes documented during and after each session. The data were analyzed using thematic analysis to identify recurrent patterns and key themes.
Results: Four major themes emerged: (1) financial barriers to establishment, particularly difficulties in raising startup capital; (2) persistent operational challenges, including poor power supply, low patient throughput, and equipment maintenance constraints; (3) systemic issues, including informal referral practices and regulatory demands; and (4) reliance on personal savings as the primary source of capital. Financial constraints were identified as the central factor underlying both establishment and ongoing operational challenges.
Conclusion: Private diagnostic imaging centers in Enugu State operate within a resource-constrained environment where financial limitations significantly affect both establishment and sustainability. Addressing structural financing barriers and operational inefficiencies may improve the viability of such centers.
Keywords: Diagnostic imaging centers; qualitative research; healthcare entrepreneurship; financial constraints; Nigeria; health systems

Introduction

Private diagnostic imaging centers play a vital role in modern healthcare by providing services for disease screening, diagnosis, and clinical evaluation using specialized imaging technologies. In many settings, these centers are established by either government institutions or private individuals and are equipped with modalities such as conventional X-ray, ultrasound, computed tomography (CT), magnetic resonance imaging (MRI), and mammography.

In Nigeria, radiographers may practice in both public and private healthcare sectors. However, limited employment opportunities, underemployment, and unfavorable working conditions in government-owned

healthcare facilities have contributed to a growing interest in private practice (1,2). As a result, some radiographers venture into establishing privately owned diagnostic imaging centers, driven by a combination of professional independence, economic considerations, and the need to expand access to diagnostic services. Private diagnostic centers also serve as an important complement to public facilities, particularly in situations where access is limited due to equipment breakdown, workforce shortages, or service disruptions (3,4).

Despite their growing relevance, the establishment and management of private diagnostic imaging centers are associated with significant financial and operational challenges (5–8). These include high capital requirements for procuring imaging equipment, securing suitable locations, maintaining infrastructure, and meeting regulatory requirements set by bodies such as the Corporate Affairs Commission (CAC) and the Radiographers Registration Board of Nigeria (RRBN). In addition, operational sustainability may be affected by factors such as competition, low patient throughput in the early stages, equipment maintenance demands, and inconsistent power supply.

The medical imaging sector is becoming increasingly complex, requiring continuous investment in technology, personnel, and quality standards. While existing studies have examined general entrepreneurial challenges in Nigeria and beyond (2,9), there is limited empirical evidence focusing specifically on the experiences of radiographer-entrepreneurs in the diagnostic imaging sector, particularly using qualitative approaches. This study therefore aims to explore the operational and financial challenges involved in establishing and managing private diagnostic imaging centers in Enugu State, Nigeria, with a focus on the lived experiences of practitioners in this field

Materials and method

Study Design

This study employed a qualitative research design to explore the operational and financial challenges associated with establishing and managing private diagnostic imaging centres.

Study Setting and Participants

The study was conducted in Enugu Urban, Enugu State, Nigeria. The study population comprised privately owned diagnostic imaging centres operated by radiographers.

Eligibility criteria included registered diagnostic imaging centres that were privately owned and managed by radiographers, located within Enugu Urban, and operational for a minimum of one year.

Sampling and Recruitment

A list of registered private diagnostic imaging centres was obtained from the State Health Board. An initial sample of 30 centres was selected using a simple random sampling approach. However, due to the sensitive nature of the study, only 10 centre owners consented to participate.

Participants were recruited via telephone contact, during which the purpose of the study was explained and confidentiality assured. Those who consented were scheduled for face-to-face interviews.

Data Collection

Data were collected using semi-structured, one-on-one interviews guided by a pre-developed interview guide. The interviews explored participants' experiences in establishing and managing their centres, with emphasis on financial and operational challenges. Each interview lasted 45–60 minutes and was conducted in person at a time convenient for the participant. Due to participants' reluctance to be audio-recorded, data was collected through detailed notetaking during interviews. These notes were expanded immediately after each interview to ensure completeness and accuracy.

Data Analysis

Data were analysed using thematic analysis following the approach described by Creswell and Creswell (10). A deductive coding approach was adopted, guided by the study objectives. Manual coding was performed by systematically organizing the data into meaningful

units, which were subsequently grouped into categories and broader themes. Patterns and relationships across participant responses were identified and synthesized into key thematic areas. To enhance the credibility of the findings, member checking was conducted by sharing expanded interview notes with participants for verification. In addition, the authors reviewed the identified themes, and consensus was reached on the final thematic structure.

Ethical Considerations

Verbal informed consent was obtained from all participants prior to data collection. Participants were assured of anonymity and confidentiality, particularly given the sensitivity of issues discussed. No identifying information was included in the analysis or reporting of findings.

Results

A total of ten (10) owners of private diagnostic imaging centres located within Enugu Urban participated in the study. Participants had a minimum of two years of experience in private practice, with a range of 2–15 years. Thematic analysis yielded four major themes:

- financial barriers to establishment,
- ongoing operational challenges,
- systemic and regulatory influences, and
- motivation and sources of capital.

Theme 1: Financial Barriers to Establishment

Participants consistently identified raising startup capital as the most significant challenge in establishing private diagnostic imaging centres. Nine out of ten participants reported difficulties in securing funds for equipment procurement, facility setup, and regulatory requirements.

"...It was a challenge raising funds to procure equipment, securing a suitable location, electricity bills, revalidating license."

"...Difficulty in saving enough to start off made me resort to bank and individual loans."

Personal savings and informal borrowing were the primary means of financing, with limited access to formal credit facilities.

Theme 2: Ongoing Operational Challenges

Participants reported that challenges persisted beyond establishment into the operational phase. Key issues included poor power supply, low patient throughput, prohibitive cost of equipment maintenance, and limited financial capacity to upgrade to advanced imaging technologies such as CT and MRI. Additional concerns included staff remuneration, brain drain, inadequate infrastructure (e.g., space and parking), and competition.

"...Equipment maintenance is no longer routine because of poor funding."

"...The site of this centre does not have a parking lot—relocation is difficult due to cost."

Participants emphasized that financial constraints underpin many of these operational challenges.

Theme 3: Systemic and Regulatory Influences

Participants were divided on the effect of regulatory requirements and systemic practices. While most participants did not consider government regulations a major barrier, some reported bureaucratic processes and financial burdens associated with compliance.

"It was not challenging except for taxation."
"...It needed scaling a lot of hurdles with bills here and there, and it was discouraging."

A notable issue raised was the practice of referral incentives, which participants reported as affecting patient flow and competitiveness. Participants reported that newly established diagnostic centres often offer higher referral incentives compared to existing centres. This practice was perceived to influence referring physicians' decisions, potentially prioritizing financial gain over competence. Consequently, this was reported to reduce patient throughput in more established centres. Furthermore, attempts to meet these referral

demands were associated with increased service costs, with patients bearing the financial burden.

"Referral bonus is gradually becoming a thorn in the flesh, these new centres giving them a higher percentage, makes them refer their patients to them."

"When you don't meet the demands, you start losing patients."

However, some participants indicated that referral incentives did not necessarily determine patient flow in all cases. They emphasized that established competence and the consistent delivery of accurate diagnostic reports could mitigate the influence of such practices. In such instances, professional reputation was perceived to play a more significant role in sustaining referrals.

"... Once you know what you are doing, referral bonus issue will not pose a challenge, the referrals will always look out for you because you give them the best."

"...Referral activities always demand a kick-back, they will frustrate you. However, if you had mastered the profession well, they would always come to you."

Theme 4: Motivation and Sources of Capital

Despite the challenges, participants identified financial independence and reduced reliance on government employment as key motivating factors for establishing private diagnostic imaging centres. Other motivations included personal interest, job satisfaction, and contributing to healthcare delivery.

"To make daily income, in order to reduce financial dependency on government."
"...Personal interest—I felt I had gained the necessary experience."

Discussion

This study explored the operational and financial challenges associated with establishing and managing private diagnostic imaging centres in Enugu State, Nigeria. The findings are discussed in relation to four key themes: financial barriers, operational challenges, systemic influences, and motivational factors.

Financial Barriers to Establishment

Financial constraints emerged as the most significant barrier to establishing private diagnostic imaging centres in this study. Participants consistently reported difficulties in raising startup capital, particularly for equipment acquisition and infrastructure development. This finding is consistent with previous studies that identified initial capital requirements and equipment costs as major barriers to diagnostic facility establishment. (7,8,11). Equipment costs have been shown to constitute the largest financial burden. For instance, Akinfenwa et al. (11) reported that radiotherapy equipment acquired through public-private partnerships may cost significantly more than government-funded alternatives, thereby increasing financial pressure on private providers. Similarly, Bello et al. (7) highlighted the prohibitive cost of specialized diagnostic tools and expertise as a key limitation in establishing biotechnology diagnostic services. This financing gap may limit the ability of new centres to scale or adopt advanced imaging technologies.

Ongoing Operational Challenges

Beyond establishment, this study found that operational challenges persist and are driven by financial limitations. Issues such as poor power supply, equipment maintenance, and limited capacity to procure advanced imaging modalities were prominent. These findings are in keeping with reports that equipment acquisition and maintenance remain persistent operational barriers, particularly in resource-constrained settings (11,12). Akinfenwa et al. (11) specifically documented frequent machine breakdowns in radiotherapy facilities due to insufficient funding for maintenance, underscoring the link between financial constraints and operational inefficiency. Staffing challenges reported in other studies, including shortages of skilled manpower and the excessive cost of expertise (7,8), further highlight the complexity of

managing diagnostic centres. Although recruitment was not widely identified as a major challenge in this study, issues such as brain drain and staff remuneration suggest underlying workforce instability. Overall, these findings reinforce the notion that operational challenges are closely intertwined with financial capacity and broader health system limitations.

Systemic and Regulatory Influences

Systemic factors, including regulatory requirements and informal referral practices, were identified as influencing both establishment and operational dynamics. While most participants did not consider government regulation a major barrier, some reported bureaucratic processes and financial burdens associated with compliance. This finding partially aligns with previous studies that identify regulatory challenges such as bureaucratic delays, restrictive policies, and contract enforcement issues as barriers to establishing diagnostic facilities (6,7,13). These differences in perception may reflect variations in individual experiences with government agencies, as well as inconsistencies in the implementation of regulatory policies. Another plausible explanation relates to the duration of operation of the centres studied. Given that the centres had been operational for periods ranging from one to ten years, it is likely that older centres commenced operations prior to the enforcement of some recent regulatory requirements and therefore may not have experienced these constraints to the same extent.

For example, current regulations require that new diagnostic centres obtain regulatory approval before registration and commencement of operations. Although this requirement has existed for some time, its enforcement was previously inconsistent. More recent enforcement practices have made compliance mandatory prior to operation, thereby increasing the regulatory burden on newly established centres.

A notable finding in this study was the role of referral incentives in influencing patient flow. Although widely regarded as unethical, all participants acknowledged their importance in promoting newly established diagnostic centres and increasing patient patronage, particularly within a highly competitive environment. These incentives appear to function as an adaptive strategy for market entry and early-stage survival. However, their influence tends to diminish over time as centres develop a stable patient base and build a reputation for delivering accurate and reliable diagnostic results. In this context, professional competence and reputation were perceived to mitigate reliance on referral incentives, highlighting a dynamic interaction between financial inducements and professional credibility in shaping referral patterns and service utilization.

Motivation and Sources of Capital

The desire for financial independence and reduced reliance on government employment emerged as the primary motivation for establishing private diagnostic imaging centres. This reflects broader workforce and employment challenges within the healthcare sector. This finding is consistent with evidence that highlights the role of private sector participation in addressing gaps in healthcare delivery and expanding access to diagnostic services (14). However, sustainability remains a concern. Okafor et al. (6) reported that a privately established kidney care centre remained financially dependent on its parent institution despite being operational, highlighting challenges in long-term financial viability. This suggests that while private diagnostic centres improve access, their sustainability is closely tied to financial structure and patient volume.

The strengths of this study lie in its provision of context-specific insights into the operational and financial challenges associated with private diagnostic imaging practice in Enugu State, Nigeria. Qualitative design enabled an in-depth exploration of the lived experiences of radiographer-entrepreneurs, capturing nuanced perspectives that are often not accessible through quantitative methods. The inclusion of participants with varying years of experience enhanced the diversity and richness of the data, while the use of semi-structured interviews and member checking strengthened the credibility of the findings. However, some limitations should be considered. The small sample size, resulting from non-compliance of

prospective due to the perceived sensitive nature of the study, may have introduce selection bias and limited the generalizability of the findings.

Conclusion

Taken together, the findings of this study highlight the interconnected nature of financial, operational, and systemic challenges in private diagnostic imaging practice in Enugu State, Nigeria. Financial constraints emerged as the central barrier, affecting both establishment and ongoing operations, and contributing to challenges such as limited access to advanced imaging technologies, equipment maintenance issues, and infrastructural deficiencies. Systemic factors, including regulatory requirements and informal referral practices, further shape the operational environment, particularly for newly established centres. While private sector involvement improves access to diagnostic services, it operates within significant structural and financial limitations. Personal savings remain the primary source of startup capital, reflecting limited access to formal financing. Addressing these challenges will require improved access to funding, more consistent regulatory implementation, and investment in healthcare infrastructure.

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