Topic: Antimicrobial resistance: One health approach in Rwanda

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Abstract

This commentary provides the authors' views related to the Antimicrobial Resistance (AMR) profile in Rwanda in terms of prevalence, knowledge, attitudes, practices, and existing interventions at the one health interface.

AMR is a critical and global health concern posing a significant threat to the effective treatment of infections and lead to increased morbidity and mortality. Among few studies that have been conducted on AMR in Rwanda, the issue was found to be widespread in both human and animals. A high resistance has been found among the commonly used antibiotics seconded by the lack of knowledge and appropriate practices among different groups of people. Some interventions, including “one health” approach are in place aiming to address these issues, but challenges are still around due to developing surveillance system, limited studies, and low public awareness. Extensive studies and enhance surveillance are recommended to better understand AMR to inform the public and policy makers for effectively tackling of the AMR issue, particularly in rural areas.

Keywords: Antimicrobial resistance, Rwanda, Usage, impact, Global Health Security

I. Background

Antimicrobial Resistance (AMR) refers to the ability of microorganisms to thrive in the presence of a drug that would normally kill them or inhibit their growth. In 2019, the World Health Organization ranked AMR in the top ten threats to the global health security. Without appropriate actions, the effective anti-microbial we have today including antibiotics, antivirals, anti-parasites, and others will be worn out due to resistant microbes. Consequently, this will make it difficult to treat or prevent even simple infections which will also expose the world to restrictions on surgeries, use of chemotherapy, and multiple deaths (1,2).

Raising knowledge, positive attitudes, and good practices toward AMR needs a collaborative approach between human, animal and environmental sectors which is also known as the "One Health" approach. This approach aims to balance and optimize the health of humans, animals, and the environment through collaboration of all those sectors as AMR can spread through them interchangeably (3). Thus, this article describes the AMR profile in Rwanda in terms of prevalence, knowledge, attitudes, practices, and existing interventions at the one health interface.

II. AMR in Rwanda

II.1. Prevalence

AMR is a surging threat to Rwandan public health like in many other countries. For instance, in a study that screened 392 patients on admission at the University Teaching Hospital of Butare, 50 % showed intestinal Extended-Spectrum Beta-Lactamase-Producing Enterobacteriaceae (ESBL-PE) carriage and 37% of caregivers. These rates increased to 65% for patients and 47 % for caregivers upon discharge (4). A retrospective study conducted at CHUK from 2017 to 2018 on 341 positive blood cultures revealed resistance among commonly prescribed antibiotics including penicillin (91.8%), trimethoprim sulfamethoxazole (83.3%), and ampicillin (81.8%) with the overall multidrug resistance of 77.1% (29.3%) (5). Another prospective observational study at CHUK in 2017 found that 357 of 942 specimens collected were culture-positive, and gram-negative bacteria comprised 88.7% (323) of isolates. Of 241 gram-negative isolates tested for ceftriaxone, 75.9 % were resistant, and 71.7% of 92 gram-negative isolates tested for ESBL were phenotypically positive (6). In 2019, 2,400 deaths were solely attributed to AMR and contribute to 9,800 deaths in Rwanda (7). In Kirehe district, 44 swabs collected from women

with C-section surgical site infections from 2019 to 2020 and showed that 68.4% of the 57 isolates were gram-negative bacteria not susceptible to ampicillin and the majority presented an intermediate susceptibility and/or resistance to ceftriaxone (92.1%) and cefepime (84.6%) (8). Additionally, in 2019, high prevalence of tetracycline resistance (35.6%), followed by ampicillin (19.6%) and streptomycin (16.5%) was found among animals in the Eastern Province of Rwanda (9).

II.2. Knowledge

Even though AMR is a growing issue in Rwanda the knowledge is still low. In 2017, a study conducted among 282 medical, dental, and pharmacy students from the University of Rwanda in levels 1 to 6, and found that 95% knew about AMR risks from antibiotic misuse and 89.5 % agreed that poor infection control practices contribute to AMR however none of the respondents knew anything about antimicrobial stewardship (10). Similarly, in a cross-sectional study conducted among 384 parents who were attending a selected Health Center in Kicukiro District of Rwanda with under 12 years old children 40.4% of them had a low level of knowledge regarding the use of antibiotics. Many (68%) incorrectly believed antibiotics produce a quick recovery when given for flu-like symptoms (11). Correspondingly, a study conducted among 384 cattle keepers in Nyagatare district found that 64.3% of them had a low level of knowledge toward antibiotic use in animals, around 56% of respondents wrongly believed that antibiotics kill bacteria and 75.8% wrongly thought antibiotics to be painkillers and antipyretics (12).

II.3. Attitudes

AMR contributing drivers lay in antimicrobial drugs misuse, overuse, inappropriate prescribing practices, poor IPC and WASH practice. In a study conducted among 384 parents with children less than 12 years old, it was found that more than half of study respondents (59.9%) had negative attitudes toward antibiotic use, 56 % of respondents would like to request antibiotics in case their children suffer from frequent URTIs while 53.9% also confirmed that they prefer buying antibiotics over-the-counter when physicians refuse to prescribe them and a big portion (73.4%) respond that they prefer giving antibiotics for children's flu or cold to decrease severity (11). Similarly in a study with cattle keepers (n=384), 68.2% of them strongly agreed that it is better to use antibiotics before consulting a veterinarian when a cow gets sick while 53.9% strongly agreed that antibiotics can be used to treat any kind of disease in cows (12).

II.4. Practices

Regarding AMR Practices, in 2017, a study among 282 university students found that, 85% of them were committed to complete course of antibiotics, and around 80% don't use antibiotics leftover to treat themselves. But, 20% kept antibiotics leftovers for future use, 21% shared antibiotics with their family members and 48.9% agree they can buy antibiotics without a medical prescription (10). In 2019, among 570 undergraduate students from the University of Rwanda, 12.1% of them reported having practiced self-medication with antibiotics in the past 6 months; self-medication with amoxicillin capsules at 59.2%. Community pharmacies were the main source of antibiotics used in self-medication 72.46% (13). Among 384 parents with under 12 years of age attending selected Health Centers in Kicukiro District participants, 62% of the study participants had poor practices regarding antibiotic use while 51.8% of participants responded that they would stop administering antibiotics as soon as the disease disappeared while others 45.1% confirmed reuse of antibiotics when a similar symptom occurs among family members (11).

II.5. Existing Interventions

In 2016, the Ministry of Health (MoH) and its partners established a "One Health" approach to respond to the AMR action plan focusing on short and medium-term priorities like sanitation in rural areas, Standard Treatment Guidelines, and AMR audit (14). Despite this, a 2018 Joint External Evaluation (JEE) conducted declared no national AMR plan for surveillance, detection, and reporting in Rwanda (15). Subsequently, MoH collaborated with the Ministry of Agriculture and Animal Resources (MINAGRI), Ministry of Environment (MoE), and the Food and Agriculture Organization (FAO) to develop a national action plan on AMR for 2020-2024 (16)**.**

From 2015 to 2019, 204 students from different disciplines were involved in field practices to leverage interactive learning opportunities through a multi-disciplinary collaboration. In addition, 528 final-year undergraduate students from the University of Rwanda in different disciplines and programs were trained on the One Health approach in adherence with One Health strategic plan of 2021-2026 (17).

On the other hand, a study conducted to assess the feasibility of setting up microbiology capacity for AMR testing at rural district hospitals in Rwanda, found a major gap in terms of

equipment and supplies needed to conduct basic microbiology essays (18). Neither the universities nor MOH, MINAGRI, and MoE have conducted a thorough research or a projection to assess the effectiveness of existing AMR interventions (17). Furthermore, a systematic review conducted on surveillance systems for AMR in Africa found that Rwanda uses unstandardized approach in data collection of common bacteria, lacks national coordination and/or quality management and does not reporting to WHO's Global Antimicrobial Resistance and Use Surveillance System (GLASS) network (19).

III. Recommendations

Although the national plan on AMR is in its last year of implementation, and some initiatives are being carried out, there is limited data on AMR in terms of knowledge, attitudes, and practices among different sectors and disciplines at One Health interface while there is no evidence for AMR rates subdue in Rwanda. Based on the findings we recommend:

1. An extensive study at the one health interface to assess knowledge, attitudes, skills, and practices toward AMR especially in rural areas where services are scarce among health care providers. This will provide a better understanding of the key areas for capability building and lead to coordinated actions that meet needs but contribute to the global action of reducing the "hidden pandemic" AMR resistance.
2. The active AMR surveillance, detection, control, and reporting plan at different health sector levels can help limit poor infection control practices and thus contribute to AMR harm reduction.
3. To reinforce compliance to WHO IPC standards, antimicrobial stewardship (AMS) protocols and WHO GLASS network reporting system.
4. To reinforce the active and co-creating engagement of community members especially rural members on aspects related to bacteriology, usage of antibiotics, function, and the effect of wrong usage on human health is vital.

IV. Conclusion

WHO recommends one health approach to be deployed to tackle the AMR challenges. Available data show the existence of AMR burden in both human and veterinary sectors with moderate to poor knowledge, attitudes, and practices toward AMR. Despite some new initiatives in place to

increase national awareness and understanding of AMR, there are limited studies in all concerned sectors. By that inducement, extensive studies are needed in Rwanda to know the current AMR profile in terms of knowledge, attitudes, and practices. These data will inform the government and stakeholders about the gaps or strengths available in fighting AMR at the one health interface.

List of abbreviations

AMR: Antimicrobial Resistance

AMS: Antimicrobial Stewardship

CHUK : Centre Hospitalier Universitaire de Kigali

ESBL-PE: Extended-Spectrum Beta-Lactamase-Producing Enterobacteriaceae

FAO: Food and Agriculture Organization

GLASS: Global Antimicrobial Resistance and Use Surveillance System

IHME: Institute for Health Metrics and Evaluation

JEE: Joint External Evaluation

MINAGRI: Ministry of Agriculture and Animal Resources

MoH: Ministry of Health

MoE: Ministry of Environment

SOHIC: Student One Health Innovation Club

STGs: Standard Treatment Guidelines

URTIs: Upper Respiratory Tract Infections

WAAW: World AMR Awareness Week

WHO: World Health Organization

WASH: Water**,** Sanitation, and Hygiene

Declarations

Ethics approval and consent to participate

This study did not involve humans or animals and thus not a human subject study in need of ethical approval.

Consent for publication

Not applicable

Availability of data and materials

The authors declare that all materials presented in this article are their views of AMR in Rwanda. All materials used for this commentary can be obtained directly from the corresponding author.

Conflict of Interests

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Authors' contributions

This article was conceptualized and initially drafted by PS and DRD. All authors then contributed to the editing of the final version

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