**Knowledge, attitude and utilization of artificial intelligence in healthcare among medical doctors at a state university teaching hospital in enugu state,**

**Nigeria**

**ABSTRACT**

**Background-** The role of artificial intelligence in healthcare is rapidly increasing. Since medical doctors play a key role in AI implementation, barriers to its effective utilization are particularly evident in teaching hospitals especially among developing countries, where future medical professionals are trained and new technologies are introduced.

**Objective**- The aim of this research was to study the knowledge, attitudes, and extent of utilization of Artificial Intelligence (AI) in healthcare among medical doctors at the Enugu State Teaching Hospital, Parklane, Nigeria.

**Methods**- This study was a prospective descriptive and analytical cross-sectional study among medical doctors at a state university teaching hospital in Enugu state, Nigeria.

**Results**- The results showed that majority (68.8%) of the participants had good knowledge of AI in healthcare. Also, 54.4% of the participants had positive attitudes towards AI and 46.8% of the participants had good utilization. AI utilization remains low due to barriers like high cost of implementation and insufficient training, and there is a critical need for structured AI education, better infrastructure and policy development to enhance adoption.

**Recommendation**- To enhance AI utilization in Nigerian healthcare, we recommend integration of AI into medical education, establishing clear AI policies, increasing government investment in AI infrastructure, organizing continuous AI training programs, incorporating AI-based clinical decision support systems, and conducting awareness campaigns to address misconceptions and ethical concerns.

**Key words**: Artificial Intelligence, Healthcare, Nigeria, Knowledge, Attitudes, and Utilization

**INTRODUCTION**

The art of building intelligent machines is called artificial intelligence (AI), and it involves using computer programs to approximate some form of human behaviour.1 Artificial intelligence (AI) is poised to be a revolutionary force in healthcare, with the promise of making an impact by optimizing clinical practice through enhancing diagnostic accuracy and treatment planning or by better managing patients.2

One of the earliest successes for using AI in medicine was a glaucoma diagnosis program created on the basis of the Computer-Aided Software Engineering Network (CASNET). This algorithm utilizes information about a disease for specific patients4, potentially enabling doctors to treat them based on their unique gene and protein expression. Given that AI technologies are more widely integrated into healthcare systems, it is important to understand the knowledge, attitudes and utilization of AI among healthcare providers. In the case of the adoption of AI tools, doctors in particular are key, given their direct interface with patients and their participation in clinical decision-making5.

Despite proven improvements by AI, its acceptance among medical doctors is very heterogeneous, ranging from issues regarding reliability to ethical concerns and related to this, a common fear of interference with the physician-patient relationship6.  Medical professionals' knowledge and attitudes largely determine the fate of AI in medical practice. As the utilization of AI has appeared to be related to positive attitudes towards AI, misconceptions or simply unfamiliarity can impede its adoption. 7 It would also be important to assess the providers' readiness for their AI technologies, in particular within teaching hospitals with a high patient volume and a large number of ways to integrate the AI into clinical workflows.

Advances in attitudes towards AI and how this is driving adoption Although AI has demonstrated to increase diagnostic accuracy, skeptical healthcare providers still question if it can be relied upon in real-time clinical decision-making. 9 The potential ability of AI to affect job security impacted by the human element in treating patients has also made medical practitioners take it slow with AI. 10 Meeting these needs and providing the needed information to use technology effectively are critical for full adoption of AI in healthcare. Implementing AI in healthcare is different in every region and institution based on available infrastructure, educational qualifications of personnel and policy frameworks. Teaching Hospitals are the pillar stones of the healthcare industry; they play a significant role in determining what the future of healthcare is going to look like by training future healthcare professionals. This study is in the domain of healthcare, where a comprehensive understanding of how Teaching Hospital medical doctors perceive AI (at scale) and utilize it in their daily practice can be central for measuring the hospital's readiness toward integrating AI, and to identify any obstacles happening towards its widespread integration. 3

Artificial intelligence (AI) technology is evolving at an unprecedented rate, offering new possibilities to help optimize care worldwide. AI has increased the accuracy of diagnoses and enables personalized treatment and more efficient health systems. 2 Yet the effectiveness of AI in healthcare depends not only on technological capabilities, but also on adopting these tools into clinical practice by appropriately trained and adept healthcare professionals. Teaching Hospitals are a perfect setting for the deployment of several technologies, including AI which aims at enhancing clinical outcomes as well as medical trainee educational experiences. One such area is understanding the attitudes of medical doctors to AI, which can inform targeted interventions such as training programs and policy frameworks to facilitate the adoption of AI within clinical workflows. 2,8

This study aims to bridge the gap and find out about the knowledge, attitude and utilization of AI among medical doctors working at a Teaching Hospital in Enugu state, Nigeria. The study's findings on the obstacles to AI adoption and the willingness of healthcare professionals to employ this technology are intended to help develop strategies that would help in successfully implementing AI in healthcare settings, thereby raising patient care levels and hospital productivity.

**METHODOLOGY**

**Study Area**

Enugu is the capital city of Enugu state with a population density of 456.33 people per square kilometer. Located at latitude 6.4483°N and longitude 7.5139°E in the southeastern region of Nigeria. Igbo-Etiti and Isi-Uzo Local Government Areas border it to the north, Aninri and a portion of Nkanu East Local Government Area border it to the south, and Nkanu East Local Government Area borders it to the east.

Enugu is located in the hot and dry climatic belt. Among these localities, the mean daily temperature varies from 22 to 30°C and relative humidity is 40 to 80% throughout the year. People are primarily civil servants and professionals, traders and artisans, and students. With its various denominations, Christianity is the most widely practiced religion. The principal spoken languages are Igbo and English.

Enugu State University Teaching Hospital (ESUTH), Parklane, a government hospital located in the metropolitan part of Enugu State. The hospital has medical services, surgical services, ambulance services, special clinic services, paediatrics services & obstetrics and gynaecology and other dental allied health care, on-site laboratory service, mortuary service and on-site imaging. With a facility code of 14/04/1/3/2/0001, the hospital is a recognized and licensed Ministry of Health teaching hospital and functions as a tertiary health care center.

Occupational data for the doctors in the hospital was recorded with 70 house officers, 14 medical officers, 117 registrars, 96 senior registrars and 94 consultants.

**Study Design**

This study is a prospective descriptive and analytical cross-sectional study.

**Study Population**

The study population is made up of medical doctors in Enugu State University Teaching Hospital (ESUTH), Parklane, and Enugu.

**Inclusion Criteria**

Medical doctors

a. The entire medical Doctors working in ESUTH Parklane, Enugu state, Nigeria, at the time of this study.

b. The physicians who have been transferred but within (at least) six (6) months.

**Exclusion Criteria**

a. Physicians who did not provide an agreement to this study.

b. Physicians who were on vacation during the time of the study.

c. Physicians on field duty during the study period

**Sample Size Determination**

The Sample size was calculated using the Cochran formula for cross-sectional studies in populations less than 10,000.

We computed as n0= Z² p q/d²

Where:

n0 = the sample size for a population of 10,000 or greater.

Z = is the standard normal deviate (usually set at 1.96, which corresponds with the 95% confidence level)

p = 57.2%75 (referenced prevalence was drawn from a comparative study conducted across the six (6) geopolitical zones in Nigeria, in August 2023)

q = 1.0 - p

d = 0.05 (maximum sampling error)

n0= (1.96)² × 0.572 × 0.428/ (0.05)²

n0= 376.19

An additional 10% of the sample size is added to account for refusal and/or attrition in data collection, just like this:

10 x 376.19/100 = 37.619

376.19 + 37.619 = 413.8

Therefore, number = 414

Getting a sample proportion; population less than 10,000.

n= n0 / [1 + (n0-1) / (N)]

Where;

n = the required sample size when the population is 10,000

The estimated population size, N = 451

n= 414/1.916

n= 216.08 ≈ 216

There were fewer than 10,000 doctors in the ESUT teaching hospital, and a calculated sample size of 216. However, we use a sample size of 250 for the fairest representation.

**Sampling Technique**

 Multi-stage sampling technique was employed.

**First stage: Stratification by Rank**

Medical doctors fall within a hierarchy which makes stratifying them intuitively by their rank: house officers, medical officers, registrars, senior registrars and consultants.

With the proportional allocation like this;

(Stratum)/Total population = strata sample size

House officers = (250 x 70) / 451 = 38.8 ≈ 39

The no of Medical officers = (250\*14) / 451 = 7.7 ≈8

Registrars = (250 x 177) / 451 ≈98 (predictions) registrars

Senior registrars = (250 × 96) / 451 ≈ 53

Consultants = (250) x (94/451) = 52.1 or about 52

Therefore, 98 responses were designated as having a registrar seniority (708 registrars responded), 53 responses with senior registrar level of experience (115 senior registrars responded), as well as 52 responses at consultant level (97 of the people who admitted to being consultants).

Bringing it to 250 doctors in all.

**Stage Two: Systematic Selection of Participants by Rank**

The first doctor in every rank was recruited by a simple random sampling technique (balloting), and the rest were recruited into the study by a systematic sampling technique. A sampling interval of 2 was calculated as the number of doctors in a stratum divided by the sample size allocated to that rank. We chose from that interval until enough people had been sampled for that rank. The sampling interval calculation is listed above.

Stratum population / Stratum sample size = Sampling interval (r)

House officers = 70/39 ≈ 1.79 ⟶2Delivery Staff

Medical officers = 14 / 8=1.75 ≈2

Average = 177 / 98 = 1.813 ⇒ Round up to the next integer (2)

Senior registrars = 96 / 53 = 1.81 ≈ 2

Consultants = 94 / 52 = 1.81 ≈ 2

**Data Collection Instrument**

Study instrument: The study tool was a self-administered semi-structured questionnaire containing questions imported and adapted from other related studies. 26,27,28

The questionnaire comprised:

Section A: Socio-demographic data

Part B: Familiarity with AI in healthcare

Part C: Attitudes about AI Use in Healthcare

Part D: The applications of artificial intelligence (AI) in the field of healthcare

**Data Collection Method**

The doctors were informed about the purpose of the study, and informed consent was obtained from all subjects before administration of the questionnaires, with an assurance of confidentiality and anonymity of their responses. The three researchers (6th-year medical students of ESUT College of Medicine) administered the same set of questionnaires to all the doctors who were concerned. Data collection was conducted over three weeks, from 23rd December 2024 to 11th January 2025. Before the collection of data, the department and project supervisor trained the three researchers on techniques, aims, items on the tool, and logistics of the work.

**Data Management**

Data analysis and entry were done with Statistical Product and Service Solutions (SPSS) software version 27.0

**Measurement of variables**

A. Socio-demographic data

The socio-demography of the participants was recorded as independent variables: age, gender, specialty, experience years, and current rank. The results were given in terms of frequency and percentage as shown.

B. Knowledge about AI healthcare

We measured knowledge with 7 structured questions respect to the contribution and the use of human tissues included in the questionnaire full details in the Additional file 1. All of these items were in the form of knowledge-based questions in which respondents measured their familiarity with AI concepts, General Use-Cases in healthcare (including diagnostics, predictive analytics, and treatment planning), and Implementation Challenges. Every correct solution was assigned 1 point, and every incorrect solution was given 0 points, making for 7 points. The knowledge was evaluated using the median of the summed scores. For evaluating the knowledge, this scoring section ranges from 0-7, and good knowledge was defined as when respondents chose correct answers and scored 4 or more (≥50%) scores, whereas poor knowledge was determined if they scored less than 3.

C. Attitude towards AI in healthcare

Testing respondents for their attitudes with Likert-scale questions from “Strongly Agree” to “Strongly Disagree.” A total of 15 specific questions assessed perceptions of the utility, ethical implications, benefits, and undoing to healthcare through AI & future medical practice. Discussion of certain attitudes to AI integration into training curricula, the replacement or assistance with clinicians' roles, in addition to consideration related to stiffness and emotional constraints, was also raised separately.

There were 15 factors, all response items in which were converted to: strongly agree and agree = 1, neutral + disagree + strongly disagree = 0; the range of total score was from 0–15. Reverse coding was done on variables 9, 16, 17, 18 and 20. Negative attitude before the session (0–7 score) was considered in scores 50%) in the range of 8–15.

D. AI implementation in healthcare

Utilization was assessed by asking participants whether they used AI tools in patient care at present and, if so, which areas specifically (e.g., diagnostics, administrative tasks, treatment planning) or more generally, making their work easier. The questionnaire also contained a section investigating the presence of AI Tools in Teaching hospitals and the reason for unavailability for those who responded no. Factors responsible included factors such as infrastructure, cost involvement, ethical concerns, etc. Each question was scored 1 for a correct response and 0 for an incorrect response on the statistical analysis. A good utilization (>50%) and poor utilization (<50%) were also categorized as yes or no.

**Statistical Analysis**

The text was manually collected and cleaned to detect any omissions and ensure proper coding. Data entry and analysis were done using SPSS. We used a chi-squared test of significance to find out the relationship between the socio-demographic characteristics and knowledge. All tests were two-tailed, and significance was defined at the 0.05 level.

**Limitations**

To start, an option for response bias; some medical doctors could exaggerate how much they know or feel more positively about AI out of professional pride or worrying about being judged. Second, especially in medicine, low response rates may occur, and data collection may be affected because of the busy schedules of medical doctors.

We addressed these deficiencies by using various techniques.

Aspects of anonymity and confidentiality were provided to promote a sense of safety that real, truthful answers were being elicited from all participants. To enhance the response rate, we adopted a multi-modal survey distribution method, like in-person distribution, and disseminated it during hospital meetings.

**RESULTS**

This chapter discloses the outcome of the study in terms of demographic ability, knowledge, and attitude to AI health care and extent of its utilization among medical doctors in Enugu State University Teaching Hospital (ESUTH), Parklane, Enugu State, Nigeria. In total, 250 people responded: response rate 100%. Stat: Data were analyzed and presented in tables in the study.

**Socio-demographic Characteristics of Participants**

Socio-demographic profile of the respondents included age, gender, marital status, specialty, years of experience in the field, highest educational qualification, current rank, and permanent residence. These were analyzed, and the results that each extracted were presented in frequency plus percentage with a table as below.

**4.2. Knowledge of Artificial Intelligence in Healthcare**

**Table 1: Knowledge of Artificial Intelligence among respondents**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Frequency** | **Percentage %** |
| **Heard about artificial intelligence (AI) in healthcare** | Yes | 240 | 96.0% |
| No | 10 | 4.0% |
| **Rated knowledge of AI in healthcare** | Excellent | 32 | 12.8% |
| Good | 94 | 37.8% |
| Average | 106 | 42.6% |
| Poor | 17 | 6.8% |
| **Area(s) of AI in healthcare you are aware of** | Diagnostic | 202 | 26.8% |
| Treatment planning | 144 | 19.1% |
| Predictive analytics | 97 | 12.9% |
| Robot-Assisted Surgery | 168 | 22.3% |
| Patient Monitoring | 142 | 18.9% |
| **Understanding of the limitations of AI in healthcare** | Yes | 151 | 60.4% |
| No | 99 | 39.6% |
| **Learned about AI in medical school** | Yes | 11 | 4.4% |
| No | 239 | 95.6% |
| **Training included a curriculum regarding AI** | Yes | 9 | 3.6% |
| No | 241 | 96.4% |
| **How did you learnt about AI in healthcare** | Formal Training/workshops | 39 | 15.8% |
| Colleagues | 74 | 30.0% |
| Internet/media | 101 | 40.9% |
| Academic journals | 29 | 11.7% |
| Others | 4 | 1.6% |
| **Overall Knowledge**  | **Poor** | 78 | 31.2% |
|  | **Good** | 172 | 68.8% |

Ninety-six per cent (96.0%) had heard of AI, but only one in eight workers rated themselves as very knowledgeable about the topic. Twenty-two per cent claimed to have had no prior exposure, even though only 4.4% learned about AI in medical school, whereas the vast majority of knowledge was garnered from informal sources – the internet (40.9%) and colleagues (30.0%). Knowledge was classified into good or poor knowledge levels.

**Attitude toward Artificial Intelligence in Healthcare**

**Table 2: Attitude toward Artificial Intelligence among respondents**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Strongly agree** | **Agree** | **Neutral** | **Disagree** | **Strongly disagree** |
| **Freq (%)** | **Freq (%)** | **Freq (%)** | **Freq (%)** | **Freq (%)** |
| **AI could be useful in your area of work** | 115 (46.2%) | 121 (48.6%) | 9 (3.6%) | 2 (0.8%) | 2 (0.8%) |
| **The diagnostic ability of AI is superior to the clinical experience of a human doctor** | 24 (9.6%) | 39 (15.6%) | 52 (20.8%) | 95 (38.0%) | 40 (16.0%) |
| **AI will improve healthcare delivery** | 92 (36.8%) | 136 (54.4%) | 21 (8.4%) | 0 (0.0%) | 1 (0.4%) |
| **AI can help reduce the number of medical errors** | 80 (32.0%) | 133 (53.2%) | 32 (12.8%) | 3 (1.2%) | 2 (0.8%) |
| **AI can deliver clinically relevant, vast amounts of high-quality data in real time.** | 99 (39.6%) | 122 (48.8%) | 23 (9.2%) | 6 (2.4%) | 0 (0.0%) |
| **AI should be included in the curriculum in medical school as well as specialist training** | 126 (50.4%) | 98 (39.2%) | 21 (8.4%) | 4 (1.6%) | 1 (0.4%) |
| **I would always use AI when making medical decisions in the future** | 35 (14.0%) | 96 (38.4%) | 90 (36.0%) | 24 (9.6%) | 5 (2.0%) |
| **AI poses ethical concerns in healthcare** | 29 (11.6%) | 86 (34.4%) | 97 (38.8%) | 35 (14.0%) | 3 (1.2%) |
| **AI will replace me at my job** | 6 (2.4%) | 21 (8.4%) | 41 (16.4%) | 98 (39.2%) | 84 (33.6%) |
| **AI cannot be used to provide opinions in unexpected situations** | 26 (10.4%) | 73 (29.2%) | 63 (25.2%) | 76 (30.4%) | 12 (4.8%) |
| **AI is not flexible enough to be applied to every patient** | 45 (18.0%) | 82 (32.8%) | 56 (22.4%) | 57 (22.8%) | 10 (4.0%) |
| **AI has a low ability to sympathise and consider the emotional well-being of the patient** | 65 (26.0%) | 125 (50.0%) | 31 (12.4%) | 26 (10.4%) | 3 (1.2%) |
| **AI would be a burden for practitioners** | 4 (1.6%) | 17 (6.8%) | 48 (19.2%) | 134 (53.6%) | 47 (18.8%) |
| **AI aids practitioners in early diagnosis and assessment of the severity of the disease** | 89 (35.6%) | 138 (55.2%) | 17 (6.8%) | 6 (2.4%) | 0 (0.0%) |
| **AI tools should be integrated into routine healthcare practice** | 130 (52.0%) | 96 (38.4%) | 18 (7.2%) | 5 (2.0%) | 1 (0.4%) |
| **Overall Attitudes**  | **Negative** | 114 | 45.6% |  |  |
|  | **Positive** | 136 | 54.4% |  |  |

About 94.8 of % majority agreed that AI can be useful in healthcare and bring accuracy with less delivery of the services. Most were in favour of some form of AI improving healthcare (54.4%), and that it would reduce errors (53.2%). 38.0% disagreed that AI was better than clinical experience. There were also ethical worries (34.4%) and skepticism regarding the takeover of their roles by AI- 39.2%. Overall, 50.4% percent were strongly in favor of weaving AI into their health professional curriculum

**Utilization of artificial intelligence in healthcare**

**Table 3: Utilization of Artificial Intelligence among respondents**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Frequency** | **Percentage %** |
| **Do you currently use AI tools in clinical practice?** | Yes | 46 | 18.4% |
| No | 204 | 81.6% |
| **Which areas do you use AI for?** | Diagnostic | 38 | 42.7% |
| Administrative tasks | 13 | 14.6% |
| Predictive analytics | 13 | 14.6% |
| Treatment planning | 15 | 16.9% |
| Medical Research | 10 | 11.2% |
| **Does AI makes your task easier?** | Yes | 127 | 50.8% |
| No | 123 | 49.2% |
| **Are there AI tools in your teaching hospital?** | Yes | 15 | 6.0% |
| No | 235 | 94.0% |
| **What are the factors limiting your use of AI in your practice?** | Lack of Knowledge | 123 | 19.1% |
| High cost of implementation | 176 | 27.3% |
| Lack of infrastructure | 164 | 25.4% |
| Resistance to change | 76 | 11.8% |
| Ethical or legal concerns | 105 | 16.3% |
| Others | 1 | 0.2% |
| **Do physicians have an important role in the application and evaluation of AI technology in the medical field?** | Yes | 206 | 82.4% |
| No | 44 | 17.6% |
| **Would you would like to work on AI in future?** | Yes | 218 | 87.2% |
| No | 32 | 12.8% |
| **Should doctors receive specific training on the use of AI tools in healthcare?** | Yes | 233 | 93.2% |
| No | 17 | 6.8% |
| **Overall Utilization**  | **Poor** | 133 | 53.2% |
|  | **Good** | 117 | 46.8% |

Results: 359 participants completed the survey, 72(20.1%) did not appear to use AI in practice, with an AI group encompassing n=66 (18.4 %). AI are mainly used for diagnostics by 42.7% of users, treatment planning by 16.9%, predictive analytics by 14.6% and finally research applied on it affirmed by 11.2% of the participants. Raising costs were the most important barrier, followed by inadequate infrastructure and lack of knowledge. Ninety-three point two per cent thought that doctors should receive training in AI, and 87.2% expressed interest in future use of AI.

**Factors that affect the knowledge of AI in healthcare**

Chi-square test of significance was used to determine the relationship between knowledge and the socio-demographic characteristics. The level of significance was set at 0.05.

**Table 4: Relationship between the socio-demographic characteristics and knowledge of the respondents**

|  |  |  |
| --- | --- | --- |
|  | **Knowledge**  |  |
| **Good** | **Poor** | **P-value** |
| **Frequency (%)** | **Frequency (%)** |
| **Age** | 21 – 25 | 13 (76.5%) | 4 (23.5%) | 0.175 |
| 26 – 30 | 44 (74.6%) | 15 (25.4%) |
| 31 – 35 | 50 (61.7%) | 31 (38.3%) |
| 36 – 40 | 40 (76.9%) | 12 (23.1%) |
| 41 – 45 | 10 (71.4%) | 4 (28.6%) |
| 46 – 50 | 6 (46.2%) | 7 (53.8%) |
| >/= 51 | 2 (100.0%) | 0 (0.0%) |
| **Gender** | Male | 122 (71.3%) | 49 (28.7%) | 0.225 |
| Female | 49 (63.6%) | 28 (36.4%) |
| **Marital Status** | Single | 76 (66.7%) | 38 (33.3%) | 0.817 |
| Married | 92 (70.8%) | 38 (29.2%) |
| Divorced | 2 (66.7%) | 1 (33.3%) |
| Widowed | 1 (100.0%) | 0 (0.0%) |
| **Specialty** | Internal Medicine | 51 (71.8%) | 20 (28.2%) | 0.392 |
| Surgery | 38 (67.9%) | 18 (32.1%) |
| Pathology | 0 (0.0%) | 0 (0.0%) |
| Obstetrics and Gynaecology | 37 (71.2%) | 15 (28.8%) |
| Paediatrics | 33 (67.3%) | 16 (32.7%) |
| Community Medicine | 3 (75.0%) | 1 (25.0%) |
| Family Medicine | 7 (53.8%) | 6 (46.2%) |
| Emergency Medicine | 0 (0.0%) | 2 (100.0%) |
| **Years of Clinical Experience** | </= 5 | 56 (65.1%) | 30 (34.9%) | 0.330 |
| 6 – 10 | 76 (74.5%) | 26 (25.5%) |
| 11 – 15 | 28 (65.1%) | 15 (34.9%) |
| 16 – 20 | 6 (50.0%) | 6 (50.0%) |
| >/= 21 | 4 (80.0%) | 1 (20.0%) |
| **Highest Educational Qualification** | MBBS | 33 (64.7%) | 18 (35.3%) | 0.716 |
| Residency | 128 (69.6%) | 56 (30.4%) |
| Fellowship | 9 (69.2%) | 4 (30.8%) |
| PhD | 2 (100.0%) | 0 (0.0%) |
| **Current Rank** | House Officer | 30 (75.0%) | 10 (25.0%) | 0.029 |
| Medical Officer | 1 (20.0%) | 4 (80.0%) |
| Registrar | 77 (65.8%) | 40 (34.2%) |
| Senior Registrar | 54 (74.0%) | 19 (26.0%) |
| Consultant | 10 (76.9%) | 3 (23.1%) |
| Chief Medical Officer | 0 (0.0%) | 2 (100.0%) |
| **Residence** | Urban | 140 (72.9%) | 52 (27.1%) | 0.040 |
| Semi-urban | 29 (58.0%) | 21 (42.0%) |
| Rural | 3 (42.9%) | 4 (57.1%) |

The table shows socio-demographic distributions of knowledge in parents.

Current rank (p = 0.029) as well as residence (p = 0.040) showed a significant association. Physicians showed the least good knowledge (20 %). The highest level of acceptance was demonstrated by residents of the urban sector (72.9%), and the lowest, by those in rural areas (42.9%).

**DISCUSSION**

This research with its results (tables 1-4) sought to evaluate the knowledge, attitude, and utilization of artificial intelligence (AI) in health care amongst medical doctors working in Enugu State University Teaching Hospital (ESUTH), Parklane, Enugu state, Nigeria.

**KNOWLEDGE OF AI**

In terms of AI knowledge, nearly seven out of 10 (68.8%) had a relatively high level of awareness around artificial intelligence (AI) in healthcare. This finding is different from a study of medical doctors in Port-Harcourt, Nigeria, where it was reported that only 14.2% of the respondents possessed comprehensive knowledge (Table 3). 16 A similar study among medical doctors from various states in Nigeria reported slightly lower levels of knowledge compared to our findings. A total of 51.7% (101/195) medical doctors had good knowledge of AI in healthcare as revealed in this study. Similarly, as low as 48% of Physicians in Morocco had basic knowledge about AI Technologies 15 Different results were found in a survey carried out in Pakistan where OR 0·15 According to the survey, only 27.3% aware of the medicals applications which can be done through AI. 14 However we were about par on knowledge with a study done in Saudi Arabia where 69% of respondents who were aware of AI knew only the basics of Artificial Intelligence.13 Within emergency medicine, a survey of Australian and New Zealand emergency physicians found that 80% had good knowledge of AI. In contrast to our results, 47.6% of Australian commodity pricing clinicians self-rated their AI knowledge as average, and only 5.5% rated their AI knowledge level as excellent

**ATTITUDES TOWARDS AI**

In this research were found to be, as a whole, very positive, with 54.4% having a positive attitude regarding artificial intelligence use in healthcare. This confirms findings from Nigeria, where in Port Harcourt, it was reported that AI practice in any form is lacking; however, the likelihood of acceptance of AI in medicine extends to stakeholders. In our study, 76% of participants concurred that AI cannot be emotional, and 54% disagreed that it could replace them. This finding contrasts with a Moroccan study, which found a majority preferring AI over human specialists due to their perceived lack of emotional exhaustion. Study participants doubts about the ability of AI to make unexpected opinions 39.6% of our study respondents doubted that AI can opinion an unexpected situations, similar to Moroccan study where 31.2 %were not sure if machines can fashion judgments for unforeseen cases, as well as 38.4% believed since artificial intelligence does not think like humans they cannot be universal solutions 15 A Saudi Arabian study also aligned with our study as 17.0% of their participants feared for losing their jobs to AI. 13 This also was observed in 38% of subjects responding to an online survey across 54 countries, with a wider net open and mildly positive view toward AI but still fewer confidence compared to our finding 4. 17 Studying in comparison with the United States it has also been found that the fear of a machine replacing a physician altogether along with lack of an understanding and experience using AI may doubt the loyalty to machine learning forecast. 20 In another survey conducted in London, 21% felt that the widespread application of AI to healthcare carried the risk of privacy intrusion, similar to our results. 19 A German physician survey found that positive attitudes toward AI prevailed in 70% of respondents, but even more so about anticipated cooperation between human and artificial intelligence in medicine (90.1%) or expected contributions by AI apps, especially in drug interaction detection (92.4%), showing more favorable attitudes compared to our results [10]. The differences in AI perceptions of racism could be due to the extent to which specific healthcare systems worldwide have been exposed and integrated with AI. However, emergency clinicians of Australia and New Zealand reported in the other study that they were worried about over-reliance on AI, given its substantial use elsewhere. However, these findings differed from our study, where we expressed concerns related to frequent use leading to over-dependence on technology, which is risky as technology can be fallible27 44 12

**UTILISATION OF AI**

In this study, we observed that only 18.4% of the overall health care professional respondents are utilizing AI tools at their workplace and mostly for diagnostics (42.7%). This trend correlates with similar results obtained by a study that was carried out in Bayelsa State (Table 4). The results displayed an overall of just 1.95 or even below-average AI use in clinical practice. Per the results of this Port-Harcourt [Nigeria] study, though physicians recognised the potential that AI could offer them in their work, they were not actively engaged with it. This is consistent with the findings from our study, where awareness did not translate to high utilization of AI. High cost of implementation (27.3%) and lack of infrastructure (25.4%) were identified as the leading barriers limiting utilization of AI in our study. This additionally concurs with a study in Oyo state, Nigeria. Research documented challenges to the accessibility of AI in healthcare, centered on low internet penetration for high-performance computers, and poorly outlined e-health development policies. Strikingly, Uganda also suffered as a result of prohibitive pricing for high-performance computers that were designed with AI use in mind. 25-28

This serves as an example of the infrastructural hurdle, which is a limitation in using AI in healthcare. Qualitative research in Mozambique showed that healthcare workers use AI to screen and diagnose tuberculosis in a high-security prison 22. A study of 120 pulmonologists in 16 teaching university hospitals in Europe reported a comparison that demonstrates the ability of AI-based software to provide highly accurate interpretation as well as to complement the reading of PFT results with decision support tools. 21 A similar study from Australia and New Zealand revealed a high AI adoption rate, especially in ophthalmology, where 15.7% of them practiced its use. The difference was statistically significant (p = 0.001) and higher than the general rate of utilization in our study. 11 These findings indicate that, although HCPs have a broad positive perception of AI, they still hold concerns about its limitations, ethical concerns, and eventual utility in decision-making. AI utilization in Africa remains low compared to Western countries, demonstrating the need for enhanced infrastructure and knowledge. Notably, the AI knowledge variation factors in this study included current rank. The residence also showed a statistically significant figure. The two factors showed that registrars and urban residents had higher levels of knowledge, matching the outcomes of the Nigerian survey, where 95.4% of resident doctors and about 70% of the urban HCPs had higher AI knowledge in their areas. 16 However, only 4.4% of our respondents had learned about AI during a medical education formal class, a critical gap identified in another study in Uganda, where structured curricula for most fields and levels of education remain low. 24 Globally, educational backgrounds and AI exposure have emerged as the key determinants of AI knowledge. In a Saudi Arabian study, gender influenced the level of AI Knowledge. 13 A separate study in Europe identified the need for specialized AI training for physicians. 17 The AHA investigation into remote ECG monitoring also revealed that elderly patients as the adoption barrier. 19 From the outcomes, we identify the need for structured training programs to promote AI knowledge in Nigeria and other developing regions. As seen in table 3, majority of the doctors (81.6%) do not utilize AI in their routine practice. This can be improved upon as artificial intelligence can be utilized in improving the educational teaching methods for medical students and interns in Enugu state, Nigeria and other developing countries. Some studies have documented the current teaching methods being practiced and the factors affecting the performance of medical students and the skill acquisition among interns in Enugu state, Nigeria which is the target population for this study. 29-34 In this educational teaching regards, artificial intelligence could also be used to improve the performance of the medical students by creating AI-powered tutors, automated educational content generation, personalized feedback and developing adaptive AI-powered learning platforms.

**CONCLUSION (S)**

There was a predominance of positive attitudes towards AI in healthcare overall, and many doctors supported its inclusion in medical training. Notice that while awareness and favorable views regarding AI are high, doctors generally reported using AI little in practice, almost exclusively for diagnostics. Some factors influencing AI knowledge included place of residence and rank, with urban residents and registrars having higher levels of knowledge.

**RECOMMENDATION (S)**

**To The Policy Makers**

1. To foster understanding in the field, AI training should be incorporated into medical training. There is a need for the Medical and Dental Council of Nigeria and related institutions to integrate courses that are focused on AI in medical curricula and residency training. This reflects the fact that few doctors considered their AI expertise to be excellent, and very few medical professionals had received formal AI training.
2. There should be public enlightenment by the Nigerian Medical Association, Public Health Educators and the Ministry of Health. It is for clarification to avoid any misconception of the AI being an alternative to human experience. That concern alone is driven by the perspective that worries about AI replacing human doctors remain, even though it actually could do a better job delivering healthcare.

**To The Hospitals**

1. Hospitals need to establish proper AI usage policies that describe how, when, and where AI should be used for diagnostics, decision making or patient management and also make sure the ethical guidelines regarding data security and patient privacy are not breached. Weakness comes in the form of greater awareness leads to more concern, even as significantly fewer respondents harboured doubts about AI being dependable or ethical.
2. Hospitals should conduct regular workshops and CME (Continuous Medical Education) programs in association with AI experts and data scientists for ongoing training in AI. This was in line with the observation that while physicians were familiar with AI, their knowledge was superficial and therefore is craving for structured training to fill the chasms.

**To The Government**

Its infrastructure to support the design of AIs must be related to government investment. High-performance computing, connectivity, and EMR should be funded to strengthen AI-driven healthcare solutions. This was because the amount of AI use among doctors was found to be generally low and faced a number of barriers; the costs associated with AI, lack of infrastructure and training resulted in a lack thereof.

**Ethical Approval and Consent:**

The research was ethically approved by the Enugu State University Teaching Hospital Ethical Committee (ID: ESUT/HREC/2025/01/002). All participants provided oral or written informed consent, and participation was voluntary. Any information from this study is anonymous, and nobody who participated would be associated with any information.

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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