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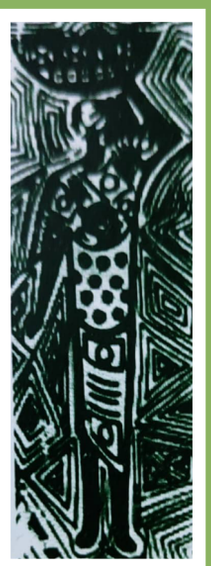

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Strengthening Hospital-Based Paediatric AMS in Nigeria: A Multi-Centre Baseline Survey and Intervention Overview

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Abstract

Background: Antimicrobial abuse drives antimicrobial resistance and is prevalent in low- and middle-income countries. Facility antimicrobial stewardship (AMS) programmes are essential interventions.

Objective: To describe the hospitals' baseline assessment in the Nigerian Society for Paediatric Infectious Diseases (NISPID) AMS programme network and interventions to strengthen/establish paediatric AMS programmes.

Methods: Paediatric Infectious Diseases (ID) leads were invited to the NISPID AMS Programme Network. Baseline assessment of core elements of hospital AMS programmes was conducted with the World Health Organisation tool. The assessment report was used to strengthen/establish the AMS programmes.

Results: Thirteen facilities completed the baseline assessment: 11 Federal and 2 State hospitals, 9 were academic hospitals. The median (range) inpatient bed capacity of hospitals was 600 (300-1000) beds, and all had microbiology laboratories and pharmacies. Thirty-six paediatric ID specialists were involved, a median (range) of two (0-6) per hospital; only two had paediatric ID sub-speciality training. Eleven hospital managements had prioritised AMS, eight had AMS committees and action plans, and none had AMS budget lines. Seven hospitals conducted AMU point prevalence surveys (PPS), three conducted antimicrobial consumption audits, nine conducted AMR surveillance, and only one audited the AMS programme. Two hospitals shared PPS and AMR surveillance reports hospital-wide, and one shared an antibiogram. Centres were trained on establishing a functional AMS Programme, constituting AMS committees, teams, terms of reference and roles of constituent members, developing action plans and carrying out various AMS interventions and surveillance activities.

Conclusion: Resources exist for paediatric AMS programmes in Nigeria, but there is a need for training and support.

Keywords: Antimicrobial Resistance, Antimicrobial Stewardship, Children, Nigeria, Hospital Interventions.

Introduction

The misuse and abuse of antimicrobials are significant factors driving the global antimicrobial resistance (AMR) pandemic. In

2021, an estimated 5million deaths were associated with bacterial AMR.[1] Estimates suggest that annual deaths from AMR will reach 10 million if the current trend is not addressed.[2] The most affected regions will be Africa and Asia, with estimated annual deaths of 4.1 and 4.7 million, respectively.[2] Moreover, by 2050, the global economy might lose over 3.8 per cent of its annual GDP 2050, with an annual shortfall of $3.4 trillion by 2030.[3] Low- and middle-income countries (LMICs), bear a disproportionate burden of AMR due to high burden of infectious diseases, unregulated access to antimicrobials, poor diagnostic platforms and ineffective regulatory mechanisms to control antibiotic use in human and animal health sectors.[4] A recent systematic analysis also revealed a disproportionately higher burden of AMR among children under the age of five years.[1] This is not unexpected considering the high burden of infectious diseases among them, their immature immune system and very high rates of antibiotic use among a significant proportion of which are inappropriate.

In 2015, the World Health Assembly approved the Global Action Plan (GAP) on AMR developed by the World Health Organisation.[5] The fourth aim of WHO GAP prioritises the access to and rational use of antimicrobials in humans and animals through antimicrobial stewardship programmes. The Nigeria AMR National Action Plan 1.0 and 2.0 echo this as well; however, several review reports indicate that AMS programmes are absent in most healthcare facilities in Nigeria.[6, 7] Antimicrobial stewardship (AMS) has been defined by the WHO as "A coherent set of actions which promote the responsible use of antimicrobials".[8] AMS is a critical intervention designed to optimise antimicrobial use, reduce resistance, and improve patient outcomes. Evidence supports the efficacy of AMS programmes in reducing the burden of AMR in children and improving outcomes in paediatric settings in Europe and America.[9-13] Unfortunately, very few AMS programmes exist in paediatric settings in Nigeria.[14-18] The dysbiosis with an altered microbiome, which predisposes to an increased risk of drug-resistant infections, as well as an increased risk of diabetes and inflammation in later life following inappropriate antibiotic use, adds another imperative to the need for AMS programmes in paediatric settings.[19]

Implementing effective AMS programmes in resource-constrained settings like Nigeria is challenging due to limited funding, insufficient training, and fragmented healthcare systems.[4, 18] The Nigerian Society for Paediatric Infectious Diseases (NISPID) established the AMS Programme Network in January 2023 to address the dearth of AMS Programmes in tertiary hospitals across Nigeria, especially in paediatric settings. The network aims to strengthen or establish AMS programmes tailored to the unique needs and resources of participating facilities. This manuscript describes the baseline assessment of AMS programmes in 13 network hospitals, conducted between February and March 2023 using the WHO AMS assessment tool. It also details the interventions implemented to enhance AMS capacity. The findings provide insights into the state of paediatric AMS in Nigeria and highlight opportunities for improvement in LMICs.

Methods

Study design and setting

The NISPID AMS Programme Network invited Paediatric Infectious Disease (ID) leads from tertiary hospitals across Nigeria to participate in a collaborative effort to strengthen AMS programmes. The network, launched in January 2023, comprised 22 hospitals with 115 multidisciplinary members, including paediatricians, pharmacists, microbiologists, and infection prevention and control (IPC) specialists.

Data collection

Between February and March 2023, a cross-sectional assessment of AMS programmes was conducted using the WHO AMS assessment tool. The tool evaluates core elements of

hospital AMS programmes: leadership commitment, accountability and responsibility, AMS actions, education and training, monitoring and surveillance, and reporting and feedback. Data was also collected on hospital infrastructure (bed capacity, availability of microbiology laboratories and pharmacies, etc.), human resources (number of paediatric ID specialists, etc.), and AMS programme components (action plans, budget lines, and audit practices, etc.).

Interventions

Following the baseline assessment, virtual platforms were utilised to verify findings and develop tailored interventions. Training sessions focused on forming AMS committees, defining terms of reference, and clarifying roles for multidisciplinary team members. Action plans were co-developed with each hospital, considering their specific resources and needs. Implementation of these plans is ongoing, with regular virtual follow-ups to monitor progress and provide support.

Data analysis

Only descriptive statistics was applied.

Results

Network and Hospital Characteristics

The NISPID AMS Programme Network includes 22 tertiary hospitals, with 13 completing the baseline assessment. The hospitals included 11 federal and two state tertiary institutions, nine of which were academic. There was at least one hospital from each of the six geopolitical zones of Nigeria (Figure 1). Participating hospitals had a median inpatient bed capacity of 600 (range: 300–1000) beds. All facilities had functional microbiology laboratories and pharmacies. A total of 36 paediatric ID specialists were involved, with a median of two (range: 0–6) per hospital. However, only two hospitals had specialists with formal paediatric ID subspecialty training, highlighting a critical gap in expertise.

Baseline Assessment Findings

The WHO AMS assessment tool revealed significant variability in AMS programme implementation (Table 1). The key findings were as follows:

Leadership and Commitment: Eleven of 13 hospitals prioritised AMS, but only eight had developed action plans, and none had dedicated budget lines for AMS activities.

Accountability and Responsibility: Eight hospitals had a dedicated AMS lead and multidisciplinary teams, but only four demonstrated precise coordination between AMS and IPC programmes.

AMS Actions: Four hospitals used standard treatment guidelines (STGs), two conducted AMS rounds, four implemented preauthorisation or restriction policies, and none had dedicated antibiotic prescription charts.

Education and Training: Only two hospitals provided induction training on antimicrobial use (AMU) and infection management, and three had trained AMS teams.

Monitoring and Surveillance: Seven hospitals conducted AMU audits, three performed antimicrobial consumption (AMC) audits, nine engaged in AMR surveillance, and one audited its AMS programme. Reporting and Feedback: Two of seven hospitals shared point prevalence survey (PPS) data, two of nine shared AMR surveillance data, and only one hospital shared antibiograms.

Taking from the baseline assessment, the NISPID AMS Programme Network implemented several interventions: Training on AMS Committee/Team Formation: Hospitals were guided on establishing AMS committees, defining terms of reference, and assigning roles to multidisciplinary team members. Development of Action Plans: Tailored action plans were co-developed to address gaps in AMS implementation, such as the adoption of STGs, preauthorisation policies, awareness, education and training activities.

Capacity building of implementing various AMS interventions: Virtual training sessions were conducted to enhance the skills of AMS team members, focusing on AMU and AMR surveillance, and using data for action.

Ongoing Support: Regular virtual meetings were established to monitor progress, share best practices, and provide technical support.

Table I: Summary of Baseline Assessments of NISPID AMS Network Sites

Leadership and Commitment	
Hospitals that where management prioritised AMS	11/18 (61.1)
Hospitals that have AMS Action Plans	8/18 (44.4)
Accountability and Responsibility	
Hospitals with a dedicated AMS Lead	8/8 (100.0)
Hospitals with multidisciplinary AMS teams	8/8 (100.0)
Hospitals with clear AMS/IPC coordination	4/8 (50.0)
AMS actions	
Hospitals that use STGs	4/18 (22.2)
Hospitals that conduct AMS rounds	2/8 (25.0)
Hospitals with a preauthorisation/restriction policy	4/8 (25.0)
Education and Training	
Hospitals' induction training on the rational antibiotic use policy	2/18 (11.1)
Hospitals where AMS teams have received AMS training	3/8 (37.5)
Monitoring and Surveillance	
Hospitals that conduct AMU Surveillance	7/8 (87.5)
Hospitals that conduct AMC Surveillance	3/8 (37.5)
Hospitals that conduct AMR Surveillance	9/18 (50.0)
Hospitals that audit the AMS Programme	1/8 (12.5)
Reporting and Feedback	
Hospitals that share PPS Data with prescribers	2/7 (28.6)
Hospitals that share AMR Surveillance data with prescribers	2/9 (22.2)
Hospitals that share antibiograms with prescribers	1/18 (5.6)

AMS - Antimicrobial Stewardship, AMR - Antimicrobial Resistance, IPC -Infection Prevention and Control, Standard Treatment Guideline, AMC- Antimicrobial Consumption, PPS – Point Prevalence Survey
Figures in parentheses are percentages of the indicated total.

Discussion

The NISPID AMS Programme Network represents a pioneering effort to address AMR in Nigerian tertiary hospitals through structured paediatric AMS programmes. The baseline assessment highlights both strengths and gaps in AMS implementation at the tertiary paediatric hospitals surveyed. While most of the hospitals reported good support from the facility management, most of them did not have established AMS programmes. This is not uncommon in most LMICs, in contrast to most developed countries, where AMS programmes are well established in acute care settings.[20] Also, this management support did not reflect dedicated staff, or staff time and budget lines needed for a sustainable AMS programme. According to a recent consensus document on AMS in paediatric settings, these are critical for an AMS programme.[21] AMS activities are generally time-consuming and often an add-on to the already bloated work schedule of the health workers responsible for the day-to-day operation of an AMS programme.[18, 22, 23] This is even more critical in most LMICs, where there are often severe shortages of human resources in the human health sector, and high staff attrition to greener pastures in the Western world. In this survey, as in most LMICs, the lack of dedicated budget lines for AMS programmes threatens their sustainability.

Donor funds from development partners often support a few centres in Nigeria with functional health facility AMS programmes.[16] This is not a sustainable model; indigenous governments need to invest in this essential AMR mitigating intervention by improving staffing deficits, providing dedicated staff or staff time, and a sustainable budget line for AMS programmes.

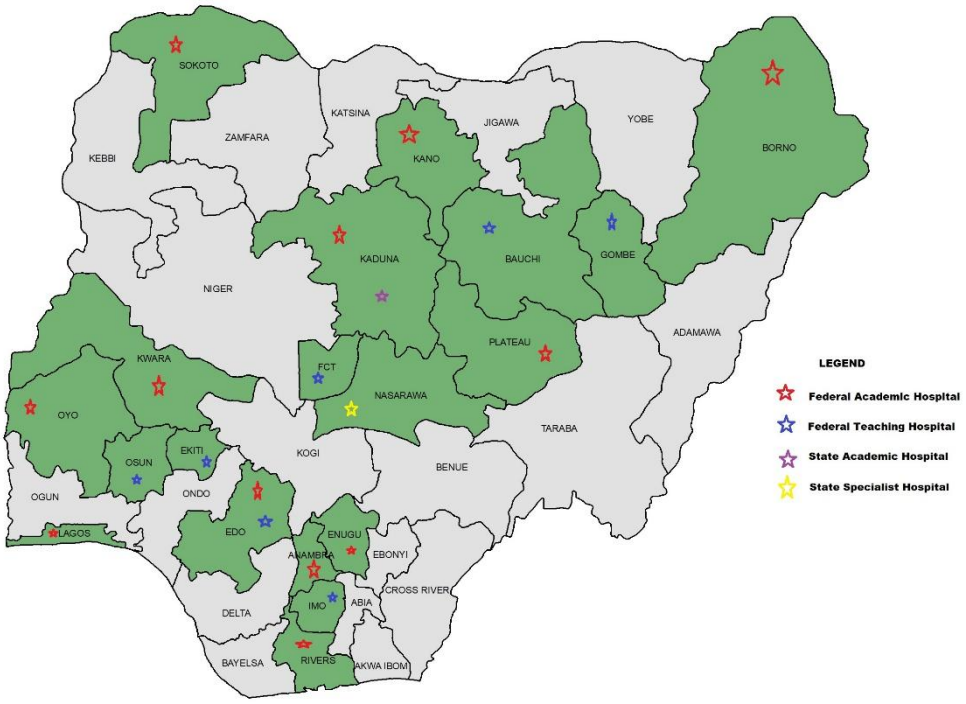

Figure 1: Location of participating sites in the NISPID AMS Network

Successful AMS programmes rest on a fulcrum of multidisciplinary teams with clear terms of reference and clearly outlined roles for the different components.[8, 18, 21, 23, 24] The team members need to be equipped with the necessary skill set required to implement MAS programmes. Most centres had multidisciplinary human resources needed for an AMS programme, including paediatricians. However, only two had paediatric infectious sub-speciality training and experience with the AMS programme delivery. This highlights the need for prioritising paediatric infectious diseases sub-speciality training in Nigeria. This is particularly important considering the significant contribution of communicable diseases in Nigeria to under-five mortality.[25, 26] The presence of microbiology laboratories and pharmacies in all participating hospitals provides a foundation for effective AMS, as these facilities are critical for diagnostic stewardship and quality-assured antimicrobial dispensing. This assessment did not evaluate the quality and utilisation of microbiology laboratories and pharmacies. The underutilisation of microbiology services by prescribers, inadequate access and cost-limiting challenges, and the frequent stock of essential antibiotics in hospitals in Nigeria are well-documented.[27-30] Optimal microbiology laboratories and pharmaceutical services must be prioritised for any successful AMS programme.

Inpatient stewardship involves a range of components, including implementing guidelines that are proven effective for common presentations, such as children admitted with asthma or community-acquired pneumonia.[31] Evidence supports the use of digital technology, including smartphone apps, to improve

adherence to antimicrobial guidelines and enhance antimicrobial prescribing through decision-making software.[20] Prospective audit and feedback, and preauthorisation and formulary restriction are core evidence-based AMS interventions recommended for prioritisation in facility AMS programmes.[8, 32] While prospective audit and feedback foster better understanding, behavioural change, and adherence to guidelines needed for rational antibiotic use, preauthorisation and formulary restriction lead to an immediate reduction in prescription rates of priority antibiotics. The limited implementation of these AMS interventions at the survey sites reflects broader difficulties in LMICs, where resource constraints and inconsistent guideline adoption hinder efforts to achieve AMS. The low frequency of AMS rounds and antibiotic prescription charts suggests opportunities for practical interventions, such as ward-based audits and standardised prescribing tools, which are successful in other settings. The variation in data sharing of results from antimicrobial resistance and use surveillance highlights the need for better reporting systems to support evidence-based prescribing.

Education and training activities, such as induction or mandatory in-service programmes, are vital to AMS Programmes. They equip healthcare workers with essential knowledge on rational antibiotic use, resistance trends, and institutional AMS protocols. These trainings foster multidisciplinary collaboration, improve prescribing behaviour, and ensure sustained AMS impact, ultimately enhancing patient outcomes and combating antimicrobial resistance effectively. Whilst these institutionalised practices are found in most advanced countries, few centres in this study reported structured AMS-related education and training programmes. Training healthcare professionals should be conducted alongside other stewardship interventions, as its standalone effectiveness has not been demonstrated.[8, 13]

Considering funding shortages, NISPID leveraged virtual platforms to enable other paediatricians in the NISPID AMS network to upskill on AMS programme implementation at the participating tertiary paediatric hospitals. This is a scalable model that can be deployed in LMICs where staff shortages and funding deficits exist. The NISPID network's use of virtual platforms to deliver training and support is a cost-effective strategy for resource-constrained settings. This approach aligns with WHO recommendations for leveraging technology to scale up AMS programmes in LMICs.[8] However, the success of these interventions depends on sustained leadership commitment, adequate funding, and ongoing training to build local expertise. A blended model with virtual and in-person mentorship will support a rapid rollout of AMS programmes in healthcare facilities. In addition, an integrated AMS-IPC-Diagnostic stewardship programme is another option for settings with limited human resources for dedicated AMS programmes.[33] Country-level initiatives must implement a comprehensive strategy to combat AMR, involving adequate funding, collaborations between public and private sectors, and a dedication to developing a sustainable model for research and development.

Conclusion

The NISPID AMS Programme Network demonstrates the feasibility of establishing paediatric AMS programmes in Nigerian tertiary hospitals. While resources such as microbiology laboratories and pharmacies are available, significant gaps in funding, training, and implementation of core AMS elements remain. The network's interventions, including training on AMS committee formation and action plan development, provide a roadmap for strengthening AMS programmes in Nigeria and other LMICs. Continued support, including government and international funding, is essential to sustain these efforts and curb the growing threat of AMR in paediatric populations.

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