

The Digital Ummah and Ethical Artificial Intelligence in Nigerian Healthcare: A Narrative Critical Review

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Abstract

Introduction: Artificial intelligence and digital health are now central to discussions on universal health coverage, service quality and health-system accountability. The digital health, frames digital technologies as tools for access, personalised care, patient engagement, privacy, affordability, equity and transparent information. These tools are limited in meeting the spiritual and ethical healthcare needs of Muslims. This review develops that argument into a Nigerian healthcare ethics and health-system paper. It asks how Islamic moral reasoning can guide artificial intelligence without weakening plural citizenship, professional standards or scientific validation.

Methodology: This was a narrative critical review. Peer-reviewed literature and official policy documents on artificial intelligence ethics, Islamic bioethics, Nigerian digital health, health financing, data protection and universal health coverage were purposively reviewed. The synthesis focused on content relevance, ethical coherence and reference integrity.

Results: Six linked themes were identified as essential to meet the Digital Ummah needs. First, the Digital Ummah concept usefully places access, affordability, privacy, transparency and equity at the centre of technological change. Second, Islamic healthcare ethics can be translated into artificial intelligence governance through *hifz al-nafs*, *hifz al-aql*, *hifz al-mal*, *adl*, *amanah*, *ihsan*, *la darar*, *shura* and *maslahah*. Third, Nigeria requires artificial intelligence to serve practical health functions, including enrolment, risk pooling, benefit design, provider payment, clinical decision support, claims review, public health surveillance and patient engagement. Fourth, the source presentation underdevelops actuarial design, adverse selection, provider incentives, lifecycle regulation, clinical validation, interoperability and inclusion. Fifth, implementation must be adapted to Muslim-majority states, mixed communities, rural settings and urban plural environments. Sixth, this paper proposes the AMANA-AI Health Architecture Model as a framework for integrating Islamic ethics, responsible artificial intelligence and Nigeria's digital health architecture.

Conclusion: Artificial intelligence for the Ummah should not be treated as a collection of attractive digital tools. It should be governed as a justice-sensitive, evidence-based and culturally grounded health-system intervention. Nigeria needs locally validated artificial intelligence, strong data protection, inclusive digital infrastructure, accountable provider incentives and plural governance that protects Muslims and non-Muslims alike.

Keywords: Artificial intelligence, Digital health, Islamic bioethics, Nigeria, Universal health coverage.

Introduction

Artificial intelligence has moved from speculative innovation into practical health-system use. Algorithms now support image interpretation, triage, remote monitoring, clinical documentation, supply-chain forecasting, claims review, health education and population-health surveillance [1,2]. These uses are attractive in countries with workforce shortages, uneven specialist distribution, high out-of-pocket expenditure and weak health-information systems. The same technologies can also reproduce bias, weaken privacy, exclude poor and digitally

marginalised groups, and shift accountability away from clinicians and institutions [3-5].

Digital health reform is therefore not only a technical issue. It is also an ethical, legal and governance question. WHO has argued that digital health should strengthen health systems, improve access and support universal health coverage, while remaining safe, equitable and sustainable [6]. Nigeria's Digital in Health Initiative similarly seeks to build a national digital health architecture, promote electronic medical records and enable data exchange across health facilities [7]. These ambitions build on earlier

national health information and communication technology planning, which recognised the role of coordinated digital systems in improving service delivery and health-system performance [8].

The ethical challenge becomes sharper when digital health is linked to financing and personal data. The Nigeria Data Protection Act 2023 provides a legal framework for protecting personal data and establishes the Nigeria Data Protection Commission [9]. The National Health Insurance Authority Act 2022 makes health insurance mandatory and provides for mechanisms such as vulnerable group coverage [10]. Commentaries and reviews of the Act suggest that its promise will depend on implementation, state-level capacity, informal-sector enrolment, provider contracting and public trust [11-13]. At the same time, World Bank data show that out-of-pocket payment remains a dominant source of health expenditure in Nigeria [14]. Empirical work has also shown that out-of-pocket spending can push Nigerian households into catastrophic expenditure and poverty [15]. If artificial intelligence is added to these reforms without safeguards, it may automate inequity. If governed well, it may strengthen coverage, detect waste, target subsidies and improve care.

The Digital Ummah idea sits within this context. In Islamic thought, the Ummah refers to the Muslim community. In Nigerian healthcare, however, a faith-informed health project must also speak to the wider moral public. Nigeria is religiously plural. Recent Pew estimates place Muslims as a national majority while Christians also constitute a very large proportion of the population [16]. This reality requires an approach that is Islamic in moral grammar, Nigerian in institutional design and plural in public accountability.

This paper therefore reframes the Digital Ummah idea as a narrative critical review of artificial intelligence, Islamic healthcare ethics and Nigerian health-system transformation. It asks four questions. First, what does Islamic healthcare ethics add to mainstream artificial intelligence ethics? Second, how can those ethical commitments be translated into concrete health functions in Nigeria? Third, what does the source presentation do well, and what remains underdeveloped? Fourth, what framework can guide policymakers, Muslim health organisations, cooperative leaders, digital health developers, health financing agencies and providers?

Methodology

This was a narrative critical review rather than a systematic review. A narrative approach was appropriate because the topic cuts across normative Islamic bioethics, health-system analysis, artificial intelligence governance, Nigerian health financing and digital health policy.

The source presentation, *The Digital Ummah: Leveraging Artificial Intelligence for Inclusive and Ethical Healthcare*, was treated as the primary conceptual material. It was not treated as a peer-reviewed evidence source because full bibliographic details were not supplied. [Author query: Please provide the presenter's name, date, venue, institutional affiliation and permission status for the source presentation if it is to be cited formally.]

The literature was purposively selected from peer-reviewed journals, PubMed-indexed articles, official WHO publications, Nigerian policy documents and legal instruments. Search concepts included artificial intelligence in healthcare, artificial intelligence ethics, digital health, Islamic bioethics, Maqasid al-Shariah, Nigeria health financing, National Health Insurance Authority Act, Nigeria data protection, health information systems, out-of-pocket expenditure, algorithmic bias, clinical artificial intelligence validation and health equity. Priority was given to real, verifiable publications and official sources published up to June 2026.

The synthesis used four analytic steps. First, the ethical claims in the literatures were extracted and grouped under access, personalisation, engagement, privacy, transparency, affordability and equity. Second, these themes were compared with Islamic bioethical principles and mainstream biomedical ethics. Third, the themes were mapped to health-system and artificial intelligence functions relevant to Nigeria, including service delivery, financing, provider payment, regulation, digital infrastructure and inclusion. Fourth, gaps were identified and used to develop an original conceptual framework, the AMANA-AI Health Architecture Model.

Results and synthesis

Conceptual contributions of reviewed literatures

The reviewed literatures' first strength are their broad view of digital healthcare. It does not restrict artificial intelligence to diagnosis. It discusses telemedicine, image-supported dermatology, 3D printing, gene-

editing technologies, virtual reality, remote monitoring, smart bandages, accessibility tools, personalised care, digital therapeutics, patient portals and health education. This breadth is useful because artificial intelligence in Nigeria is unlikely to transform care through a single hospital-based tool. Its more realistic value will be distributed across access, decision support, workflow, financing, public health, patient communication and quality improvement [1-4].

A second strength is the early recognition of ethical risk. The presentation identifies privacy, security, bias, equitable access, affordability and transparent information as concerns that must accompany digital health deployment. This is consistent with WHO's view that artificial intelligence for health must protect autonomy, promote safety and public interest, ensure transparency, foster responsibility, advance inclusiveness and remain responsive and sustainable [4]. WHO regulatory guidance also emphasises documentation, risk management, clinical evaluation, data quality, privacy and post-market monitoring [5].

A third strength is the insistence that Islamic ethics is not external to healthcare quality. The presentation links equity and excellence to religious duty, and treats the protection of life as central to medical practice. This helps move Muslim health discourse beyond charitable sentiment. It allows ethics to be translated into operational questions: who is reached, whose data are used, who pays, who benefits, who is harmed, who can appeal, and who is accountable when an artificial intelligence-supported decision is wrong?

Islamic healthcare ethics translated into artificial intelligence and health-system functions

Islamic bioethics is not reducible to scriptural quotation or moral exhortation. It is a juristic and ethical tradition that reasons about intention, action, consequences, necessity, harm, public benefit and human dignity [17-21]. In healthcare, this tradition can be read alongside mainstream principles of beneficence, non-maleficence, autonomy and justice, while retaining its distinctive emphasis on divine accountability, communal welfare, moral character,

preservation of life and protection from harm [18-22].

The table shows that Islamic ethics can become a practical design language for artificial intelligence. It links moral vocabulary to health-system tasks, measurable safeguards and governance responsibilities. Ethical artificial intelligence cannot be guaranteed by good intention alone. It requires design choices, documentation, validation, accountability and correction.

The most critical translation is from justice to actuarial fairness. Many health artificial intelligence systems use historical cost, health service utilisation or claims history as proxies for need. In settings where poor people underuse care because they cannot pay, such proxies can misclassify deprivation as low need. Obermeyer and colleagues showed how a widely used population-health algorithm in the United States produced racial bias because cost was used as a proxy for illness [23]. In Nigeria, the danger is broader. Ability to pay, distance from facilities, gendered access, disability, state of residence and informal work may all distort datasets. An Islamic ethic of *adl* therefore requires need-sensitive data design rather than blind reliance on historical expenditure.

Nigeria-specific health and artificial intelligence functions

For Nigeria, ethical artificial intelligence must serve concrete health functions. First, it can support access through telemedicine, symptom navigation, referral routing, community health worker decision support and remote monitoring. These tools are relevant in rural areas, conflict-affected communities, settlements of internally displaced persons and areas with few specialists. Access tools must be linked to real providers, referral pathways and emergency transport. A chatbot that gives advice without a functioning referral system may create false reassurance rather than care.

Table 1: Islamic healthcare ethics translated into artificial intelligence and health-system functions

Islamic ethical principle	Health and artificial intelligence function	Practical Nigerian translation	Safeguards and indicators
Hifz al-nafs: protection of life	Triage, clinical decision support, emergency referral, disease surveillance	Use artificial intelligence to identify danger signs in primary care, maternal health, mental health, epidemics and chronic disease, while ensuring rapid human escalation.	Nigerian clinical validation; emergency override; audit of false negatives and missed referrals.
Adl and qist: justice and fairness	Eligibility, enrolment, risk adjustment, benefit design, claims review	Do not allow artificial intelligence to deny care because patients are poor, rural, female, disabled, informally employed or poorly represented in datasets.	Fairness audits by state, gender, language, disability, income and religion; appeal mechanisms; public reporting.
Amanah: trust and accountability	Data stewardship, procurement, vendor management, clinical responsibility	Assign named human responsibility for tools used by hospitals, state insurance agencies, HMOs and vendors.	Data processing agreements; audit trails; incident reporting; professional accountability; transparent procurement.
Ihsan: excellence and quality	Quality measurement, provider feedback, guideline adherence, patient experience	Use artificial intelligence to identify unsafe prescribing, delayed referrals, poor follow-up and avoidable readmissions without humiliating providers.	Quality-improvement orientation; peer review; provider training; non-punitive learning before sanctions.
La darar wa la dirar: no harm	Safety, cybersecurity, adverse-event monitoring, model updates	Prevent harm from wrong advice, privacy breaches, discriminatory denial or unsafe automation.	Safety case before deployment; red-team testing; downtime plans; post-deployment surveillance.
Shura: consultation	Governance, consent design, community engagement	Include clinicians, patients, women, disability advocates, Muslim scholars, Christian leaders, informal-sector groups and regulators in high-impact artificial intelligence decisions.	Participatory boards; documented consultation; culturally understandable consent materials.
Satr and hurmah: privacy and dignity	Electronic records, remote monitoring, mental health platforms, reproductive and genetic data	Protect sensitive data from unnecessary disclosure, stigma, surveillance and commercial exploitation.	NDPA compliance; privacy by design; minimum necessary data; role-based access; de-identification where appropriate.
Maslahah: public interest	Population health, resource allocation, outbreak response, benefit-package prioritisation	Deploy artificial intelligence where it measurably improves access, safety, financial protection or public health, not merely where it is commercially attractive.	Public-interest test; cost-effectiveness; budget-impact review; equity impact assessment.
Hifz al-mal: protection of wealth	Financial protection, fraud detection, provider payment, claims analytics	Use artificial intelligence to reduce waste and fraud while protecting patients from catastrophic spending and unjust claims denial.	Need-based risk adjustment; transparent denial reasons; appeals; monitoring of high-risk patient exclusion.
Karama: human dignity	Patient engagement, digital therapeutics, disability access, language access	Design tools for Hausa, Yoruba, Igbo, Pidgin and local literacy realities; include people with disabilities and low-end phones.	Accessibility standards; offline and USSD options; patient comprehension checks; language-specific evaluation.

Second, artificial intelligence can support enrolment, risk pooling and financial protection. The NHIA Act 2022 creates a legal basis for mandatory insurance and vulnerable group coverage [10-13]. Artificial intelligence could help identify uninsured households, predict catastrophic expenditure risk, detect duplicate enrolment, support targeted subsidies and improve premium collection for informal-sector groups. This requires careful safeguards. Algorithms should not label high-risk families as commercially unattractive, exclude people with chronic illness, or allow private schemes to cream-skim healthy populations.

Third, artificial intelligence can support strategic purchasing and provider payment. Nigeria needs more than digital registration. Health financing agencies must purchase services that are necessary, safe, efficient and equitable. Artificial intelligence can review claims, detect fraud, flag irrational prescribing, compare provider quality and support capitation, case-based payment or pay-for-quality models. Poorly designed systems can also intensify denial of claims, under-service, under capitation, upcoding under case-based payment and punitive surveillance of providers. The ethical question is therefore not whether artificial intelligence should be used, but what incentives it monitors and what rights of appeal exist.

Fourth, artificial intelligence can strengthen service quality and safety. It may improve early detection of high-risk pregnancy, tuberculosis, diabetes complications, mental health crises, medication interactions and outbreak signals. Yet imported tools should not be deployed at scale simply because they performed well elsewhere. Studies of diagnostic artificial intelligence have shown that evidence quality, reporting standards and external validation often remain limited [24]. CONSORT-AI, SPIRIT-AI and DECIDE-AI provide useful reporting and evaluation guidance for trials, protocols and early-stage clinical evaluation of artificial intelligence interventions [25-27]. Responsible machine learning also requires attention to patient safety, workflow, human oversight and clinical impact [28,29].

Fifth, artificial intelligence can improve patient engagement. It rightly highlights patient portals, digital health education and personalised interventions. In Nigeria, this must include low-literacy formats, voice prompts, local languages,

disability access, cultural sensitivity and family decision-making patterns. Digital engagement should strengthen, not replace, the clinician-patient relationship. It should also protect confidential conditions such as mental illness, HIV, infertility, substance use disorders, sexual violence and reproductive health concerns.

Further ethical lessons that appear underdeveloped

The reviewed literatures on digital health in Nigeria are conceptually useful but appear limited in some areas. First, it treats artificial intelligence mainly as technology for access, personalisation and workflow. It does not sufficiently analyse artificial intelligence as part of health financing, actuarial modelling, provider payment and purchasing. This matters because many ethically consequential decisions will occur not at the bedside, but in enrolment, claims approval, risk scoring, fraud detection and allocation of subsidies.

Second, the presentation identifies bias but does not specify how bias arises. Bias can enter through non-representative training data, missing data, wrong proxy variables, historical discrimination, poor labelling, language exclusion and deployment in settings different from the development environment. In Nigeria, these risks are heightened by fragmented records, high out-of-pocket expenditure, uneven digital infrastructure, poor civil registration, informal employment and state-level disparities.

Third, provider incentives are largely absent. Artificial intelligence may support better care only if providers are paid and governed in ways that reward appropriate service delivery. If payment systems reward volume, algorithms may accelerate unnecessary care. If payment systems reward cost suppression, algorithms may facilitate under-treatment. Islamic ethics requires fairness to both patients and providers: patients should not be denied needed care, and providers should not be placed under opaque, punitive or impossible digital regimes.

Fourth, adverse selection and moral hazard need explicit treatment. Voluntary insurance schemes may attract mainly people who already expect high healthcare use, while healthy informal-sector workers may stay out until they are ill. Providers may also increase claims when payment rules are weak. Artificial intelligence can help identify these patterns, but it can also be misused to exclude high-risk individuals. A morally defensible system must

combine mandatory participation, subsidies for the poor, risk adjustment, provider audits and transparent appeals.

Fifth, the regulatory discussion needs localisation. The literatures acknowledged foreign regulatory examples, but for Nigeria in 2026, the more direct legal anchor is the Nigeria Data Protection Act 2023 and the Nigeria Data Protection Commission [9]. Health artificial intelligence governance must also connect with professional regulation, medical-device oversight, research ethics, consumer protection, cybersecurity, procurement rules and the emerging national digital health architecture.

Sixth, inclusion needs stronger operational detail. A Digital Ummah model should not assume smartphones, English literacy, stable electricity or uniform religious expectations. It must include USSD, assisted enrolment, trusted community agents, offline functionality, voice-based tools, disability access, gender-sensitive design and protection for people who do not want religiously framed services. In plural Nigeria, Islamic motivation should widen solidarity, not narrow eligibility.

The AMANA-AI Health Architecture Model

This review proposes the AMANA-AI Health Architecture Model as a practical framework for integrating Islamic healthcare ethics into Nigeria's digital health and artificial intelligence systems. AMANA means trust. It also functions as an acronym: Accountability, Maqasid alignment, Actuarial fairness, Non-maleficence and Access. The model is designed for ministries of health, state health insurance agencies, Muslim medical organisations, cooperative health schemes, digital health vendors, hospitals and public health programmemeemes.

Accountability requires named responsibility across the artificial intelligence lifecycle. Every tool used for clinical, administrative or financing decisions should have an accountable clinical owner, data controller, technical owner and institutional governance body. Maqasid alignment requires each tool to state which health good it protects: life, intellect, dignity, family, property, faith-sensitive conscience or public welfare. Actuarial fairness requires data systems, risk scoring and benefit design to protect high-need groups rather than exclude them. Non-maleficence requires validation, cybersecurity, human oversight, incident reporting and safe decommissioning when tools fail. Access requires

multilingual, disability-sensitive, low-bandwidth and plural design.

The model has five layers. The data layer concerns identity, consent, interoperability, privacy and data quality. The algorithm layer concerns model development, validation, bias testing and explainability. The service layer concerns provider workflows, referral systems, patient engagement and clinical responsibility. The financing layer concerns enrolment, pooling, purchasing, provider payment and claims. The governance layer concerns regulation, community consultation, professional accountability, Shariah-informed ethical reflection and plural public oversight.

Discussion

The Digital Ummah idea is strongest when it is interpreted as a theory of ethical infrastructure rather than as a celebration of technology. Its central message is that artificial intelligence must improve access, protect life, preserve dignity, support transparency and promote fairness. This message is timely because Nigeria is simultaneously expanding health insurance, digitising health information systems and confronting persistent financial hardship from healthcare spending [7-15]. The ethical task is to ensure that these reforms converge around people, not around software procurement.

Islamic healthcare ethics strengthens artificial intelligence governance in three ways. First, it foregrounds moral intention. A tool should not be adopted merely because it is novel, fundable or marketable. It should serve a real health need. Second, it insists that method matters. A beneficial goal cannot justify privacy violations, discrimination, deceptive consent, unsafe automation or exclusion of vulnerable patients. Third, it judges outcomes in terms of human welfare and harm. These elements mirror Maqasid-based approaches to bioethics, which examine intention, method and outcome within a hierarchy of human interests [19].

Islamic ethics still has to be made operational. Appeals to equity and protection of life do not automatically solve actuarial design, provider payment or data governance. For example, an insurance algorithm may appear efficient because it reduces claims expenditure. Yet if it achieves savings by denying care to poor patients with incomplete

Table 2: Nigeria-specific implementation pathways and risks for the Digital Ummah

Setting or population	Implementation pathway	Main risks	Controls and indicators
Muslim-majority northern states and rural communities	Link state health insurance schemes, primary healthcare facilities, zakat and waqf actors, Islamic medical associations, women's groups, community health workers and mosque-based health education.	Religious gatekeeping; gender exclusion; weak broadband; insecurity; over-reliance on volunteers; politicisation of data.	Need-based eligibility; female digital health agents; offline tools; security-aware referral pathways; interfaith access guarantees; state-level equity dashboards.
Mixed states and Middle Belt communities	Use interfaith governance boards and neutral benefit packages while allowing faith-sensitive counselling and consent support where requested.	Suspicion that Islamic framing favours one group; conflict sensitivity; language and identity-based exclusion.	Transparent rules; Christian and traditional community representation; grievance channels; public reporting by geography and vulnerability rather than religion alone.
Urban plural settings: Lagos, FCT, Kano, Port Harcourt and large university towns	Integrate artificial intelligence-enabled triage, telemedicine, private hospitals, laboratories, pharmacies, HMOs, fintech payment channels and state insurance platforms.	Commercial capture; privacy breaches; fragmented platforms; overdiagnosis; aggressive marketing; exclusion of urban poor.	Vendor accreditation; NDPA compliance; price transparency; claims audit; consumer protection; low-cost public options.
Informal-sector workers, market associations, artisans and transport unions	Use cooperative enrolment, agent-assisted registration, USSD payments, flexible premiums, group risk pools and artificial intelligence-supported subsidy targeting.	Adverse selection; irregular contributions; fraud; data errors; exclusion of seasonal workers and migrants.	Mandatory or auto-enrolment where lawful; grace periods; risk equalisation; human verification; appeals and portability across states.
Women, adolescents, persons with disabilities and displaced populations	Design accessible tools for maternal health, mental health, gender-based violence response, rehabilitation, disability support and chronic care.	Phone ownership gaps; confidentiality risks; male gatekeeping; stigma; inaccessible interfaces.	Confidential channels; disability standards; voice and local-language tools; safeguarding protocols; gender-disaggregated monitoring.
Providers, state schemes and purchasing agencies	Deploy artificial intelligence for claims review, clinical audit, referral tracking, medicine use, provider quality measurement and payment reform.	Opaque claim denial; upcoding; under-service; provider distrust; punitive surveillance.	Explainable payment rules; provider appeal panels; peer review; audit trails; balanced indicators for cost, quality and patient outcome.
Public health emergencies and outbreak response	Use artificial intelligence for signal detection, logistics forecasting, vaccination planning, misinformation tracking and community risk communication.	Surveillance creep; stigmatisation of communities; inaccurate local predictions; emergency procurement abuse.	Time-limited data use; ethics review; community communication; public procurement disclosure; independent after-action review.

payment or data governance. For example, an insurance algorithm may appear efficient because it reduces claims expenditure. Yet if it achieves savings by denying care to poor patients with incomplete

records, it violates both health economics and Islamic justice. Similarly, a telemedicine platform may expand consultations, but if it lacks referral

pathways, emergency escalation and language adaptation, it may widen inequity.

Health economics is therefore indispensable. Universal health coverage depends on revenue raising, pooling, purchasing, benefit design, financial protection, service quality and governance. Artificial intelligence can assist each function, but only if the moral objective is explicit. In informal-sector enrolment, it may identify households likely to need subsidy support. In risk pooling, it may detect imbalances across schemes and help design risk equalisation. In purchasing, it may compare provider performance. In benefit design, it may help model affordable packages. In claims, it may detect fraud and waste. Yet every use carries a justice risk if the system mistakes low utilisation for low need, poor documentation for low eligibility, or costly illness for undesirable membership.

Provider payment deserves special attention. Capitation can improve predictability and encourage prevention, but it may also encourage under-service. Fee-for-service may improve access but can encourage unnecessary care. Case-based payment may improve efficiency but can encourage upcoding. Pay-for-performance may reward quality but can punish providers serving complex populations. Artificial intelligence can monitor these effects, but ethical design must include risk adjustment, patient outcomes, provider context and appeal rights. An Islamic ethic of amanah applies not only to clinicians, but also to purchasers, scheme managers, software vendors and regulators.

The Nigerian digital health environment creates both opportunity and risk. The National Health ICT Strategic Framework recognised the need for coordinated architecture and health information systems linked to universal health coverage [8]. The Digital in Health Initiative seeks to move towards national electronic medical records and data exchange [7]. These are important foundations because artificial intelligence quality depends on data quality, interoperability and governance. Fragmented databases, inconsistent identifiers, weak consent processes and poor cybersecurity will produce fragile artificial intelligence. In such a setting, importing sophisticated models may create an illusion of modernity without improving care.

Data protection is a central test of seriousness. The Nigeria Data Protection Act 2023 provides a legal

framework for personal data protection and establishes the Nigeria Data Protection Commission [9]. Health data require special care because misuse can cause stigma, discrimination, family conflict, employment harm and loss of trust. Mental health, HIV, reproductive, genomic and substance-use data are especially sensitive. Islamic ethics reinforces this legal duty through the concepts of privacy, dignity and trust. The practical requirement is privacy by design, role-based access, minimum necessary data, cybersecurity, consent where appropriate, de-identification for secondary use and clear accountability for breaches.

Clinical validation is another test. Artificial intelligence tools often perform worse when moved from the population, language, device, workflow or disease pattern on which they were trained. This risk is not theoretical. Reviews of diagnostic artificial intelligence have shown weaknesses in design, reporting standards and validation [24]. Reporting guidelines such as CONSORT-AI, SPIRIT-AI and DECIDE-AI are therefore relevant to Nigeria [25-27]. For the Digital Ummah, validation is an ethical obligation, not a technical luxury. A tool that has not been tested among Nigerian patients, providers and workflows should not be allowed to make high-stakes decisions without strong human oversight.

Implementation must also be geographically and culturally intelligent. In Muslim-majority states, Islamic medical associations, zakat and waqf institutions, mosque networks, women's groups and state health insurance agencies can support trust, health literacy, subsidy mobilisation and enrolment. In mixed states, the same model must be deliberately interfaith and conflict-sensitive. In urban plural settings, regulation should focus on commercial platforms, privacy, price transparency, interoperability and protection of the urban poor. Across all settings, Islamic ethics should function as a source of solidarity, not as a tool of exclusion.

The informal sector is perhaps the most important test case. Many Nigerians work outside formal payroll systems, including traders, artisans, transport workers, farmers, domestic workers, religious teachers and small business operators. They are difficult to enrol, difficult to retain and often exposed to catastrophic spending. Earlier work on community-based health insurance in Nigeria shows that uptake and integration have long been

challenging [30]. More recent work on community-based health financing in Anambra State also shows that uptake is shaped by socio-demographic and economic realities [31]. Artificial intelligence-supported enrolment may help identify groups, forecast payment patterns, support flexible contributions and target subsidies. But adverse selection will persist unless schemes are large, trusted, affordable and linked to real service benefits. Community-based and cooperative mechanisms can help, but they must be integrated into state and national risk pools rather than left as small, fragile schemes.

This review has limitations. It is a narrative synthesis and does not estimate effect sizes. It draws on the some of the existing literatures as conceptual materials, not as empirical evidence of artificial intelligence implementation. The AMANA-AI model is original and requires field testing. Future studies should assess whether the model improves ethical procurement, model validation, enrolment equity, provider trust, patient understanding, financial protection and service outcomes.

Policy and research recommendations

Nigeria should develop a national health artificial intelligence governance guideline aligned with WHO guidance, the Nigeria Data Protection Act, the NHIA Act and the Digital in Health Initiative.

High-impact artificial intelligence tools used for diagnosis, triage, enrolment, claims approval, provider payment or subsidy targeting should undergo algorithmic impact assessment before deployment.

State health insurance agencies and NHIA-linked schemes should prohibit artificial intelligence-supported exclusion on the basis of chronic illness, disability, pregnancy, poverty, state of residence, incomplete records or predicted high cost.

Artificial intelligence systems used in health financing should include need-based risk adjustment, human review of adverse decisions, transparent denial reasons and accessible appeal mechanisms.

Muslim health organisations, Islamic cooperatives, zakat and waqf institutions should pilot Digital Ummah programmes only within inclusive, lawful and plural governance arrangements.

Digital health tools should be designed for Nigerian realities: low-end phones, USSD, intermittent

electricity, local languages, voice prompts, disability access and assisted enrolment.

Hospitals and providers should have clear policies on human oversight, clinical responsibility, documentation, incident reporting and patient disclosure when artificial intelligence influences care.

Research ethics committees should require local validation, data protection plans and equity monitoring for artificial intelligence studies involving Nigerian patients or health records.

Future research should evaluate the AMANA-AI model in Muslim-majority, mixed and urban plural settings, using outcomes such as access, financial protection, patient trust, provider behaviour, safety incidents and equity of algorithmic performance.

Nigeria should build multidisciplinary capacity in health artificial intelligence ethics, including clinicians, data scientists, Islamic bioethicists, health economists, lawyers, disability advocates, community representatives and patient groups.

Conclusion

Artificial intelligence can help Nigeria move towards more inclusive, efficient and responsive healthcare. It can also automate exclusion, conceal unfair decisions and deepen mistrust. The Digital Ummah presentation rightly insists that technology must be judged by access, affordability, privacy, transparency and equity. This review extends that claim by showing how Islamic healthcare ethics can be translated into artificial intelligence governance, health financing, provider payment, clinical safety and digital health architecture.

The proposed AMANA-AI Health Architecture Model provides a practical bridge between Islamic moral reasoning and Nigeria's health-system needs. It requires accountability, Maqasid alignment, actuarial fairness, non-maleficence and access. It also recognises Nigeria's plural reality: a Muslim ethical contribution to healthcare must protect the common good and serve patients across religious, ethnic, gender, disability and socioeconomic lines. The Digital Ummah should therefore be understood not as a closed religious technology project, but as a faith-informed, rights-respecting and evidence-based contribution to universal health coverage.

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