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ICREID

SCIENTIFIC REPORT

AFRICA CDC
Centres for Disease Control and Prevention
Safeguarding Africa's Health

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INTRODUCTION

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In 2007, WHO warned that infectious diseases are emerging and re-emerging at a rate that has not been seen before. The potential for infectious diseases to spread rapidly results in high morbidity and mortality, causing a potential global public health treat of major concern.

Several factors are contributing to the (re)emergence of infectious diseases such as population growth, living in close contact with animals, frequent travelling, poverty, destructive ecological changes due to economic development and land use and climate change result in global warming.

Especially Africa is at a threat for (re)emerging infectious diseases due to the huge population growth (expected to reach 2.5 billion by 2050) with rapid urbanisation. Additionally, people across and beyond the continent are excessively mobile which is combined with a weak health system. Moreover, the risk of (re)emerging infectious disease is further heightened by three newly adopted continental initiatives: African Continental Free Trade Area, Free Movement of Persons and African Passport and Single African Air Transport Market.

Therefore, the African Heads of State and Governments issued a declaration on the 3rd of July 2017 to accelerate the implementation of the International Health Regulations (IHR) in order to safeguard Africa's health security and protect economic growth[1,2]. The IHR is a legally binding instrument adopted by all WHO Member States to protect the lives and livelihoods from the international spread of diseases and other health risks[1]. Additionally, many African countries participate in the Global Health Security Agenda (GHSA) launched in February 2014 to advance a world to safety and security from infectious disease threats.

However, it is vital for all stakeholders to be aware of continuous updates, the current and future challenges, and moreover to exchange knowledge regarding epidemic preparedness. Therefore, the second International Conference on (Re)Emerging Infectious Diseases (ICREID) in Addis Ababa was organized. The ICREID provides a global platform bringing public health and specialists in emerging infectious diseases together in an interactive conference setting. A three-day meeting, in line with the GHSA and IHR, served as a catalyst to safeguard global health security, strengthening disease intelligence and provide information to respond and prevent acute public health threats. This meeting report outlines an overview of the most important topics discussed during the meeting.

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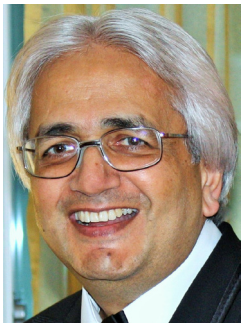

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EPIDEMIC PREPAREDNESS

In order to avoid new pandemics, pandemic or epidemic preparedness (EP) is highly important. Lessons learned from historical experiences can indicate that pandemics can have a tremendous effect on humanity resulting in an increased mortality and morbidity. Moreover, pandemics lead to social devastation and they have an economical impact due to the disruption of trade and other sectors, as routine health services. Ebola, for example, resulted in a loss of gross domestic product ranging from $2.8 to $32.6 billion. Additionally, the comprehensive economic and social burden in West Africa was estimated around $53.2 billion[3,4].

Different aspects are required to prepare for the next pandemic. Additionally, preparations should be made in a timely manner. The first aspect in EP is the placement of a good prediction system. However, predicting the location of the next emerging infection can by quite challenging and requires sufficient epidemiological and biological knowledge. For instance, identification of the Ebola outbreak took three months, since there was a lack of experience with the virus in the affected region. Additionally, laboratories struggled with sample handling and diagnostics, since there was no experience with this specimen. Early detection training, increasing biological knowledge, and capacity building are therefore key. Countries can invest in improving early detection and predictions by training epidemiologists and infectious disease public health specialists. Additionally, laboratories can be trained in handling certain specimens.

EP also involves other aspects such as sufficient communication, resource availability, and the proper logistics of resources and samples to the affected regions. During the West Africa Ebola outbreak, most of the affected countries were poorly equipped. Resources were unavailable, which can be overcome by countries stockpiling resources in advance. Poor roads challenged the transport of supplies and patients. Furthermore, weak communication systems made it hard to provide health alerts and inform the public. This resulted in fear and misinformation of the people, which are as contagious as the pathogen itself.

Another essential part in EP is strong leadership, as shown by Nigeria during the Ebola outbreak. A swift and aggressive public health response, involving the emergency operations centre (EOP) with local officials and international partners, haltered the Ebola epidemic. In Nigeria, isolation wards were opened, funds were rapidly dispersed, and the polio eradication infrastructure and lessons learned where executed in the Ebola response. Additionally, trained local health care workers provided surveillance and local contact tracing.

Unfortunately, at the moment, only few countries are reported to be IHR compliant to some extent at the African continent[2,5]. In order to establishing a solid EP plan support from the international community is key and financial support is needed. One of the investing partners in EP is the World Bank, whom has stated to provide financial support to countries who are developing an EP plan.

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THE ROLE OF NATIONAL PUBLIC HEALTH INSTITUTIONS IN EPIDEMIC PREPAREDNESS AND OUTBREAK RESPONSE

Since a public health event can rapidly turn from a local epidemic into a global epidemic, local health protection is extremely important. The National Public Health Institutes (NPHIs) are therefore crucial in ensuring EP. Key focus points of NPHIs are developing and coordinating strong surveillance and response systems. The obtained data and knowledge from these systems can be used to further inform priorities and to develop and evaluate policies and programs.

An example of national EP is the response to Rift Valley Fever (RVF) in Kenya. RVF outbreaks occur every 5-15 years and are mostly due to animal to animal transmission. Currently, surveillance is lacking, consequently mapping the hotspot of RVF at international borders is a huge challenge. Since in Kenya, no NPHI is present the ministry of health fulfils the role of implementing different public health core capacities which included a RVF surveillance.

In Zambia, the Zambia NPHI (ZNPHI) is a specialized technical arm of health mandated to supports the districts in improving the health of people in Zambia. They are an intelligence unit providing leadership in assuring national public health security and supporting the operationalisation of the Africa CDC. They had a significant role during the last cholera outbreak, where after laboratory confirmation of 2 cholera cases an Incidence Management System was initiated. Furthermore, the ZNPHI identified the risk factors resulted in cholera and performed geo-mapping to identify the outbreak locations. The cholera outbreak was associated with high-density areas were water source problem occurred due to poor sanitation, contaminated food, personal hygiene, and poor solid waste management. The ZNPHI was involved in managing and improving these problems. Due to their extensive knowledge and experiences, Zambia has led the sponsorship of the 2018 World Health Assembly resolution on Ending Cholera by 2030. Since Cholera is not halted by borders, cross border engagement is essential. Therefore, they have pushed the regional strategy and shared the resource mobilization, and technical support among member states. They participate in the Cholera Echo platform where all member states are linked and can discuss Cholera related topics and additionally see the involvement in EP[6].

In Nigeria, the Nigeria Centre for Disease Control and Prevention (NCDC) played a major role in the Lassa Fever outbreak. Previously, despite a high case fatality rate of 25% there is limited data and focus on Lassa Fever. The NCDC collected epidemiological and surveillance data. Next goals are to improve digital surveillance using real-time data which starts at a local level but will be exported to a national, and regional level. The improvement of surveillance systems

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involves in faster and more complete case detection. The challenge however is to establish the proper infrastructure from, and between, the several national districts and from paper towards an electronic system.

Another major role of the NPHI is coordinating diagnostics, maintaining and establishing the laboratory networks, and coordinating sample transportation. Often the laboratory infrastructure is the most neglected part in surveillance in Africa. Nevertheless, diagnostics are key in EP, since actions cannot be made based on solely clinical syndromes. During outbreaks an excessive number of supplies is needed to perform massive diagnostics. Moreover, real-time sequencing can guide an outbreak response as was shown during the Lassa fever and Monkey pox outbreaks. NPHIs can provide a supply chain system so basics response commodities are available when required. Subsequently, this involves logistic teams, drivers, warehouses for storage, and the distribution of commodities during an outbreak. The Nigeria CDC, for example, improved sample transportation, by partnering with a private company and building a governance and framework which met the standards of the reference lab.

THE ROLE OF NATIONAL PUBLIC HEALTH INSTITUTIONS IN EPIDEMIC PREPAREDNESS AND OUTBREAK RESPONSE

In many African countries the number of molecular laboratories are limited and existing laboratories are poorly distributed over the country. In Kenya for example, all laboratories are located in Nairobi, which is not readily accessible to some part of the country. The NPHIs can provide a strategic plan which involves logical locations, where mostly required, for new laboratories. Moreover, they can increase the number of molecular laboratories and establish laboratory networks (lab networks). The benefit of lab networks are that quality can be assured and the strength of a network can be used.

The NPHI also have the lead, overall coordination, advices, and evaluates during outbreaks. Often during outbreaks additional taskforces are set up. In Kenya for instance, the RVF task force takes the role of advising during RVF outbreaks. Furthermore, they provide support in coordination of the outbreak response. Emergency operation centers (EOCs) also have a role during outbreaks. The polio EOCs, for instance, were used during the Ebola outbreak. After the Ebola outbreak national EOCs were initiated to navigate the response in every state. Importantly, researchers should be included in the EOCs, since they can provide information and fill out the research gaps. The NPHI facilitates this by building capacity and the training of epidemiologist and public health specialists.

One of the most important responsibilities in EP of the NPHI is finding the right collaborators and bringing all partners and stakeholders together. During the outbreak response, which is a synergy of actions, the NPHI should take the lead and ensure fluent coordination. After the outbreak the NPHI maintain the relation with the partners and collaborators.

NPHI are also key in building trust towards the people by providing solid information over media and social media. Often, they provide accurate and new information to the health practitioners, program managers, and policy makers. As an example, the ZNPHI provided community information on the dangers of handling and consumption of dead meat and carcasses, which was unknown by the citizens. Moreover, NPHI have the opportunity to communicate with leaders and politicians to increase commitment.

Countries leadership and ownership are indispensable in EP. Therefore, it is very important that countries commit some budget to the NPHI or a national CDC. This shows commitment and accountability to the populace. Moreover, Africa is a very large continent so sub regional hubs can help in standardization and interpretability and minimize gaps in countries.

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ROLE OF REGIONAL PUBLIC HEALTH INSTITUTIONS

Globally there are several public health institutions (PHI) that operate on a regional level and are supported by the government. Regional PHI are needed since epidemics do not halt at national borders and often affect regions. Regional PHI provides an umbrella over the different NPHI and with that closes the gap with surveillance and data. Moreover, regional PHI can build capacity on a regional level.

One of the examples of a regional PHI is the European Centre for Disease Prevention and Control (ECDC) in Europe. The ECDC is a decentralised body for a specific technical area and provides specialised knowledge with certain degree of independence to the European Union (EU) commission, EU counsel, and EU member states. The ECDC aims to identify, assess and communicate current and emerging treats to human health posed by infectious diseases. They mostly perform risk assessments and not risk management, since this is the responsibility of the EU commission and individual countries. Additionally, they support the member states in their task of risk managements. The ECDC works from a core of scientific evidence, which they define as independent, high quality and relevant.

The ECDC strengthens its ties with the EPIET program, which is a training program for epidemiologists and microbiologists but also teaches general preparedness infrastructure. They perform daily surveillance, which is based on two pillars. The first is an indicator-based surveillance, which is a slow system. Therefore, the second strategy is a faster, event-based surveillance. In daily meetings the signals of both surveillance pillars, response, and follow-up are discussed.

On most occasions the technical and logistic public health emergency teams from the ECDC were deployed based on cases outside of the EU region. Therefore, the ECDC also provide several trainings in collaboration with the WHO as for instance a simulation exercises on a hot topic, multi resistance AMR case that travelled through several countries.

Furthermore, they collaborate with several partners on surveillance and the analysis of data in a One Health perspective (EMA, EFSA). They publish an EuLabCap report every two years, which describes the public health vulnerabilities in microbiology in the EU and EU member states. Moreover, they partner with the veterinary sector to investigate the Antimicrobial Consumption and Resistance in the EU, which is also published every two years[7].

In Africa the regional PHI is the African CDC, which is recently established due to the need for a continental network of networks. The African CDC is in line with the IHR, which encourages regions to take functional and effective responsibility for EP with sensible assistance from partners where needed. Roles of the Africa CDC are to strengthen coordination, have an oversight role, establish and maintain quality, and strengthening the health systems. They strongly advocate to have NPHI in every country, since this is the only way to harness the public health systems. Combining strengths can define the preparedness ability on the continent. The Africa CDC has, therefore, started with seeking partners to establish and support this matter.

The individual NHPI should invest in smart surveillance, which can be an early warning system for outbreaks. However, since most outbreaks are never detected the Africa CDC has established a comprehensive disease intelligence surveillance tool. This tool is linked to the integrated base surveillance from WHO. The establishment of evidence-based-surveillance together with other partners as the WHO, NGOs and member states can close the gap in surveillance. Additionally, inspired by trainings programs as EPIET and EIS, they want to increase investment in trainings programs for epidemiologists and public health experts from and within the African continent. Currently, they are seeking partners with the same vision to further expand the programs.

In order to improve diagnostics, the Africa CDC deployed four laboratories, which can provide testing for Ebola in DRC and are all operated by local Congolese citizens. In this manner, the African people can take adequate response and address the problems in their region. They further aim to strengthen whole genomic sequencing sites which were very instrumental in the Lassa fever outbreak since they determined the transmission source. Furthermore, real-time sequencing could define the strategy for infection control. Several institutions are helping the Africa CDC to establish a regional integrated laboratory surveillance network (RISLNET) with laboratories from several countries on the African continent. To achieve universal health coverage, we must integrate and coordinate research, capacity development and implementation efforts.

ROLE OF REGIONAL PUBLIC HEALTH INSTITUTIONS

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The Africa CDC encourages all member states to have their own response teams. Nevertheless, the CDC also has rapid response teams which can be deployed when needed. Since resources and trained work force are often scarce, frameworks for other diseases should be integrated to have a more effective approach. The framework for HIV for instance, is solid and people can be trained for emerging infectious diseases and used when required. These people can be trained for an outbreak response and deployed when needed. In order to share all experience and research from the continent within the continent, the Africa CDC has established a journal, Journal of Public Health Africa.

Unfortunately, there are still several challenges that the African CDC and its African partners are facing. Due to better understanding and investigation many can be addressed and solved. Especially, with the support from partners from around the world including the private sector. One of the ongoing challenges are the Influenza outbreaks. Influenza is a risk factor for serious illness accompanied with a high burden of morbidity and mortality[8,9]. Furthermore, it is one of the main causes of respiratory deaths in the elderly population. Currently, there is a lack of data since only few African countries have published on influenza. Therefore, it is unknown what the total burden of influenza is, who the population at risk is, and when the seasonal influenza outbreaks occur, which might vary per country[9]. Moreover, in many other countries elderly are vaccinated to prevent influenza infection, however it is unknown if this would be useful in African countries. Additionally, only three African countries have policies regarding influenza vaccines[10]. A good surveillance system must be in place to guide decision making.

Another challenge is the plague, which is still present in several countries worldwide. From 2010 to 2015 there were a total of 3248 plague cases and 584 deaths worldwide. Most cases were reported by the Democratic Republic of Congo, Madagascar, and Peru. Usually, the plague is endemic in rural areas however occasionally outbreaks in urban areas occur. There are several challenges in the plague control, which includes a high mobile population, crowded road transport, and frequent interchanges between rural and urban areas. Moreover, rodent control is difficult and when a rodent is killed the fleas can transport the plague towards humans. In rural areas, rodents are also required since they are a source of protein. The CDC can move the agenda forward and push for more research with the help of the NPHI.

Lassa fever, a neglected disease for many years, occurs frequently in Africa in the so-called Lassa fever belt[11,12]. The Nigeria CDC is trying to fill the knowledge gaps by establishing a research agenda for Lassa fever[13]. Although several successes have been obtained (an international Lassa fever conference, improved surveillance and research, better diagnostics and laboratory strengthening) there are still many challenges. Still, not all the risk factors are known and there is no available vaccine or other known interventions to prevent human infections. The best method for rodent control is also a difficult issue, since the current vector control is a risk for children. In Europe baited vaccines for animals are provided for rabies, which could perhaps also be exploited to Lassa fever. Research into this is required however. More research is however needed. Currently, the CDC is investigating Personal Protection Equipment specially adapted to tropical climates to protect people who might get exposed.

The Africa CDC has several international partners with whom they are working together. One of the partners is the China CDC. The China CDC is collaborating actively with the Africa CDC since their vision is that one health and the Global Health Security can only be obtained if all people are united[14]. Since the 2014 Ebola outbreak the China CDC have supported the Africa Union and other partners with the establishment of Africa CDC. As of 2017, around 1100 health care professionals from China were working in several African countries. Furthermore, they promote its strategy, institutional development and capacity building in order to strengthen the public health system.

Another partner is the West Africa Health Organization (WAHO), which is the only sub-regional health arm also including public health in Africa. The WAHO has convening authority and therefore it can bring countries together. Additionally, they communicate with the leaders of countries. They coordinate the implementation of the one health approach for surveillance of epidemics and national AMR. Other tasks of WAHO are strengthening the EID surveillance with special projects where epidemiologists are trained. In order to train more field epidemiologists WAHO is also engaged in two universities. Moreover, they try to harmonize policies of several countries and discuss the establishment of regional reference laboratories. The WAHO have response teams and provide technical and financial support during outbreaks. Interestingly, they organized a regional biobank to provide transparency in the data and informed consent of the public.

THE ELIMINATION OF YELLOW FEVER EPIDEMICS

Yellow fever (YF) is a difficult virus since it causes epidemic changes from sylvatic cycle transition to urban transmission cycle with humans as a reservoir. When conditions facilitate this (high density populations, good mosquito breading environment, and insufficient vaccine coverage) big outbreaks occur. This was the case in countries as Congo, Angola, and Uganda, which required massive vaccine campaigns (>30 million people). Subsequently, this depleted the global YF vaccine depository and was very costly.

Moreover, YF provides a diagnostic challenge due to co-circulating viruses with serologic cross-reactivity, overlapping clinical syndromes and geographical distribution. In some areas there is low awareness towards YF and therefore, other VHF or malaria are ruled out first, which results in a diagnostic delay. Consequently, this results in a delay in detecting YF outbreaks.

There are YF vaccines available. A single dose provides lifelong immunization, which opens the opportunity for the global strategy to elimination yellow fever epidemics (EYE) to eliminate YF by 2026. In collaboration with partners as GAVI and WHO, massive vaccination campaigns are started. However, due to vaccine shortage one of the primary pillars of EYE is to prioritize public health interventions based on risk. Moreover, the strategy includes that international spread should be prevented, and high-risk workers protected. In line with the IHR resilient urban cities should be build. Strong surveillance and laboratory capacity is crucial in EYE. Still, there are many challenges to overcome on the road towards elimination.

In Sudan there is a diagnostic delay of YF, since doctors first refer to malaria due to low YF awareness. In order to tackle YF, Sudan is building strong partnerships with organizations as the Africa CDC, Robert Koch Institute, WHO, UNICEF, and WFP. In the process of elimination, they learned to include all available data from YF serological studies on non-human primates for surveillance purposes. Additionally, entomological studies, which includes information regarding the YF potential vectors, eco environmental data and information in which can be used surveillance models, are of importance.

In the past years, several YF outbreaks occurred in Nigeria. The 1995 outbreak, however, was the reason to initiate surveillances. Furthermore since 2014, a vaccine program where all 9-month-olds are vaccinated is in place. Currently, YF should be immediately reported when diagnosed to the authorities. However, challenges still occur. In 2017, the YF and monkey pox outbreak occurred simultaneously, and in the latest outbreak the YF epicentre was similar to the Lassa Fever one. In both examples this resulted in a major diagnostic challenge, which resulted in late diagnosis and subsequently reporting.

There are only four laboratories in Nigeria, which are part of the Laboratory Network. During the outbreak samples were, therefore, sent to non-network labs. Additionally, the national testing is based on serology (IgM ELISA), which has long protocols and is therefore challenging for the staff. Molecular confirmation is only available in Dakar (molecular reference centre), which takes at least 21 days. The previous outbreak highlighted the importance of timely diagnostics during active transmission.

Nigeria aims to expend the laboratory network and had assessments from WHO Nigeria, the Nigeria CDC and AFRO network. This resulted three additional laboratories into the Laboratory network which can perform serology. In addition, laboratories whom perform Lassa Fever serology have the capacity for YF, so these should be added to the YF network in the following years. Moreover, Nigeria wants to strengthen serology testing by shortening the turnaround time and carefully implement molecular testing in the laboratory network, which enables the opportunity for real-time case confirmation in the future. Importantly, in country WHO YF network accreditation is needed, so samples do not have to leave the country.

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THE ELIMINATION OF YELLOW FEVER EPIDEMICS

In Cameroon, YF diagnostics is also limited by the diagnostic capacity. A strong laboratory network is urgently needed to ensure rapid and reliable case confirmation and outbreak characterization. They contributed to the establishment of AFRO in 2007, which is a YF laboratory network with a reference lab in almost all high-risk countries. This was crucial to determine cases during the last outbreak. Currently, only two laboratories are WHO accredited as reference labs and a third laboratory (Cameroon) is under consideration. During the accreditation assessment several gaps were detected, which outlined the importance of a strong laboratory network. In the laboratories no special YF budget was present. Additionally, reagent procurements were insufficient which resulted in a shortage of stock and consequent testing interruptions or delays. Furthermore, there was a lack of funding for sample shipment. Due to the previous Ebola outbreak no collaboration with courier services was in place, since they haltered the collaboration. It also outlined the lack of a molecular testing platform (92% molecular testing for other pathogens while <50% for YF), the use of different testing protocols per centre, laboratories being understaffed, no routine or formal program for YF serologic or molecular proficiency testing and infrequent accreditation visits. Other facility and equipment gaps were also identified as; electricity interruptions, lack of biosafety cabinets, difficulties in calibrating instruments and inadequate laboratory space. The CDC has developed MAC ELISA kits to address the reagent logistic problems. Regional YF diagnostic training workshops in Africa have or are being organized. Additionally, a testing algorithm is developed for the AFRO laboratory network and allows national case confirmation.

GAVI, the vaccine alliance, aims to better target the YF vaccine use, particularly by improving timeliness and completeness of YF laboratory network testing. Additionally, GAVI tries to market shape the diagnostic market and to avoid YG vaccine stock outs. They provide funding to high-risk GAVI eligible countries to increase the laboratory capacity and to improve diagnostic procurement.

EPIDEMIC RISK INDEX IN AFRICA

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In 2015, The African minister of Finance requested the African Risk Capacity (ARC) Agency to develop a product to address countries' financing needs to contain infectious disease outbreaks common to the African continent. This information should provide transparency in the return of investment in outbreak and epidemics. Additionally, the ARC is developing a new parametric insurance product for outbreaks and epidemics to enable rapid country-led responses to stop the spread of a nascent infectious disease outbreak. With this information they expect to obtain faster and more predictable funding, early actions by governments, catalytic funding to start a country response, and a reduced impact of outbreaks and epidemics.

One of the partners of the ARC, Metabiota, established the Epidemic Preparedness Index (EPI), which uses data from 188 countries worldwide. The data is integrated in the Metabiota's disease-spread model, which informs governments, the private sector and other in financial decision making around outbreaks and epidemics[15]. The EPI scores are a comparable preparedness assessment metric to JEE composite scores[15]. The EPI sketches a profile of the countries capacity and provides strategic information.

There are several other frameworks to measure risk capacity which are divided in three categories; risk tools, preparedness tools, and health event guidelines. Most preparedness scores assess the national level, while there is often a tremendous subnational difference. Additionally, there is an absence of a standardized, reproducible, and comparable tool with pathogen-specific features and metrics.

The pathogen-specific risk profiling of the ARC is more subnational focussed and based on three data pillars; the disease emergence maps, a capacity analysis and the preparedness index scores. The capacity analysis consists of seven different major domains, which are in line with the JEE; surveillance, response, laboratory capacity, risk, governance, financing and infrastructure. Through this analysis for instance, the ARC revealed a regional capacity difference for meningitis and viral haemorrhagic fever samples in Uganda.

THE TREATMENT AND HANDLING OF ANTIMICROBIAL RESISTANCE

Antimicrobial resistance (AMR) is resulting in problems that undermine all previously made efforts resulting in infections that are difficult or impossible to treat. The CDC estimated that annually 2 million people are getting infected with AMR, 10 million people will die in 2050 due to AMR, which will mostly be in developing countries[16] . Therefore, AMR is a big danger to humanity as big a danger as climate change or warfare.

Following the 2015 World Health Assembly, all 194 WHO member states committed to developing National AMR Action Plans with policies to improve responsible antibiotic use by 2017 Progress has been patchy and slow, especially in low- and middle-income countries (LMIC). Many National AMR Action Plans do not have detailed strategies for implementation or committed resources.

AMR is not a disease but an outcome and shows the numbers of overtreatment with antibiotics. AMR can therefore be reduced by reducing infections in general, due to a healthier population with better water, vaccination, and health care[17]. Interestingly, vaccinations result in less disease, which results in less treatment of secondary bacterial infections. Logically, less disease results in less overtreatment. For instance, 1 out of 3 children gets infected with a community acquired pneumonia, which according to guidelines is treated with antibiotics while the major cause is often a virus. Literature shows that distribution of Influenza vaccinations strongly reduces the use of antibiotics[17].

In order to reduce AMR, the use of antimicrobials should be optimized. This can be guided by diagnostics, with for example more point of care testing. Additionally, several AMR diagnostic use accelerators are available which uses electronical clinical decision aid tools and behaviour change interventions to guide policy decisions for implementation. Moreover, governance and regulations should be implemented adequately for animal health, human health, and food production. Moreover, health care providers should be well trained on the use of antimicrobials. Subsequently, this involves veterinary education. New drugs should be preserved, which can be maintained by established stewardships to avoid rapid overuse and early emergence of resistance. This can be vital for resistant gonorrhoea for which a new drug is in the pipeline. However, there is low access to diagnostics that can support the appropriate diagnose.

AMR surveillance efforts should be empowered to track and map the emergence of resistance and to take adequate control measures. Presently, there is a lack of tools to capture this data. AMR surveillance data should start locally but should report to regional and global surveillance systems. The challenge here is that data formats often differ. The trade-off cost of surveillance should be assessed to build more advocacy and investment.

INNOVATIVE APPROACHES TO MONITOR AND CONTROL OUTBREAKS AND THE IMPORTANCE TO SPEED UP INNOVATIONS IN AFRICA

There is a major importance of diagnostics in EP[18,19]. However, the development, availability and uptake of diagnostics are too slow. As an example, during the Ebola epidemic there were almost no available diagnostics. However, when the WHO declared the Ebola outbreak as a worldwide treat, shortly afterwards an acceleration for Ebola diagnostics took place. In total, 14 diagnostics were approved by the FDA and WHO. Strikingly, many Ebola diagnostic tests were no longer available two years after the first African outbreak[20]. Additionally, several companies developed with multiple viruses and malaria (topical fever multiplex test). Although these tests are easy and can reach the patient in rural areas, there is no commercialization of these tests.

The costs of these tests are often high and the commercial interest for infectious diseases is low. Currently, there is no market for infectious disease diagnostics. Companies need to justify these costs and the process should be accelerated as part of EP. A market must be created, to increase the interest of commercialization by companies, which can be generated by surveillance. By using the test in surveillance the test is available and in use. Therefore, when an outbreak occurs the numbers only should be increased. Furthermore, funding is needed to breach the gap, and in order to ensure sustainability in the affected region aim for an integrated diagnostic approach.

There should be a global diagnostic alliance, which integrates several key players to discuss, validate and integrate innovation and diagnostics. Moreover, GAVI would be a suitable partner, since they have a sustainable framework and good business model.

CONCLUSION

For EP, profound political will and global leadership are key to prevent and or halt the next pandemic. A coordinated multisector approach is key in addressing public health treats due to EID. Having a dedicated technical arm safeguards a coordinated response, this starts with NPHI, continental networks of networks, and regional institutes as the Africa CDC takes the lead in building advocacy. Solid surveillance systems should be in place, preferably integrated with other existing surveillance systems. In addition, more investment is needed for continental training of epidemiologists and public health specialists. Furthermore, more research is needed to guide surveillance programs and EP plans.

Crucial for both surveillance and during outbreaks are timely and sustainable diagnostics. Laboratory networks are key and should be expanded for both serology and molecular testing. Funding is essential in strengthening laboratory networks and to improve diagnostic procurement. Importantly, more laboratories involved in the laboratory networks, should get WHO accreditation as reference lab. Real-time sequencing can guide outbreak responses during ongoing transmission. Moreover, it provides information on where to prioritize vaccines with regards to YF elimination. International and domestic sample transportation is an overall issue and not only for YF, so collaboration with partners is key to establish a solution. Integrated platform responses are more successful and sustainable.

In order to reduce AMR, vaccine coverage should increase. Additionally, all countries should be aware of the danger of AMR and health care givers should be trained in adequate antimicrobial use.

REFERENCES

1. Organization WH. International Health regulations (2005) third edition ed. Geneva2006.
2. meeting THoSaG. Declaration on accelerating implementation of international health regulations in Africa. DocEXCL/1026(XXXI)2017.
3. Group WB. 2014 -2015 West Africa Ebola Crisis: Impact Update. 2016.
4. Huber C, Finelli L, Stevens W. The Economic and Social Burden of the 2014 Ebola Outbreak in West Africa. The Journal of Infectious Diseases 2018;218:S698-S704.
5. Commission TAU. Agenda 2063, The Africa We Want - A shared strategic framework for inclusive growht and sustainable development, First ten-year implementation plan 2014-20232015.
6. Cholera Platform. Global Task Force on Cholera Control. (Accessed 15-07-2019, 2019, at https://www.plateformecholera.info/index.php/wac-platform.)
7. European Centre for Diseaese Prevention and Control (ECDC) EFSAE, and European Medicines Agency (EMA). ECDC/EFSA/EMA second joing report on the intergrated analysis of the consumption of antimicrobial agents and occurence of antimicorbial reistance in bacteria from humans and food-producing animals - JIACRA report 2017.
8. Nair H, Brooks WA, Katz M, et al. Global burden of respiratory infections due to seasonal influenza in young children: a systematic review and meta-analysis. Lancet 2011;378:1917-30.
9. Gessner BD, Shindo N, Briand S. Seasonal influenza epidemiology in sub-Saharan Africa: a systematic review. Lancet Infect Dis 2011;11:223-35.
10. Ortiz JR, Perut M, Dumolard L, et al. A global review of national influenza immunization policies: Analysis of the 2014 WHO/UNICEF Joint Reporting Form on immunization. Vaccine 2016;34:5400-5.
11. Akpede GO, Asogun DA, Okogbenin SA, Okokhere PO. Lassa fever outbreaks in Nigeria. Expert Rev Anti Infect Ther 2018;16:663-6.
12. Ilori EA, Furuse Y, Ipadeola OB, et al. Epidemiologic and Clinical Features of Lassa Fever Outbreak in Nigeria, January 1-May 6, 2018. Emerg Infect Dis 2019;25:1066-74.
13. National Disease Outbreak Dashboard 2006 - 2018 Nigeria Centre for Disease Control, 2019. (Accessed 12-07-2019, 2019, at https://ncdc.gov.ng/data.)
14. Gao GF, Nkengasong JN. Public health priorities for China–Africa cooperation. The Lancet Public Health 2019;4:e177-e8.
15. Oppenheim B, Gallivan M, Madhav NK, et al. Assessing global preparedness for the next pandemic: development and application of an Epidemic Preparedness Index. BMJ Global Health 2019;4:e001157.
16. O'Neill J. Antimicrobial Resistance: Tackling a cirisis for the health and wealth of nations2014.
17. Lipsitch M, Siber GR. How Can Vaccines Contribute to Solving the Antimicrobial Resistance Problem? MBio 2016;7.
18. Kelly-Cirino CD, Nkengasong J, Kettler H, et al. Importance of diagnostics in epidemic and pandemic preparedness. BMJ Glob Health 2019;4:e001179.
19. Peeling RW, Murtagh M, Olliaro PL. Epidemic preparedness: why is there a need to accelerate the development of diagnostics? Lancet Infect Dis 2019;19:e172-e8.
20. Cnops L, De Smet B, Mbala-Kingebeni P, van Griensven J, Ahuka-Mundeke S, Arien KK. Where are the Ebola diagnostics from last time? Nature 2019;565:419-21.

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