



TRANSFORMING HEALTHCARE IN NIGERIA THROUGH ICT: AN IN-DEPTH ANALYSIS AT FEDERAL MEDICAL CENTRE IDI-ABA, ABEOKUTA

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Abstract

This study examines the transformative influence of Information and Communication Technology (ICT) on the healthcare sector in Nigeria, focusing specifically on its application at the Federal Medical Centre Idi-Aba, Abeokuta. As technological advancements continue to evolve, their integration in the health sector has become essential, significantly enhancing patient care, management practices, and the overall operational efficiency of healthcare facilities. Employing a mixed-methods research approach that combines interviews with quantitative data, this paper explores the myriad ways in which ICT has redefined the landscape of healthcare delivery in Nigeria. This exploration is particularly centered around the Federal Medical Centre Idi-Aba, assessing the adoption and impact of electronic health records (EHRs), telemedicine, mobile health (mHealth) applications, and other ICT innovations. These technologies have been instrumental in improving the accessibility and quality of healthcare services, enhancing diagnostic precision, streamlining administrative operations, and empowering healthcare providers and patients alike. Furthermore, the study critically analyzes the hurdles encountered in the adoption and practical application of ICT within Nigeria's healthcare system. Challenges such as infrastructural deficits, limited resources, concerns over data privacy, and gaps in technological literacy among healthcare professionals and patients are thoroughly evaluated. Through identifying these challenges, the research aims to shed light on viable strategies to surmount these obstacles, thereby optimizing the benefits of ICT in enhancing the healthcare sector's effectiveness and responsiveness.

Keywords: Healthcare, In-Depth Analysis, Federal Medical Centre, ICT, Transforming.

Introduction

The advent of Information and Communication Technology (ICT) heralds a transformative era with the potential to significantly alter the lives of vast segments of the global populace. In the

realm of governance and commerce, ICT emerges as a pivotal force, molding the nuances of individual lifestyles, work dynamics, social interactions, and even the integrity of both the natural and constructed environments. Within the contemporary business milieu, the strategic role of ICT as an essential driver of organizational competitiveness cannot be overstated. Its profound influence permeates various human endeavors, notably in the healthcare domain, where it spans from medical instrumentation to surgical procedures.

The endeavor to integrate ICTs into the economies of developing nations, including Nigeria, has seen varied reforms. Despite these efforts, the resultant economic upliftment often pales in comparison to that observed in developed nations. The inception of ICT adoption policies in Nigeria, dating back to 1999, marked a significant milestone. The ensuing activities of licensed telecommunication service providers have spurred notable macroeconomic benefits—job creation, enhanced service delivery, reduced transport costs, bolstered security, and augmented national output [1].

The healthcare sector has a critical contribution to the global economy and, by extension, the economic growth and development of nations [2]. Integrating ICT in healthcare can help to improve lives and well-being and also assist in the achievement of the health-related Sustainable Development Goals (SDGs) (Shao et al, 2022 [3]). One benefit of ICT to health is the convenient access to information for both health practitioners and patients (iED Team, 2022 [4]). In addition, ICT is important in healthcare to manage medical records; it has aided the development of health apps making it easy to access medical information (Fingent, n.d.[5]).

The healthcare sector benefits from ICT through e-health solutions, enhancing service efficiency and coverage. This digital revolution, encompassing telemedicine, electronic medical records (EMR), and health information systems, among others, epitomizes the sector's evolution. Following the turn of the millennium, Nigeria's Federal Government embarked on an ambitious ICT integration in public services, culminating in the National Telecommunication Policy of 2001[6]. This policy underscored the essential role of ICT in education, health improvement, poverty eradication, job creation, and fostering global competitiveness, aiming to cultivate a workforce proficient in ICT and related disciplines [6].

[7] adds that with ICT, many problems such as long hours spent by patients waiting their turn, missing cards/files, lack of information will be solved. Given the importance of ICT in healthcare delivery, this study examines the impact of ICT in the health sector, through a study of the Federal Medical Centre in Abeokuta, Ogun State.

Some studies have established positive relationships between ICTS and health which confirms the essence in health.

Literature Review

The integration of Information and Communication Technology (ICT) into healthcare represents a significant shift towards modernized and enhanced services in Nigeria. This review

explores the diverse impacts of ICT on healthcare delivery and management within the country, drawing upon relevant theoretical frameworks and empirical studies.

The transformative potential of ICT in healthcare is widely acknowledged, with systems developed to predict health states and manage drug prescriptions efficiently ([8]). Telemedicine, exemplified by real-time or asynchronous healthcare delivery, highlights the global progression of ICT applications in health sectors, significantly in developed economies ([9]). The National Health ICT Strategic Framework (2015-2020) emphasizes the exponential growth of ICT penetration in healthcare, facilitated by the advent of new, affordable tools aiding healthcare practitioners ([10]).

Studies reveal a varied utilization of ICT among demographic groups, indicating its critical role in improving health outcomes, particularly among the youth and the elderly. The importance of ICT in promoting mental health among marginalized youths ([11]) and assisting older adults in cognitive enhancement has been stressed, suggesting a broad acceptance of health-related ICT applications with increased access ([11], [12]). Despite the availability of ICT resources in Nigerian teaching hospitals, challenges persist, including limited internet connectivity, highlighting a reliance on external internet sources ([13]).

The initiation of the National Health Insurance Scheme (NHIS) in 2005 by the Nigerian government was a pivotal step towards integrating ICT in healthcare. However, the implementation of ICT systems in hospitals remains sluggish, affecting efficiency and data management ([14]). The emergence of e-health technologies promises substantial improvements in patient safety, dietary management, and document management, underscoring the importance of ICT in enhancing healthcare service quality ([15]).

Comparative studies, such as those evaluating Nigeria's healthcare funding and performance against other countries, reveal significant disparities. Despite allocating a lower percentage of its budget to healthcare, Nigeria faces challenges in quality healthcare delivery and accessibility, necessitating reforms and a focus on primary healthcare services ([16], [17], [18]). Evaluations of healthcare facilities and policies underscore the necessity for effective systems that address quality and accessibility issues in a cost-effective manner ([19]).

In summary, the literature underscores the critical role of ICT in transforming healthcare in Nigeria. Despite notable advancements and the potential for significant impacts on healthcare delivery, challenges related to implementation, accessibility, and funding persist. Addressing these challenges requires concerted efforts from government, healthcare providers, and the private sector to fully realize the benefits of ICT in healthcare.

Theoretical Paradigm for the impact of ICT in Healthcare

Below is the relevant framework for this study:

Technology Acceptance Model (TAM): The TAM posits that the adoption and acceptance of technology are significantly influenced by its perceived ease of use and usefulness. In the

context of Nigeria's health sector, this model elucidates the attitudes of healthcare professionals and patients towards ICT, highlighting the critical role of user perception in the successful integration of technological solutions.

Innovation Diffusion Theory: This theory offers insights into the mechanisms through which ICT innovations are disseminated and adopted within healthcare settings. It emphasizes the influence of communication channels, societal norms, and temporal factors on the adoption rate of ICT solutions among healthcare organizations and professionals.

Resource-Based View (RBV): The RBV framework provides a lens through which to view ICT as a strategic asset that can endow healthcare organizations with a competitive advantage. By focusing on the internal capabilities and resources of healthcare institutions, this perspective underscores the strategic importance of ICT in enhancing service delivery and operational efficiency.

Health Information System (HIS) Framework: Central to managing health data effectively, the HIS framework advocates for a comprehensive approach to data collection, storage, processing, and dissemination. Its application in Nigeria can illuminate the pivotal role of ICT in streamlining health information management processes, thereby improving decision-making and healthcare outcomes.

Socio-Technical Systems Theory: This theory acknowledges the symbiotic relationship between social and technical elements within organizational systems. In the Nigerian health sector, it sheds light on how ICT implementation impacts social structures, work processes, and human interactions, influencing the overall efficacy of health services.

Digital Divide Theory: This theory explores the disparities in ICT access and usage, which can significantly affect the equity and effectiveness of health services. The Nigerian health sector's experience with the digital divide reveals the challenges and opportunities in leveraging ICT to bridge gaps in healthcare access and quality.

Human-Centered Design (HCD): HCD emphasizes the importance of designing ICT solutions that are intuitive, user-friendly, and culturally appropriate. Its principles ensure that technological interventions in the health sector are more likely to be accepted and effectively utilized by both healthcare providers and patients.

Conceptual Insights into ICT's Impact on Healthcare

The impact of ICT on the health sector in Nigeria involves examining key concepts, trends, and potential implications. Below is an overview of the main elements that characterize this impact:

Enhancing Healthcare Delivery: ICT's role in facilitating telemedicine initiatives offers a promising avenue for extending healthcare services to underserved regions, thereby improving access and quality of care.

Streamlining Health Information Management: The adoption of Electronic Health Records (EHRs) and Health Information Systems (HIS) revolutionizes patient information management, enhancing the efficiency and coordination of healthcare services.

Improving Disease Surveillance and Response: ICT enables real-time monitoring and management of disease outbreaks, a critical capability for addressing public health challenges and emerging infectious diseases.

In conclusion, the literature underscores ICT's potential to transform Nigeria's health sector by improving service delivery, enhancing information management, and facilitating effective disease surveillance. However, realizing these benefits necessitates addressing challenges related to ICT infrastructure, resource allocation, and digital literacy among healthcare stakeholders.

Methodology

This section delineates the research methodology employed to explore the impact of Information and Communication Technology (ICT) on healthcare delivery at the Federal Medical Centre, Idi-Aba, Abeokuta, Ogun State, Nigeria. It outlines the study's design, population, sampling techniques, data collection methods, and analytical procedures to assess the hypothesis.

Study Design and Population

The research adopted a mixed-methods approach, integrating both qualitative and quantitative data to provide a comprehensive analysis of ICT's impact within the healthcare sector. The study focused on the Federal Medical Centre, Idi-Aba, targeting a specific group of healthcare professionals to understand the depth and breadth of ICT's impact.

The population of the study comprised 50 healthcare staff members from various departments within the Federal Medical Centre, Idi-Aba, selected to represent a wide range of roles and perspectives on the integration and utilization of ICT in healthcare delivery.

Sampling Techniques and Sample Size

A purposive sampling technique was employed to select participants who are directly involved in or influenced by the application of ICT in their work environment. This method ensured the inclusion of individuals with relevant experience and insights into the study's focus area.

Data Sources

Data were collected using both primary and secondary sources to enrich the study's findings. Primary data were gathered through surveys and interviews with selected staff members, while secondary data were sourced from existing literature, reports, and online resources relevant to ICT in healthcare.

Data Collection Methods

A structured questionnaire served as the primary tool for collecting empirical data from participants. The questionnaire was meticulously designed to cover various aspects of ICT usage

in healthcare, including the adoption of electronic health records, telemedicine services, and other digital tools.

Prior to distribution, the questionnaire underwent a pilot test with a small group of 5 respondents from the targeted population to refine the questions and ensure clarity, relevance, and comprehensiveness. Feedback from the pilot study was instrumental in finalizing the questionnaire.

In addition to the questionnaire, semi-structured interviews were conducted to gain deeper insights and qualitative data on the participants' experiences, challenges, and perceptions regarding ICT in healthcare.

Data Analysis

Quantitative data obtained from the questionnaire were analyzed using statistical software to identify patterns, trends, and correlations. Descriptive statistics, such as means, percentages, and frequency distributions, were employed to summarize the data. For qualitative data from interviews, thematic analysis was utilized to extract significant themes and narratives that elucidate the impact of ICT on healthcare delivery.

This comprehensive methodology aims to provide a robust understanding of the current state of ICT in healthcare at the Federal Medical Centre, Idi-Aba, and offer actionable insights for enhancing its effectiveness and addressing challenges.

Analysis and Results

This section presents the analysis and interpretation of data collected through the survey conducted as part of this research. A total of 50 respondents participated in the survey, providing insights into the impact of Information and Communication Technology (ICT) on healthcare delivery within the context of the Federal Medical Centre, Idi-Aba, Abeokuta. The data analysis focuses on the demographic distribution of respondents and their perspectives on ICT usage in healthcare settings.

Gender Distribution of Respondents

The survey sought to understand the gender distribution of healthcare staff participating in the study to ensure a balanced representation of perspectives. The findings are summarized in Table 1, which outlines the gender distribution among the respondents.

Table 1: Gender Distribution of Respondents

	Frequency	Percent
Male	25	51
Female	24	48.9

Total	49	100
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Source: field survey, February 2024.

As illustrated in Table 1, the gender composition of the survey respondents comprised 25 males (51%) and 24 females (48.9%), totaling 49 participants who completed and returned the questionnaire. This distribution indicates a relatively balanced gender representation among the respondents, providing a diverse range of insights into the adoption and impact of ICT in the healthcare sector.

The analysis of gender distribution is essential for understanding the diverse perspectives and experiences of healthcare professionals regarding the integration of ICT in their daily operations and patient care. This diversity enriches the findings and contributes to a more comprehensive understanding of the role of ICT in enhancing healthcare delivery and outcomes.

Age Distribution of Respondents

The age distribution of the respondents provides insight into the demographic makeup of the participants in this study. The data collected from the survey, as depicted in Table 2, categorizes respondents into various age groups, highlighting the diversity among the healthcare staff at the Federal Medical Centre, Idi-Aba.

Table 2: Age range of respondents

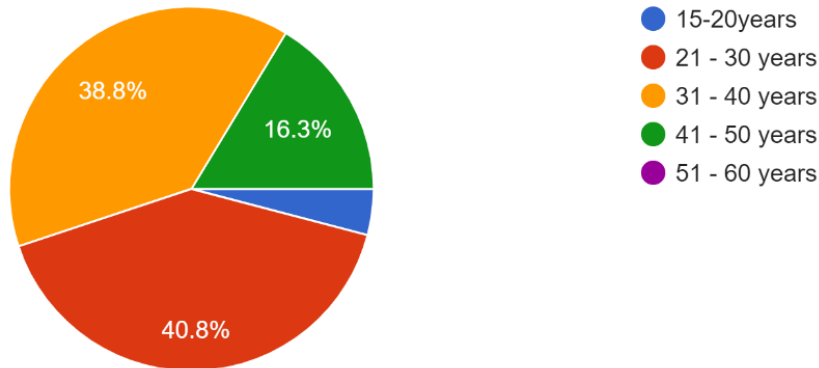
Valid	Frequency	Percent
15-20years	2	4.1
21-30years	20	40.8
31-40years	19	38.8
41-50years	8	16.3
above 50years	0	0
Total	49	100

Source: field survey, February 2024.

From the survey results, it is evident that the majority of respondents fall within the age range of 21-30 years (40.8%) and 31-40 years (38.8%), indicating a predominantly young workforce within the health facility. This is followed by those in the age group of 41-50 years (16.3%), with a smaller portion in the 15-20 years category (4.1%). Notably, there were no respondents above the age of 50 years. This demographic distribution underscores the youthful nature of the workforce at the Federal Medical Centre, Idi-Aba and the assumption that the utilization of ICT tools should be high.

Age Range

49 responses



Educational Background of Respondents

The educational background of the respondents is a critical factor in understanding the level of expertise and knowledge base within the Federal Medical Centre, Idi-Aba. Table 3 provides a breakdown of the highest educational qualifications of the study participants, shedding light on the academic diversity of the staff.

Table 3: Educational background of respondents

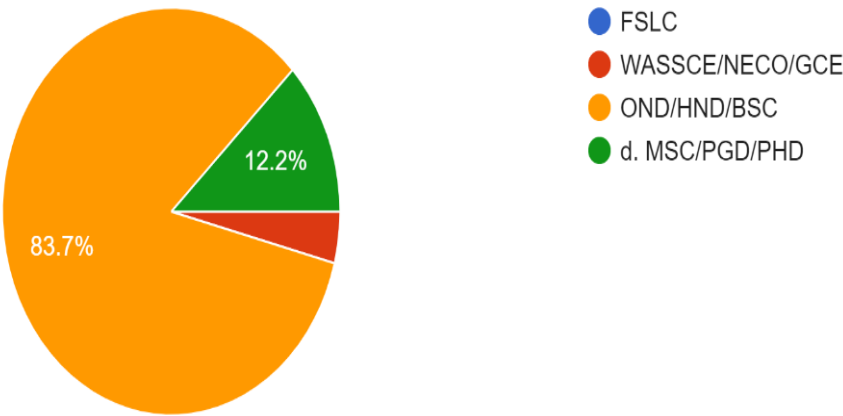
	Frequency	Percent
FSLC	0	0
WASSCE/NECO/GCE	2	4.1
OND/HND/BSC	41	83.7
MSC/PGD/PHD	6	12.2
Total	49	100.0

Source: field survey, February 2024.

The survey results reveal a significant proportion of the respondents (83.7%) possess undergraduate degrees (OND/HND/BSc), indicating a high level of formal education among the healthcare staff. Additionally, 12.2% of the respondents have attained postgraduate degrees (MSc/PGD/PhD), further highlighting the advanced academic qualifications present within the facility. A smaller segment (4.1%) holds secondary education certificates (WASSCE/NECO/GCE). Notably, there are no respondents with FSLC (First School Leaving Certificate), suggesting that all participants have at least completed secondary education. This distribution underscores the well-educated nature of the staff, potentially influencing their proficiency and adaptability in utilizing ICT in healthcare delivery.

1. Educational background

49 responses



Marital Status of Respondents

The marital status of the respondents provides valuable context regarding the personal demographics of healthcare staff at the Federal Medical Centre, Idi-Aba, which can influence lifestyle, availability, and perhaps perspectives on workplace policies and ICT usage in healthcare delivery. Table 4 outlines the marital composition of the survey participants.

Table 4: Marital status of respondents

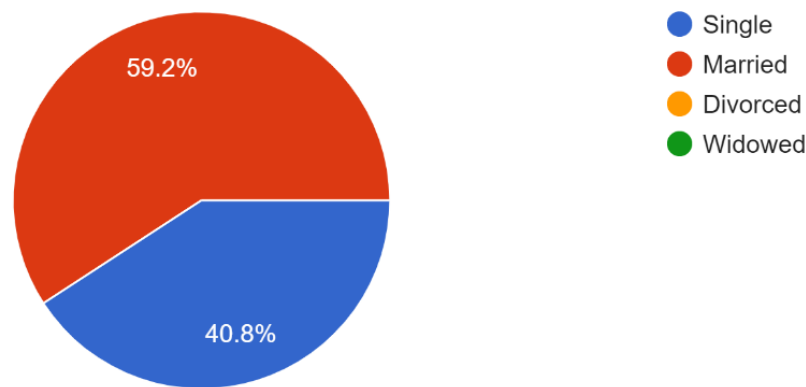
	Frequency	Percent
Single	20	40.8
Married	29	59.2
Divorced	0	0
Widowed	0	0
Total	49	100.0

Source: field survey, February 2024.

Analysis of the marital status shows that a majority of the respondents (59.2%) are married, while a significant portion (40.8%) are single. There were no respondents who identified as divorced or widowed. This distribution suggests that the majority of the staff members are in a stable marital situation, which could have implications for their work-life balance, responsibilities, and possibly their engagement with ICT tools in the healthcare setting. Understanding these demographics is essential for tailoring ICT training and implementation strategies to fit the needs and circumstances of the healthcare workforce.

Marital Status

49 responses



RQ 1: What is the level of ICT awareness among staff of Federal Medical Centre, Idi-Aba Abeokuta, Ogun State?

Assessing the level of Information and Communication Technology (ICT) awareness among healthcare professionals offers insights into the readiness and acceptance of technological advancements in Nigeria's health sector. Table 8 delineates the survey results concerning respondents' perceptions of ICT awareness within the country.

Table 5: Level of ICT awareness

	Frequency	Percent
Strongly agree	10	20.4
Agree	14	28.6
Disagree	6	12.2
Strongly disagree	0	0
Undecided	19	38.8
Total	49	100.0

Source: Field survey, February 2024.

The survey findings reveal a mixed perspective on ICT awareness levels in Nigeria, with a notable portion of respondents (20.4%) strongly agreeing and another segment (28.6%) agreeing that awareness is high. This suggests a growing consciousness and acceptance of ICT within the country, particularly in the health sector. However, a significant number of participants (38.8%) remain undecided, indicating potential variability in awareness levels across different regions or sectors. A minority of the respondents (12.2%) disagreed with the notion of high ICT awareness, suggesting areas where further efforts to enhance understanding and utilization of ICT may be necessary.

Overall, the data suggest an increasing trend in ICT awareness in Nigeria, with a majority of healthcare professionals acknowledging its importance. This trend indicates progress compared to earlier decades and underscores the need for continued education and advocacy to further elevate the level of ICT literacy and utilization across the nation, especially in enhancing healthcare outcomes.

RQ2: What is the extent of utilization of ICT tools at the Federal Medical Centre, Idi-Aba Abeokuta, Ogun State?

Table 6: Extent of utilization of ICT

	Frequency	Percent
Very high extent	25	51
High extent	17	34.7
Low extent	4	8.2
Very low extent	3	6.1
Undecided	0	0
Total	49	100.0

Source: field survey, February 2024.

Table 6 shows that FMC Idi-Aba staff members are not only aware of ICT facilities for the job but also utilize them greatly. Respondents to a very high extent (51%) use ICT facilities followed by those that use it to a great extent (34.7%), on a combined note, some respondents said their usage of ICT facilities is low (14.3%). This shows that there is acceptability of ICT facilities by the staff members of FMC Idi-Aba.

RQ3: To what extent can ICT improve the outcome of the health sector?

The capacity of Information and Communication Technology (ICT) to augment the outcomes within the Nigerian health sector is a subject of considerable interest. Table 7 encapsulates the perspectives of healthcare professionals regarding the transformative impact of ICT on healthcare delivery and outcomes.

Table 7: Extent to which ICT can improve the outcome of the Health Sector in Nigeria

	Frequency	Percent
Very high extent	28	57.1
High extent	14	28.6
Low extent	4	8.2
Very low extent	1	2

Undecided	2	4.1
Total	49	100.0

Source: field survey, February 2024.

A substantial majority of the respondents (57.1%) strongly believe in the efficacy of ICT to enhance healthcare outcomes in Nigeria, with an additional 28.6% concurring with this assessment. This overwhelming support underscores a general optimism about the role of ICT in revolutionizing healthcare delivery, including improving access to care, enhancing diagnostic accuracy, and facilitating patient management.

However, a small segment of the participants (4.1%) remains undecided, possibly reflecting uncertainties about ICT's full potential or its implementation challenges within the health sector. Meanwhile, a minority of the survey participants expressed reservations, with 8.2% disagreeing and 2% strongly disagreeing with the premise that ICT can significantly improve health sector outcomes in Nigeria.

These insights reveal a predominant belief among healthcare professionals that the strategic integration of ICT tools and systems has the potential to significantly improve the efficiency, accessibility, and quality of healthcare services in Nigeria, contributing to better health outcomes for the population.

RQ4: What is the extent to which the hospital will perform better if e-health is introduced?

Evaluating the potential impact of introducing e-health services on hospital performance provides crucial insights into the transformative capabilities of digital healthcare solutions.

Table 8: Extent to which the Hospital will perform better if e-health is introduced

	Frequency	Percent
Very great extent	27	50.1
Great extent	13	26.5
Low extent	1	2
Very low extent	3	6.1
Undecided	5	10.2
Total	49	100.0

Source: field survey, February 2024.

The majority of respondents (50.1%) strongly believe that the hospital's performance and service delivery would significantly improve with the introduction of e-health systems. An additional 26.5% agree with this assertion, collectively indicating a strong endorsement for

digital health technologies among the staff. A small segment of respondents (10.2%) remains undecided, possibly reflecting uncertainties about e-health implementation challenges or outcomes. Only a minimal number of participants expressed resistance or skepticism, with 2% disagreeing and 6.1% strongly disagreeing about the potential improvements e-health could bring.

These findings suggest a broad consensus among healthcare professionals at the Federal Medical Centre, Idi-Aba, that digitalization through e-health initiatives would enhance hospital efficiency, patient care quality, and overall healthcare outcomes. The data advocate for the strategic adoption and integration of e-health technologies to modernize and improve healthcare services, aligning with global trends towards digital health solutions.

RQ 5: What are the inherent challenges with the use of ICT in the health sector?

Personal interviews were conducted with some staff of Federal Medical Centre, Idi-Aba Abeokuta. They highlighted some challenges on the use of ICT in the health sector.

Some of the challenges as revealed by the respondents are related to poor infrastructure like epileptic electricity supply, lack of widespread internet connectivity and high cost of ICT equipment. Electricity is a major issue in Nigeria and this has led to businesses and organizations spending a lot on petrol and diesel to keep business activities running. Also, health facilities require equipment for some minimal and advanced health diagnosis; and as a Federal organization, FMC Idi-Aba requires government funding which might not always be available when needed. There is poor internet penetration in the country and when available, subscription is expensive.

There is also the issue of lack of awareness and resistance to ICT adoption by the older generation. A respondent pointed out the need for digital literacy among staff and the general population. This shows that there is need for sensitization on the importance of ICT to health practice. Furthermore, there are concerns about cyber-security and the lack of effective ICT policies and regulations. The issue of corruption was also mentioned noting that manual processes are often preferred for the sake of opacity as some believe that ICT will introduce transparency and accountability which ordinarily should not be a challenge.

Respondents were further asked how ICT can improve the health sector and some suggestions. The following are the excerpts of their responses:

Respondent 1: Envisioned ICT as a catalyst for enhancing efficiency, accessibility, and patient care, with Electronic Health Records (EHRs), telemedicine, mobile health applications, data analytics, and artificial intelligence playing pivotal roles in revolutionizing healthcare delivery.

Respondent 2: Advocated for a secure database for patient records to facilitate quick and reliable access to medical information by healthcare providers, regardless of their location.

Respondent 3: Recommended the digitalization of health records and the use of servers for their safekeeping and easy retrieval, which would streamline health information management.

Respondent 4: Emphasized the need for awareness and the provision of necessary ICT tools to improve the cost-effectiveness and efficiency of healthcare services.

Respondent 5: Believed that ICT could significantly improve the quality of care, reduce patient waiting times, and enable seamless access to medical records, telemedicine, and remote monitoring services.

The consensus among the interviewed staff members is that while there are several obstacles to the widespread adoption and effective use of ICT in Nigeria's health sector, the potential benefits are immeasurable. Implementing ICT solutions such as EHRs, telemedicine, and data analytics could lead to significant improvements in healthcare delivery, patient outcomes, and overall sector efficiency. The feedback underscores the necessity for targeted interventions to overcome existing barriers, including infrastructure development, policy reform, corruption mitigation, and educational initiatives to increase digital literacy and acceptance of ICT innovations in healthcare.

Conclusion

Based on the findings, the level of ICT awareness among FMC Idi-Aba staff is high likewise their level of utilization of ICT facilities. This study concludes that the utilization of ICT in health practice is very vital as it can improve efficiency and overall health outcomes. ICT stands as a pivotal element within Nigeria's health sector, underscoring its importance in modern healthcare delivery. Moreover, though there are challenges, the potential benefits are more.

This study therefore recommends the following:

1. The government should prioritize investments in comprehensive ICT infrastructure, ensuring high-speed internet and reliable electricity, particularly in rural and marginalized areas, to democratize access to digital healthcare solutions.
2. There should be training and development programs for healthcare professionals, enhancing their proficiency in ICT applications to elevate the quality of care.
3. Protective measures for health data should be strengthened through advanced encryption, rigorous access controls, and continuous security monitoring to maintain confidentiality and integrity of patient information.

4. The need to foster an environment conducive to innovation by supporting ICT research tailored to the healthcare sector's unique needs, evaluating the efficacy of technological interventions in improving healthcare delivery and patient outcomes.
5. There is need for public-private collaborations with partnerships across government, industry, academia, and civil society to pool resources, expertise, and technologies, facilitating large-scale ICT initiatives that can transform healthcare services.

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