A Multi-Center Study to Measure the Performance of Antimicrobial Stewardship in 14 Hospitals Across Nigeria: Needs Assessment

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***Abstract*: Antimicrobial resistance is a significant global health problem that is increasing worldwide. About 700,000 people die each year from antimicrobial resistant infections. This coupled with the high burden of infectious disease, a high population density, and weak health systems makes Nigeria a priority country for interventions targeted at reducing the occurrence of resistant infections and ultimately lowering the disease burden. One way to achieve this is by instituting Antimicrobial Stewardship Programs (ASPs) in our health facilities which aim at improving patient health outcome. The extent to which this has been achieved in Nigeria is unknown and this paper seeks to explore this. We conducted a cross sectional study on 14 hospitals selected from six states and the Federal Capital Territory (FCT) in Nigeria. The study utilises a questionnaire designed and scripted into Open Data Kit (ODK) to assess the needs of an ASP in a hospital setting. We found that only a few hospitals have AMS structures in place 11(78.6%). In addition, patients are not engaged in AMS activities across hospitals which is a requirement for ASPs to be successful. Overall, the study has identified gaps in the AMS program which can be leveraged to improve AMS within hospital settings. Moreover, the results underscores the urgent need to establish and strengthen AMS programs in Nigeria to help reduce the disease burden and improve health outcomes of the population.**

***Keywords*: Antimicrobial Resistance, Antimicrobial stewardship, Hospitals, Nigeria**

I. INTRODUCTION

In recent times, microorganisms, especially bacteria have increasingly become resistant to different types of antimicrobials. This resistance may be triggered by the inappropriate use of antimicrobials, which is consistently supported by several studies in this field (Adda et al., 2022). Furthermore, the misuse of these antimicrobials had proven to be the driver of the development of Antimicrobial Resistance (AMR) (Emelda et al., 2021). This was further highlighted by the Political Declaration of the High-Level Meeting of the General Assembly of the United Nation, and the World Health Assembly's endorsement of the Global Action Plan on Antimicrobial Resistance AMR that was held in September 2017 and May 2015 respectively. Both recognize AMR as a global crisis, threatening decades of progress in public health and achievement of the sustainable development goals (WHO, 2019). Globally, antimicrobial-resistant infections causes about 700,000 deaths each year, with indication that by 2050, annual death due to AMR may increase to 10 million (O'Neill, 2016, Emelda et al., 2021,; Jacob et al., 2020). These deaths mostly occur in low- and middle-income countries (LMICs), especially Sub-Saharan Africa including Nigeria. Without any intervention, low- and middle-income countries will be most affected due to the high burden of disease and increasing AMR levels compared to high-income countries.

In response to this challenge, Nigerian Government set up a national AMR Technical Working Group in 2016, which oversaw the development and ratification of the 2017-2022 National Action Plan on AMR. The plan focuses on five strrategic objectives which include; Increasing awareness and knowledge on AMR and related topics, one health AMR surveillance and research, infection Prevention and Control in the tripartite sector, promote rational access to antibiotics and Antimicrobial stewardship, and to invest in research to quantify the cost of resistance (NCDC, 2017). Although much has been done in this regard, a lot more still needs to be done to ensure that these strategies are implemented at health facilities.

A study conducted by Umeokonkwo (2019) across tertiary hospitals in south east Nigeria reported a high rate of antimicrobial use, as 78.2% of inpatients surveyed were exposed to at least one antimicrobial agent. In another study in Owerri, Nigeria, a lower prevalence of antibiotic use of 55.9% was found. Currently, comprehensive information regarding the extent of ASPs among rural and urban hospitals across Nigeria is scanty. One way to achieve this is by instituting Antimicrobial Stewardship Programs (ASPs) in our health facilities which aim at improving patient health outcome. The extent to which this has been achieved in Nigeria is unknown hence this paper sought to conduct needs assessment across 14 hospitals in Nigeria namely; General hospital Gembu, Taraba

State; General Hospital, Takum, Taraba State; Abubakar Tafawa Balewa University Teaching Hospital, Bauchi, Bauchi State, Taraba State Specialist Hospital Jalingo, Taraba State, State Specialist Hospital, Yola, Adamawa State, Federal Teaching Hospital, Gombe; Benue State University Teaching Hospital, Makurdi, Benue State; General hospital Bwari, Abuja, FCT; General hospital Kuje, Abuja, FCT; University of Abuja Teaching Hospital, Gwagwalada, Abuja, FCT; General hospital Kwali Abuja, FCT; General Hospital, Asokoro, Abuja, FCT; General Hospital, Gwarimpa, Abuja, FCT; and General Hospital, Wuse, Abuja, FCT

Objectives of the Study

The objectives of the study are to;

i. Conduct a hospital based needs assessment across intervention and close monitoring hospitals in target locations
ii. Identify missing but priority gaps that will guide in the implementation of AMS across all the target facilities in Nigeria

II. METHODS

Study design

This was a hospital based cross sectional that was conducted using well-structured questionnaire across 14 hospitals in six states including FCT (Taraba, Benue, Adamawa, Gombe, Bauchi and FCT Abuja). The need assessment tools (questionnaire) was scripted into ODK (Open Data kit) and administered to each hospital between the periods of March, 2021 to April, 2021 by well trained and qualified CFID/NCDC assessors. The Interview targeted key hospital management staff such as Clinical Microbiologist/Medical Laboratory, Infectious disease physicians, Pharmacy, infectious diseases nurses, Infection Prevention and Control, Pharmacy department, Infection Prevention and Control and ICT/Record officer by well-trained and qualified CFID/NCDC assessors.

Statistical analysis

To validly draw conclusion from the sampled populations (Health care facilities), data were entered into SPSS version 26 (version 26, IBM, Chicago, IL) and summarized using descriptive statistics such as frequencies and simple percentages. Demographic characteristics and key variables were also displayed using simple percentage by means of cross tabulations.

III. RESULTS

Key Questions	Responses	
	Yes	No
Does the facility have a committee on pharmacovigilance?	4 (28.6%)	10 (71.4%)
Does the facility have an Infection Prevent & control committee?	13 (92.9%)	1(7.1%)
Does your facility have an infectious disease physician available for consults 24/7	6(42.9%)	8(57.1%)
Does the facility have a formal organizational structure for antimicrobial stewardship?	3(21.4%)	11 (78.6%)
Is an antimicrobial stewardship team available at the facility?	3(21.4%)	11 (78.6%)
Does the facility have an antimicrobial stewardship committee?	3(21.4%)	11 (78.6%)
Does your antimicrobial stewardship committee include patient representative?	0 (0%)	14 (100%)
Is there a physician identified as the leader for antimicrobial stewardship in the facility?	3(21.4%)	11 (78.6%)
Do clinicians work with the stewardship leaders to improve antibiotic use?	3(21.4%)	11 (78.6%)
Does the facility provide any support for antimicrobial stewardship activities?	1(7.1%)	13 (92.9%)
Does the facility have the information technology (IT) capability to support antimicrobial stewardship activities?	8 (56.8%)	6 (43.2%)
Does your stewardship program provide education to clinician and other relevant staff on improving antibiotic prescribing? If yes, how frequent is staff education on antibiotic stewardship?	3(21.4%)	11 (78.6%)
Does your facility have a physician or pharmacist review of therapy for specified antibiotic agents?	5 (35.7%)	9 (64.3%)
Does your facility have specific antibiotic agents that need to be approved by a physician or pharmacist prior to dispensing	3(21.4%)	11 (78.6%)
Does your facility monitor antibiotic use at the unit and/or facility wide level by counts of antibiotic(s) administered to patient per day or by grams/mg of antibiotics use?	5(35.7%)	9(64.3%)
Does your facility monitor antibiotic use at the unit and/or facility wide level by direct expenditure for antibiotics?	8(57.1%)	6 (42.9%)
Does your facility track antibiotic on electronic?	2 (14.3%)	12 (85.7%)
Is time-sensitive automatic stop orders for specified antibiotic prescriptions on antimicrobial use implemented in your facility?	9 (64.3%)	5 (35.7%)
Does the facility have an outpatient parental antibiotic therapy (OPAT) unit?	7(50.0%)	7 (50.0%)
Does your facility produce an antibiogram (cumulative antibiotic susceptibility report)?	1(7.1%)	13(92.9%)
Has annual report focused on antimicrobial stewardship been produced for your facility in the past year?	1(7.1%)	13(92.9%)
Does the facility have an antibiotic formulary	6(42.9%)	8 (57.1%)
Does the facility have an antibiotic guideline?	3 (21.4%)	11 (78.6%)
Does your hospital have specific clinical guidelines for management of common infectious diseases?	9 (64.3%)	5(35.7%)
Does the facility have written policy that requires prescribers to document an indication in the medical records or antibiotic prescription forms?	5(35.7%)	9 (64.3%)
Is it routine practice for specified antibiotic agents to be approved by a designated physician or pharmacist or member of the facility antimicrobial stewardship team?	2(14.3%)	12 (85.7%)

Is there a formal procedure to review the appropriateness of an antibiotic at or after 48 hours from the initial order?	5(35.7%)	9 (64.3%)
Does your facility have facility specific treatment recommendations, based on national guidelines and local susceptibility, to assist with antibiotic selection for common clinical conditions?	5(35.7%)	9 (64.3%)
Does your facility monitor antibiotic use?	8 (57.1%)	6 (42.9%)
Does your facility monitor whether the indication is captured in the medical record for all antibiotic prescriptions?	9 (64.3%)	5(35.7%)
Does your facility audit or review surgical antibiotic prophylaxis choice and duration?	6(42.9%)	8 (57.1%)
Does your facility monitor antibiotic use by grams of antibiotic(s) by patient per day?	7(50.0%)	7 (50.0%)
Is monitored antibiotic use reported by hospital activity denominator?	6(42.9%)	8 (57.1%)
Has your facility produced a cumulative antibiotic susceptibility report in the past year?	1(7.1%)	13 (92.9%)
Is your facility participating in the national antibiotic resistance surveillance program?	0(0%)	14(100%)
Is a UV technology system used as part of terminal cleaning of patient care areas?	0(0%)	14 (100%)

Summary Description of Results

Fourteen (14) facilities participated in the needs assessment out of which 12 (85.8%) were tertiary hospitals while 2 (14.2% were secondary hospitals). All the hospitals had acute beds ranged from 20 to 568 and number of ICU beds ranged from 4-12. Three of the facilities had no ICU beds while eleven facilities had beds ranging from 4-12. It can be observed that all the facilities had annual number of overall patient days ranging from 24 to 95193.

The table 1 above summarizes that 10 facilities representing 71.41% had no committee on pharmacovigilance in their hospitals only 4 (28.6%) had pharmacovigilance committee in place. Eight hospitals representing 57.1% had no infectious disease physician who is available for consults 24/7, 11 (78.6%) had no formal organizational structure for antimicrobial stewardship, same number (11) of the hospitals representing 78.6% had no antimicrobial stewardship team, eleven hospital representing 78.6% did not have an antimicrobial stewardship committee in place.

All the hospitals had no patients/religious group/opinion leaders as part of antimicrobial stewardship committee or team. Eleven (11) hospitals representing 78.6% did not identify clinicians as the leader for antimicrobial stewardship and therefore, have not worked to increase antibiotic use in their respective hospitals. Thirteen of the hospitals do not support antimicrobial stewardship activities 13(92.9%), six hospitals representing 43.2% had no information technology (IT) capability to support antimicrobial stewardship activities. Overall, 11 (78.6%) do not provide education to clinicians and other relevant staff on improving antibiotic prescription, 9 (64.3%) had no physician or pharmacist review of therapy for specified antibiotic agents with no specific antibiotic agents that need to be approved by same physician or pharmacist prior to dispensing. Nine of the hospitals have not monitored antibiotic use at the unit and/or facility wide level by counts of antibiotic(s) administered to patient per day or by number of grams/mg of antibiotic. Majority of the hospitals 12(85.7%), track antibiotics on paper rather than electronic 2(14.36%). Twelve of the hospitals 12(57.1%) had no time-sensitive automatic stop orders for specified antibiotic prescriptions on antimicrobial use, 7 (50%) had no outpatient parental antibiotic therapy (OPAT) unit, 13(92.9) did not produce antibiogram (cumulative antibiotic susceptibility report) and 13(92.9) did not have annual report that is focused on antimicrobial stewardship 13(92.9). Altogether 8 hospitals did not have an antibiotic formulary 8(57.1%), also, 11(78.6%) had no antibiotic guideline in place and 5 (35.7%) had no specific clinical guidelines for management of common infectious diseases while 9(64.3%) have such guidelines. Only 5 hospitals had written policy that requires prescribers to document an indication in the medical records or antibiotic prescription forms while 9(64.3%) do not have such written policy. Twelve hospitals do not consider routine practice for specified antibiotic agents to be approved by a designated physician or pharmacist or member of the facility antimicrobial stewardship team 12(85.7%), 9 hospitals had no formal procedure to review the appropriateness of an antibiotic at or after 48 hours from the initial order representing 64.5%, eight hospitals had no audit or review of surgical antibiotic prophylaxis choice and duration this represents 57.1%. seven hospitals do not monitor antibiotic use by grams of antibiotic(s) by patient per day 50%, while eight hospitals denominators had no report on monitored antibiotic use.

Thirteen hospitals had never produced cumulative antibiotic susceptibility report in the past year and this represents 92.9% of the entire hospitals. None of the hospitals have participated in the national antibiotic resistance surveillance programme nor made use of UV technology system as part of terminal cleaning of patient care areas.

IV. DISCUSSIONS

This was a cross-sectional survey designed to examine facility-specific needs of some healthcare centres using a predesigned questionnaire and, overall, reports limited AMS programs in healthcare facilities used for this study. The results of the survey showed poor state of AMS practice among secondary and tertiary hospitals in Nigeria. Both the core and supplementary strategies were either non-existent or poorly practiced. The poor state of AMS practice is evidenced by the few AMS committees and near-total lack of leadership support and resource allocation. The health system has not identified AMS as a priority, hence the absence of policy and lack of resource allocation. This level of practice could explain the high level of antimicrobial use earlier reported in some Nigerian hospitals (Nnadozie, *et al.*, 2020; Umeokonkwo, *et al.*, 2019; Oduyebo, *et al.*, 2017; Abubakar, 2020).

The few hospitals with AMS committees do not have any terms of reference and do not hold regular meetings. This could also partly explain the absence of leadership commitment or the reason for it as this study reports low 3(21.4%) facilities having an identified leader. It will be challenging to operate a successful and sustainable AMS programme without leadership support and a functional AMS committee to drive the process. The near absence of AMS actions or interventions such as education and training, monitoring and evaluation, reporting and feedback might all be due to the absence of functional AMS committees, and leadership/administration support.

Although the two hospitals with AMS committees had multidisciplinary members with clear leadership, this has not engendered the implementation of the supplementary strategies such as education and training, which calls to question the level of knowledge about AMS of the membership of these committees. An interesting aspect of the situation in these hospitals is the availability of adequate facilities for culture and sensitivity. Paradoxically, a previous study in Nigeria had identified poor use of the clinical microbiology laboratory by physicians (Iregbu, *et al.,* 2020). Some of the reasons advanced for the finding in this previous study included the belief by many physicians that "clinical diagnosis was sufficient", frustration at the "delay in getting results", physician having sufficient "knowledge of potent antibiotics", lack of access to clinical laboratory facilities, and non-availability of pathologists to assure the quality of laboratory tests. Under this scenario, a substantial number of prescriptions are bound to be or remain empiric and inappropriate, a situation that fuels antimicrobial resistance. In the absence of any significant AMS activity, there was nothing to monitor or evaluate.

Alongside the huge AMS deficits highlighted here, there are also some notable challenges to implementation of AMS in the hospitals. These include but not limited to lack of funding, poor awareness of AMS usefulness by staff, prescribers' opposition, and lack of leadership support. Similar findings have been reported in a previous study of eleven hospitals in six continents (Howard, *et al., 2013;* Manning, *et al., 2018*), where it was shown that, amongst others, the administrations in some of the study sites were not aware of the programme. It would therefore be difficult for the leadership to support a programme it was never aware of. This emphasizes the need for adequate and proper communication to ensure that all relevant interest groups and stakeholders are involved for a functional and sustainable AMS programme.

The need for quality education on prudent antibiotic use is of outmost importance in Antimicrobial Stewardship Programme. It has been established that education is most effective when paired with interventions and measurement of outcomes such as prospective audit with feedback and pre-authorisation, especially when feedback is done (Emelda et al., 2021; CDC, 2019). This study revealed that fewer number of facilities 3(21.4%) engaged nurses, physicians, and pharmacists in antibiotic stewardship education and this can be compared with a study by Emelda, et al., (2021) whose study only provided prescriber education (32%) compared with patient education (64%) and the majority of the facilities that provide patient education undertook verbal counselling regarding prudent use of antibiotics and AMR during consultation.

Antimicrobial Stewardship Programmes are expected to provide regular updates to prescribers, pharmacists, nurses and leadership on process and outcome measures that address both national and local issues, including AMR (US CDC, 2019). Unfortunately, only two facilities communicated the results of antimicrobial audits or reviews directly to prescribers. Since the development of AMR is a direct consequence of antibiotic misuse, it is most desired that a facility-specific AMR profile should be produced in collaboration with the microbiology laboratory and the infection control and healthcare epidemiology department to guide treatment. However, this remains a major challenge especially in private and primary healthcare centres with limited microbiology laboratories. Reporting of outcomes of antibiotic use was poor among the sampled facilities and this was evident in the low percentage 1(7.1%) of facilities with a cumulative antimicrobial susceptibility and AMS annual report. Our findings agree with a previous report by Fadare et al. (2019) where a cumulative antimicrobial susceptibility report for the previous year was available in only two (12%) of the tertiary healthcare facilities in Nigeria.

V. CONCLUSION

Antimicrobial resistance is a significant global health problem that is increasing worldwide. About 700,000 people die each year from antimicrobial resistant infections. This coupled with the high burden of infectious disease, a high population density, and weak health systems makes Nigeria a priority country for interventions targeted at reducing the occurrence of resistant infections and ultimately lowering the disease burden. Findings from this study identifies drivers of effective AMS intervention across hospitals which will be useful in carrying out AMS interventions in Nigeria. Result from this study reflects little or low AMS structures across different tiers of hospitals in Nigeria. Result also recorded no engagement and involvement of patients in all AMS activities across hospitals in Nigeria. This underscores the urgent need to revitalize and strengthen AMS programs in Nigeria, especially with a growing population of over 200 million people. The study has identified gaps in the AMS program which can be leveraged to improve AMS within hospital settings.

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