Opportunities and challenges in antimicrobial resistance behavior change communication

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A B S T R A C T

Antimicrobial Resistance (AMR) is already affecting human and animal health sectors negatively. The UN General Assembly has listed AMR among issues that need urgent address; subsequently FAO/OIE/WHO tripartite took lead and jointly developed Global Action Plan (GAP) to tackle the problem. States and Governments have developed AMR National Action Plans (NAP), Policies and Communication Strategies.

In health communication realms AMR is a distinctive and novel phenomenon. Consequently, communication theories and principles on this issue have not been tested adequately; even as literature around AMR is growing. While there are lessons that can be learned from previous and ongoing health communication campaigns targeting various audiences and coined around behavior change strategies; AMR is certainly a unique and maiden case. Kenya developed and is implementing its AMR - NAP. Kenya is among few countries that have developed and implemented an AMR Communication Strategy with the goal to create awareness and subsequently change audience behavior.

This paper presents a review of available literature, reports, Kenya experiences and theories that can be applied to AMR communications. It illustrates the gaps, opportunities and challenges and proposes strategies that can be applied at the moment as more literature on AMR communication is collected through research and documentation of country experiences.

1. Introduction

The discovery of penicillin as the first antibiotic in 1928 by Sir Alexander Fleming, redefined the practice of medicine both in humans and animals. Antibiotics emerged as a potent tool in the fight against infectious diseases that had by then claimed millions of lives. So powerful were antibiotics that they were christened – "Magic Bullets" as had been prophesied by Paul Ehrlich. This was based on their ability to selectively "identify" and "kill" bacteria with the might of a gun bullet. The discovery of antibiotics herald advent of antibiotic age/antibiotic revolution [1,2]. The British Medical Journal in 2007 listed the discovery and development of antibiotics as the second most important public health invention of the last century [1]. Similar agents have been developed for fungi, protozoa and other groups of disease-causing microbes; collectively called antimicrobials. Antimicrobials have saved millions of lives to date.

Available scientific data shows that antimicrobials are slowly losing their potent [3,6]. This phenomenon is known as Antimicrobial Resistance (AMR). Where micro-organisms initially susceptible to antimicrobials become resistant. The emergence of AMR threatens gains made in human and animal disease management [3,4,8].

It is documented that Sir Alexander Fleming in 1945 in an interview with New York Times warned that inappropriate use of antibiotics and natural adaptation process of bacteria would result in selective resistance by bacteria after some time [5]. Human behavior in regard to use of the antibiotics was a driver of AMR from the beginning. Since resistance is a natural process of adaptation of bacteria in reaction to antibiotics; meant that antibiotics had a limited lifespan from the very beginning [6,7]. This should have been explicitly made known to the public, human and veterinary doctors at the inception of antibiotics. This was a first missed opportunity towards mitigation of AMR, through communication targeting awareness and human behavior. In 2015 the World Health Organization (WHO) during its world health assembly adopted the Global Action Plan (GAP) on AMR. The GAP lists "improved awareness and understanding of antimicrobial resistance through effective communication, education and training" as its first objective. This is not an accidental placement but rather a chronological emphasis that communication should be the first activity for countries to implement in addressing AMR. Countries should set an AMR agenda across audiences by creating awareness on AMR. The dilemma though

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is how countries will create awareness and educate audiences with minimal factual national statistical information on AMR? The need for rigorous research and sharing of findings is of critical importance at this point in time. This is highlighted in this paper as a challenge that countries must devise ways of overcoming through AMR knowledge management.

However, even with the little available information, communication targeting behavior change can still be carried out. For example, the assertion that AMR is happening when there are no new antibiotic classes and molecules being manufactured; out of the 18 major global pharmaceutical firms, only 3 continue to develop new antibiotics today [7,8,12,13]. This is a documented finding that can be used within the principle of use of fear appeals in communication to effectively bring about a desired change targeting general public, policy makers, veterinarians and human medics on importance of prudent use of available and potent antimicrobials.

Antimicrobial resistance is defined as the ability of disease-causing microorganisms to resist effects of drugs that they were initially susceptible to [6]. This phenomenon negatively impacts on human and animal health sectors as it limits treatment options, increases cost of treatment and potential side effects as health professionals opt for stronger and potentially toxic drugs [8,12]. The resistance has been fueled by excessive use and misuse of antimicrobial agents in animal husbandry, inappropriate prescriptions of human medicine and lack of emphasis on Infection Prevention and Control (IPC) practices in health institutions and globalization that has eased transport of human, animals and agricultural products [9,13].

The AMR problem is projected to affect developing countries due to current challenges faced by healthcare systems [9,13]. The need for heightened awareness creation especially at the policy making level in the developing country to mitigate against negative effects of AMR is both an opportunity and a challenge for health communication experts. It is an opportunity because it is an idea whose time has come and a challenge because audiences decode and understands health messages differently and therefore require a mix of strategies. For example, policy makers understand statistics when they are domesticated; at the moment most of AMR statistics are still in global terms. This creates an opportunity to lobby for more research at a national level to generate data which can be used to advocate for government buy-in and support.

Human behavior is a factor in the outbreak and spread of diseases [15]. Handling and use of antimicrobial agents are solely done by humans; the doctor who prescribes, a pharmacist who dispenses and veterinary doctor who prescribes and administers and the farmer who pays for or uses antimicrobials in animal husbandry. AMR presents a unique case for health communications experts considering the heterogeneous audiences involved. The use of behavior change strategies in combating AMR comes with the challenge of lack of previous experience. To address the challenge of little literature on this subject matter, countries should urgently document and share their communication experiences on AMR.

Kenya was among the first countries in Africa to develop AMR National Action Plan, AMR Policy and AMR Communication Strategy. The WHO during its joint external evaluation of Kenya's compliance to International Health Regulations (IHR) noted that the country had done well in public health communication. The One Health principle has been applied through its AMR secretariat that brings together agricultural professionals, human and veterinary doctors in addressing AMR [16].

2. Methodology

This paper is based on review of available literature on AMR. It builds on Kenyan experience during the development and implementation of its AMR communication strategy. While it widely uses AMR literature from other countries and its experience; emphasis is on how the available information has been used or can be applied in

behavior change communication. To unbundle this; inference is made from how the experiences can be explained by existing theories of communication and behavior change. The communication theories in addition to assisting in understanding of current status also help in identifying opportunities and challenges while carrying out AMR behavior change communication. The theories are grouped around four thematic areas namely; adoption of innovations, audience convergence around an innovation or an issue, agenda setting versus human suspicion trait and fear appeals.

Diffusion of innovations theory by Everett Rogers [17], explains how innovations and inventions like antimicrobials permeate through societies. The role of actors grouped as innovators, early adopters, early majority, late majority and laggards are explained by this theory. As an innovation diffuses spreads through masses; human beings have a tendency to converge around it subsequently resulting in mass acceptance of an innovation [17]. Converge may also be seen on how an innovation or invention is utilized as determined by stage of economic development; this is explained by the modernization theory [18]. Rostow's in modernization theory lists five stages of economic growth namely traditional, pre-condition to take-off, take-off, drive to maturity and mass consumption. According to modernization and diffusion of innovations theories; innovations or inventions at their climax or peak enjoy a mass consumption due to the convergence effect [17,18]. Antimicrobials can be placed at the mass consumption stage as seen in wide their usage globally. The usage of antimicrobials is determined by a many factor that differ from one society to another depending on their phase of economic development and stage of diffusion. At the peak of diffusion process, an innovation or invention audiences are many and heterogeneous. The challenge is how to reach all these audiences with different messages and achieve the same goal of changing their risky behaviors in the usage of antimicrobials to prevent AMR.

Conspiracy theory sees audiences as suspicious beings [19]. More so when an issue is being pushed by a few people or seems elitist. In contrast agenda setting theory asserts that masses should be told what to think around by their opinion leaders [10,11]. This means that a smaller team should set and drive an agenda for the masses to follow. An issue must have a group that champions its course; albeit the challenge of being viewed as elitist should be addressed. This theory supports source credibility in the voice of experts giving an opportunity to professionals to set the agenda. By who and how should the AMR agenda be set? Is the question this theory attempts to explain and answer in the process illustrating opportunities and challenges for health communication experts in AMR realm.

Lastly the paper discusses application of fear appeals as a message packaging principle. Should fear be used? If yes, what level of fear is likely to yield positive behavior change? And how can this be packaged to yield the requisite dose to trigger positive behavior among audiences?

3. Human behavior and AMR

Human behavior is a summation of knowledge and attitudes that people have covertly and the overt practice they exhibit as actions or inactions at an appropriate time [11]. The knowledge, attitudes and behavior are determined by the source of information, socio-cultural setting within which people exist. Attitude is overall feeling of favorableness or unfavorableness towards that object, institution, event or behavior [10,11]. Attitude towards performing a specific behavior is based on one's beliefs, immediate surroundings and information they access [10,11,15].

There is human behavior component on all aspects of AMR since antibiotics are solely handled and used by human beings. Doctors prescribe, the public takes or applies the antimicrobials while veterinarians prescribe and administer antimicrobials to animals. The resistance to antimicrobials is attributed to excessive use and misuse of antimicrobial agents in animal health, inappropriate prescriptions in

human medicine and misuse of antibiotics by the general public [12,13,20,21]. Subsequently understanding human behavior provides opportunities that an effective communication strategy can utilize in message development. However, it must be noted that human are both rational, irrational and rationalizing beings [10,11]. This presents a challenge that can be addressed through audience segmentation based on information needs after carrying out Knowledge Attitudes and Practices (KAP) survey. Segmentation means development and production of many Information, Education and Communication (IECs) for the different audiences based on their information needs as dictated by their risky behaviors.

For example; excessive use of antimicrobials in animals is fueled by intensive farming systems to meet an ever-growing market demand for livestock products [9,21,25]; points to a risky behavior among farmers. Subsequently vets may be influenced by a farmer to prescribe against their wish [9]. This is maybe worsened by low AMR risk perception indexes as seen in inadequate awareness among human and animal health professional [9,14]. The low risk perception index affects the medics' and vets' objectivity when prescribing antimicrobials to their clients. Patient or client behavior also influences the prescription or treatment decisions with some doctors prescribing antibiotics for treatment of viral diseases [14,20]. Why human beings do what they do must be understood for effective behavior change communication strategies. Take these two examples of documented researches which assert that: -

- "Use of antimicrobial in animals is mainly in animal production to control infections and boost productivity by increasing growth rates, production and optimizing reproduction" [13].
- "In the animal health sector, it is reported that the global antimicrobial use in animals will increase by 67%; with Brazil, Russia, India, China, and South Africa being the greatest consumers" [21].

Focusing on the statements above; two audiences and issues emerge in the mitigation of AMR – the audiences are veterinary doctors and farmers. The issue is veterinarians' and farmers risky behaviors in prescribing and administration of drugs and self-treatment respectively. The risky behaviors; which is the reason why both behave in a manner that goes against prudent use of antimicrobials must be identified and messages developed to counter such risky behavior.

4. The challenges

4.1. Many audiences, many messages, high cost

Audiences are the targets of a communication process. They are final consumers of the message shared and show the overt action depending on how they decode the message. A message is a specific statement of limited scope that is usually packaged to contain only one main idea and should relate, to the communication objective [23]. The packaging of messages is done based on carefully planned communication strategies, which are derived from knowledge of audience behavior, communication theories and information relating to audiences [10,11,23]. When many audiences are involved then it follows that an audience analysis and segmentation should be done. The different audience groups will each require different message packaging and different channels for effective communication. This is not only costly but time consuming.

In the Kenyan example, Ministry of Health (MoH) and Director of Veterinary Services (DVS) prepared Information Education and Communication (IECs) for four audiences namely; − farmers, veterinary professionals, human medical professionals and the general public. The messages were packages into posters for all the audiences and two Frequently Asked Questions (FAQs) brochures for the veterinary and human medicine professional audience groups. A total of seven types of IECs for the five audiences were produced. This was in

English alone, if this was to be done in Kiswahili which is the second national language in Kenya; the cost and time would double. The number and type of IECs was determined by audience segmentation based on information needs of these different audiences. This segmentation was aided by a pretest that was initially done on some posters produced targeting the general public. The paucity of country specific information on AMR further compounds the challenge.

Compare the above scenario with the case of polio, tuberculosis, HIV/AIDs or malaria awareness campaigns where audience groups were not as diverse and one message could be used for different audiences across countries. This must be considered by AMR awareness campaigns when they borrow from such past or ongoing health communication interventions.

4.2. Novelty of AMR as a health communication problem

Although the world was warned by Sir Alexander Fleming about antibiotic resistance in 1945; few heeded this message [5]. AMR is the first event of its type; and this means that health communication experts have not had an inoculation in this realm. The challenge with such novel experiences is that one has to start almost at point zero; without the benefit of experience and with only a few lessons learned from documented paltry case studies. The world needs to grow fast on AMR and mature before the problem grows and gets out of hand. The health communication experts need to guide on some communication and behavior change theories and principles that should be put to test, document success stories and quickly share for application.

There is need for KAP surveys to be carried across diverse audience groups to get a glimpse on how they perceive AMR, to identify risky behaviors and package messages that target to change such behaviors. Evidence from KAP surveys done in Kenya has illustrated novel perspectives of audiences on AMR. The KAP survey done in Kenya for example showed how farmers perceive and utilize or do not utilize footbaths at poultry units' doors to disinfect their feet [25]. Farmers despite being aware of this did not use footbaths because of the perceived cost implications of the disinfectant. The farmers said that most of their money is used to buy animal feeds and meet veterinary costs [25]. The fear of veterinary costs in this example can be packaged in an awareness message on proper use of footbaths which will lower disease incidences and subsequently cost of veterinary services. This is an example of how a study can unpack an audience's mental process about this novel phenomenon and how the findings can be used in communication.

4.3. Role of poverty

The role of poverty in the spread of other diseases like TB and HIV/AIDS is well documented [26,27]. Poverty is an audience characteristic that has an effect on how they decode messages and how they subsequently act- audience behavior. There is a strong correlation between poverty and the spread of TB and HIV/AIDs and AMR [26,27]. Human behavior is attributable to one's socio-economic status [15]. Poverty may dictate the covert attitudes and overt behaviors in the use of antimicrobial agents. Poverty affects supply of medications forcing the health professionals to prescribe partially and non-efficacious treatments and dispensing without prescription; lack of access to diagnostics resulting in symptomatic and not lab confirmed diagnosis [4,21,22,28].

Poverty affects use of antimicrobials resulting risky behaviors like sharing or saving for future use which can result in the development of resistance. Sharing of antibiotics among family members and neighbors is a common practice in most regions of the world [28–30]. Inasmuch as poverty has been reported to affect antimicrobial use, it is a pointer to other audience traits that are yet to be documented but which could be a factor in AMR and therefore presents an opportunity for further studies.

4.4. Oblivious professional "abusers"

While the outbreak and spread of diseases may not be fully attributed to health professionals; AMR may be attributed to health professionals to a significant degree. Health professionals occupy a critical position on Antimicrobial Use (AMU) and they have to be sensitized on AMR for them to carry on the message to their clients. They are credible sources of information on AMU and AMR. In the case of AMR, the vets and human medics may be victims of client pressure when it comes to prescribing of drugs. This audience need a conversion first; presenting an opportunity and challenge in AMR behavior change in equal measure. Several studies document overuse and misuse of antimicrobials among healthcare providers [12,22,30–32]. Studies have shown that physicians prescribe antibiotics for patients with colds and flus [31]. Although; this may be blamed on pressure from clients, the bowing to this pressure is indicative of low risk perception index among the health professionals as relates to AMR [20,32]. Client pressure results in human doctors and vets prescribing medications that are not necessary [33,34,36]. This risky behavior has contributed to AMR.

Doctors mostly choose to empirically treat based on their experience and epidemiology rather than confirmed laboratory results. An incorrect guess can lead to AMR and thus increased cost treatment [35]. In veterinary practice the same applies [36]. Behavior change communication should target these risky behaviors among human and animal health professionals. However, the practicability aspect of confirmed laboratory diagnosis in field veterinary practice is a challenge that needs to be addressed.

Training in effective clinician-patient communication to enable health professionals act as credible sources and communicate about the benefits and risks of antibiotics for improved clinical decision-making and patient satisfaction is suggested as an opportunity [32,33].

4.5. Global vs national statistics

Statistics are important tools in communication; they help in information packaging by enhancing message appeal to target audience. Statistics give evidence why an intervention must be done. They are a strong call to action. However, statistics must be proximate to targeted audiences both psychologically and geographically. For proper advocacy at national and regional levels local statistics are needed. Policy makers need contextual and national statistics to influence their decisions on resource allocation towards AMR. Statistics must speak to a national audience not a global audience as it is with AMR currently.

Human minds decipher messages based on how proximate an issue is to them geographically and psychological. Currently there are a lot of statistics that attempt to quantify the AMR problem but most of them are at global scale and far placed in terms of time lines when the AMR impact will be felt. Examples of statistical statements below as relates to AMR are widely quoted: -.

"Economically, the result of our current failure to limit AMR is predicted to reduce global population between 11 and 444 million by 2050. As a result, this annual decrease in gross domestic production could lead to a deficit of 2.1 to 124.5 trillion dollars."

[37].

"Global consumption of antimicrobials in food animals was estimated at 63 151 tons in 2010, of which the largest share 23%, was in China, 13% in the USA, 9% in Brazil, 3% in India."

[21].

"One person dies every minute from AMR in the globe."

[49].

The above messages are unlikely to trigger an action at a personal level when dealing with individuals nor at a national level when lobbying policy makers. Most AMR national action plans point out this weakness in availability of national statistics on AMRs and propose for studies to document the effects of the problem nationally.

4.6. Putting a face to AMR

Does AMR have a face? Is a question that was asked during a sensitization of journalists on AMR in Kenya. The journalist who asked the question explained that like in TB and HIV/AIDs they had seen patients and had talked to them and all he wanted was for us to show him an AMR victim so that they can interview the person and write a story? It was certainly a difficult question; because AMR is more of a multi-faced phenomenon rather than a well-defined condition. In answering we referred to relatively well-known Multi-drug resistance TB and chronic wounds as faces of AMR. We added the disk diffusion bioassays for antibiotic activity to try and mortalise AMR.

AMR has a "language problem" [38, 39] Many terms that are used fail to convey information about the threat. In 2005, WHO did a general public survey on awareness about AMR; only 44% of respondents were aware of the term 'antimicrobial resistance' compared with 68% for the term 'drug resistance', terminology used much less frequently in this context. The journalist's question was basically attempting to put a face on AMR.

Countries need to carry out Knowledge Attitudes and Practices (KAP) survey to better understand how communities have constructed AMR [25]. Through communication people construct meanings based on their social settings. This meaning should be deciphered and integrated into AMR communications. In a poster on antimicrobials for example do you use a picture of a pill, capsule, bottle or a sachet to portray an antimicrobial? This is questions that should be answered when developing AMR messages and this is all in an attempt to put a face to AMR.

5. The opportunities in AMR communication

5.1. Some communication theories applicable in understanding AMR

Development of resistance in micro-organisms is natural process of adaptation, antimicrobial resistance, means that the effective lifespan of antibiotics was limited [5,6]. Public education on AMR should have started immediately antibiotics were invented. Why? Because innovations go through a stepwise phased progression as they are adopted by the populations. This diffusion of innovation is governed by among others optimistic opinion leaders who set the agenda, the pessimists who oppose the diffusion, individual traits like fear and design of the innovation being diffused. Health communication experts can borrow some lessons from diffusion of innovation, modernization, agenda setting and conspiracy theories and other concepts like use of fear appeals in message packaging. Below is an elaboration of these theories and their probable application in AMR behavior change communication

5.1.1. Diffusion of innovations and modernization theories

Diffusion of innovations theory was developed by Everett Rogers in 1962 to explain how, over time an idea or a product gains momentum and diffuses (or spreads) through a social system [17]. This theory has been widely applied in behavior change communications to segment audiences and improve the rate of adoption of an innovation or invention [17]. Antimicrobials are inventions; to date they have diffused and have been adopted by societies across the globe. They have gone through awareness, interest, evaluation and trail phases. Antimicrobials have been adopted by the public because they are believed to be effective; the economic status of their users has played a role in their diffusion.

According to modernization theory, societies have the tendency to convergence and resemblance which pushes an innovation through masses [18]. This happens at the climax of the change brought about by the innovation. Generally traditional societies are hard to change because of the sociocultural settings [10,15,24,26]. In general, change is a

slow process. According to the modernization theory the transformation process is classified into: -traditional, pre-condition for take-off, the take- off, drive to maturity and high or mass consumption of change (product or service) [18]. At maturity stage; masses have almost fully adopted the innovation and have developed different ways of utilizing it. At this stage; risky behaviors arising from differences in use are many and the challenge is their identification and prescription of change strategies. We are at stage of mass consumption of antimicrobials where there is a wide almost universal adoption and use of antimicrobials. The magnitude of change required to reverse some of the AMU habits that fuel AMR is a challenge. In the same breadth other new alternatives like use of bacteriophages [43] can be marketed as innovations that can help in AMR using the diffusion of innovations theory.

5.1.2. Conspiracy and agenda setting theories

Conspiracy theory attempts to explain important events as secret plots by powerful and malevolent group [40]. The interests of this group are perceived to benefit them and not the masses. Conspiracy theory builds on the principle that perceptions are realities [19,41] – "people are what they think". In the diffusion of innovations curve; the left tail is composed of a small number of innovators who develop the invention or innovation. This small group is the one that pushes for the adoption of their invention or innovation or to set an agenda for an issue. Audiences are both rational and irrational and can be swayed by conspiracy theory to believe what is not necessarily objective. It is no wonder to date over a third of Americans believe that global warming is a hoax [19,42]. A noble course maybe perceived to be elitist and may fail to get the social support it needs for the achievement of a set goal. As AMR campaign picks momentum, it is important to plan how to overcome opposition to the AMR course.

Agenda setting theory attempts to describe how the public decides what to pick from its environment for discussion. The public agenda is the main focus or prime issue which the public is concerned about [24,46,47]. The Theory was developed in the early twenties by Walter Lippmann in reference to the role of mass media in influencing the setting of certain image in the publics' minds. There are three agenda setting types namely public, mass media and policy agendas [47].

Once an agenda is set the public is primed to receive and process information around the issue. It opens up debate and a collective action is sought. The question is can we set an AMR an agenda at the global, continental, regional and national levels? The UN organizations; − FAO, WHO and OIE have set the pace with the GAPs, the national governments have developed and are implementing NAPs. This is however not enough; the efforts must be increased to attain the threshold for more action towards mitigating the effects of AMR. Being cognizance of conspiracy theory and building on agenda setting theory how can we use our current scenario to ride on agenda setting and counter conspiracy theorists?

As heightened AMR awareness creation starts there might be some audience groups that can easily become avoiders or blockers due to misinformation or lack of adequate information or negative impact of AMR campaigns on their livelihoods. There is an opportunity for professionals in human and veterinary medicine to actively set the agenda as credible sources on AMR.

5.1.3. Use of fear appeals

The current literature from few researches done already paint an unpalatable picture of the future if humanity does not contain AMR. The statistic by institutions and scholars largely use fear appeals albeit in a generalized form. Examples are highlighted below: -.

"Current failure to limit AMR is predicted to reduce global population between 11 to 444 million by 2050."

[37].

"The health consequences and economic costs of AMR are respectively estimated at 10 million human fatalities a year and a 2 to 3.5

percent decrease in global Gross Domestic Product (GDP) amounting to US$ 100 trillion by 2050."

[48].

"It is postulated that AMR will increase Length of Stay (LOS) in hospitals, use of costly and toxic treatment and complications and death".

[4].

"According to WHO one person dies every minute from AMR globally. It is further estimated that AMR will increases LOS by 6.4 to 12.7 days totaling to 8 million extra hospital days translating to 20 billion dollars in direct costs and 35 billion in indirect costs."

[49].

"Research into new molecules is not moving as fast as AMR further making the future picture grim. The reason given for this is the greater profit margins for drugs treating chronic illnesses, pharmaceutical companies have largely abandoned antibiotic development."

[45].

Use of fear appeals is a concept used in behavior change communications. The AMR issue has fear arousing traits that can push audiences to action; they include the cost of treatment, long stays in hospitals and death. The question is how these fear appeals can be harnessed to bring about a desired behavior change in Anti-Microbial Usage (AMU). Research shows that medium and targeted fear appeals have a positive effect on behavior change [44].

6. Knowledge attitudes and practices (KAP) surveys

Lack of effective demand by the beneficiary populations has been blamed for low uptake of health interventions in sub Saharan Africa [49]. Communities must demand for the health interventions for quick adoption; this is possible when communities are involved in the definition of the problems and identification of solutions.

Integration of Indigenous Knowledge, local cultures and beliefs systems in AMR should be done to answer questions like: - What are antimicrobials? How do different communities classify diseases? What are the benefits to the communities for actions taken towards prudent use of antibiotics? KAPs should be carried out across the globe and findings documented and shared for the development of effective AMR behavior change communication strategies and subsequently the messages.

More KAP surveys on AMR will help countries and the globe by offering information that can used to coin messages and subsequently influence behavior change. Countries should also be assisted to establish public health information units as directed by International Health Regulations [16].

7. Conclusion

Antimicrobial resistance is a multifactorial problem which requires input from various stakeholders. Existence of strong Global and National Action Plans for AMR should be boosted with development of communication strategies. Unlike the other disease conditions experienced in the health sector, AMR is a unique phenomenon which requires novel mitigation strategies. As a result, it is inevitable to put in place communication strategies that will lead to behavior prediction and effective behavior change strategies among all actors in AMR. This is likely to be a gradual process that will demand immense and consistent input from all players in order battle AMR.

Declaration of Competing Interest

I declare no conflict of interest in the publication of this paper.

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