Artificial Intelligence for Immunization: Empowering Health Workers to Improve Vaccination Coverage in Ibadan-North LGA, Oyo State, Nigeria

Executive Summary

This study examined health workers' knowledge, perception, utilization, and factors influencing AI use in vaccination programs in Ibadan-North Local Government Area, Oyo State, Nigeria. Through a descriptive, cross-sectional survey involving 422 health workers across selected healthcare facilities, it examined knowledge, perceptions, usage and factors influencing AI use. Findings revealed that while most health workers had heard of AI, their practical knowledge and utilization remained low. However, nearly all respondents acknowledged AI's potential to enhance efficiency, reduce errors, and improve vaccine tracking and outreach. Major barriers identified included inadequate training, poor infrastructure, and limited digital support.
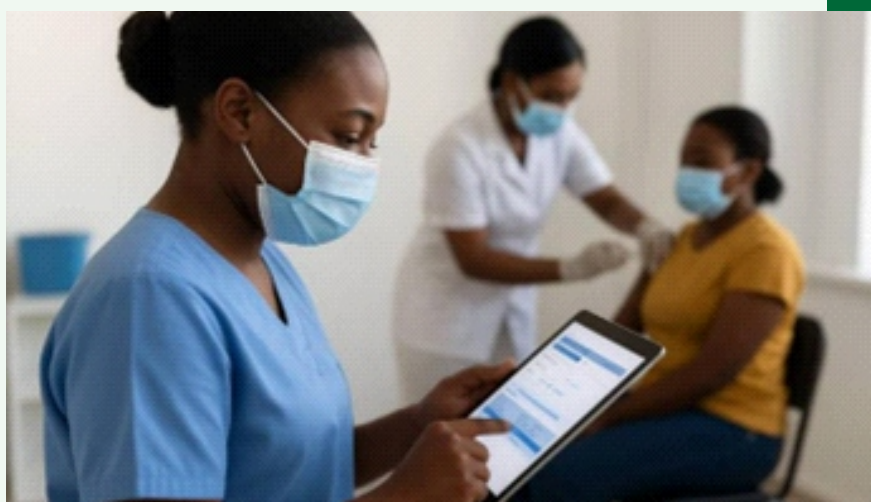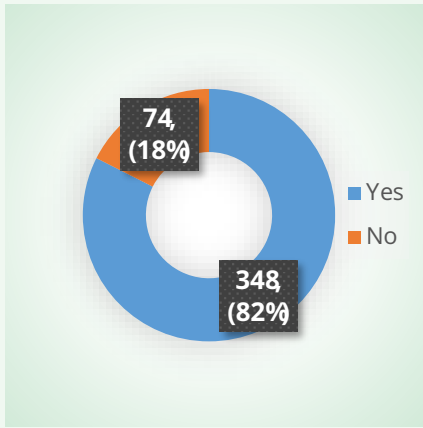
Introduction

Vaccination remains one of the most effective public health interventions for preventing infectious diseases. Despite global progress, Nigeria continues to record suboptimal vaccination coverage rates. Artificial Intelligence (AI) offers innovative opportunities to strengthen health systems through predictive analytics, automated reminders, and digital decision-support tools. However, in Nigeria, the use of AI in immunization remains limited due to infrastructural, policy, and capacity gaps. This study examined the knowledge, perception, and use of AI among health workers in Ibadan-North LGA to inform policy actions for enhanced immunization outcomes.
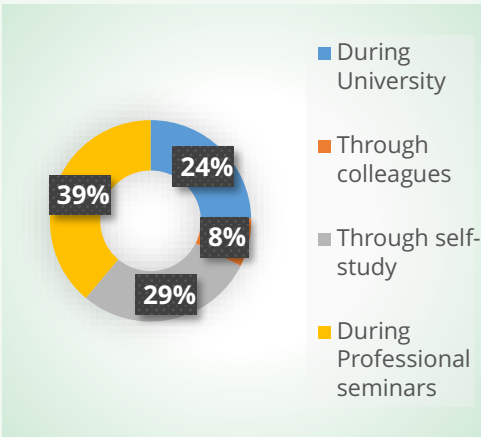
Methodology

A descriptive cross-sectional design was adopted using a mixed-method approach. Quantitative data were collected from 422 health workers selected through stratified random sampling across public and private health facilities in Ibadan-North LGA. Semi-structured questionnaires and key informant interviews were used to gather data on knowledge, perception, and use of AI for vaccination services. Data were analyzed using SPSS Version 25, applying descriptive statistics and thematic analysis for qualitative responses.

Key Messages

- About 96.2% of respondents agreed that AI can improve vaccination service efficiency.

- Over half (51.9%) of health workers demonstrated adequate computer literacy essential for AI use.

- Training gaps persist with only 38.9% had attended AI-related seminars or workshops.

- Major barriers include insufficient infrastructure, poor internet connectivity, and lack of AI related policy guidance.

- Capacity building, supportive policies, and investment in digital health systems are critical for sustainable implementation.

- Collaborative efforts between government and NGOs are crucial for enhancing vaccination services and AI integration in Nigeria.

Results

Use of AI Tools

Yes 348, (82%)
No 74, (18%)

Knowledge on AI

- During University — 24%
- Through colleagues — 8%
- Through self-study — 29%
- During Professional seminars — 39%

Factors Influencing AI USE (Internet Access)

Yes 321, (76%)
No 101, (24%)

Perceptions of AI

Bar chart (Percentage %):
- Basic — 10.00%
- Advanced — 23.20%
- Hands on Experiences — 51.70%
- Outgoing mentorship — 1.20%
- Certification program — 14.00%
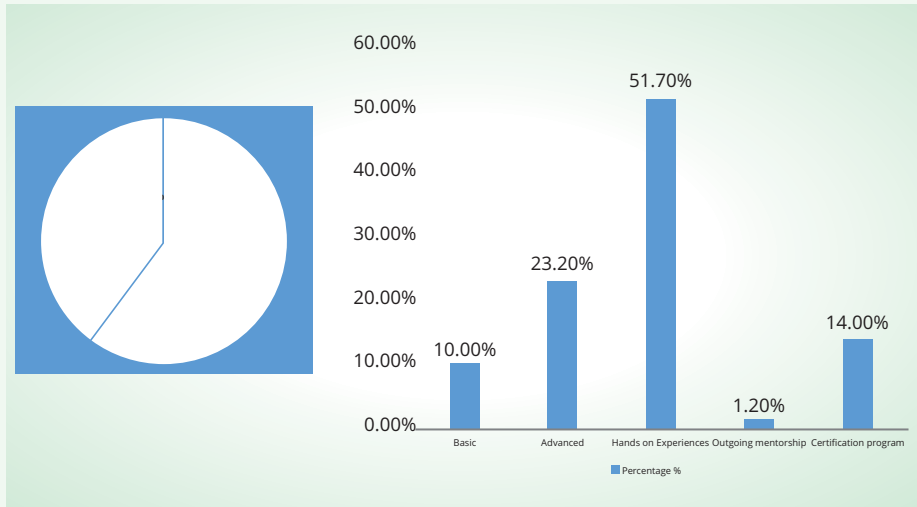
Conclusion

Findings of this study revealed that awareness of AI among health workers was moderate, with 38.9% gaining knowledge through professional seminars. Over half (51.9%) possessed adequate computer skills essential for AI adoption. The majority (96.2%) perceived AI as useful in enhancing efficiency in vaccination service delivery. However, challenges such as poor digital infrastructure, limited training, and lack of government investment in AI systems were identified. Health workers expressed willingness to adopt AI tools provided there was institutional support and adequate capacity building. Integrating AI into vaccination programs holds transformative potential for Nigeria's immunization outcomes. Empowering health workers through capacity building and infrastructural support is essential to achieving universal vaccine coverage.

Policy Implications and Recommendations:

1. **Capacity Building:** Establish continuous training programs on AI applications for health workers to improve digital literacy and practical use.
2. **Infrastructure Investment:** Improve digital infrastructure, internet access, and power supply in health facilities.
3. **Policy Development:** Develop clear national and institutional policies guiding AI use in health service delivery, focusing on immunization data management.
4. **Public–Private Partnerships:** Encourage collaborations between government, NGOs, and tech companies for AI integration.
5. **Data Systems:** Strengthen electronic data management and monitoring tools to enhance vaccination coverage tracking.

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